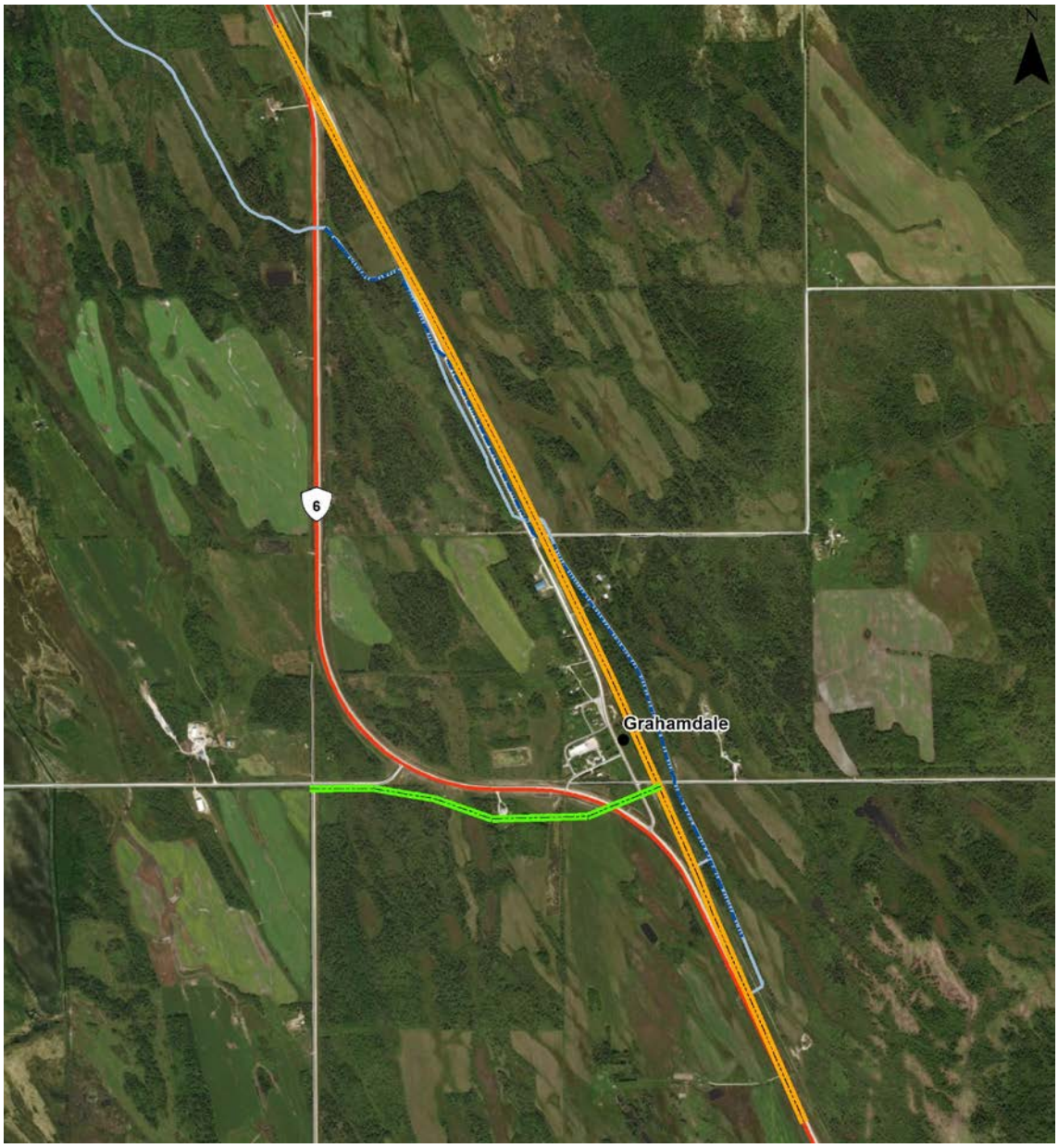
MANITOBA ENVIRONMENT ACT PROPOSAL

Relocation of a 3.6 Km Section of PTH 6 and Upgrades to 1.1 km of Carne Ridge Road in the Vicinity of Grahamdale



Manitoba Infrastructure

November 2019

Manitoba Environment Act Proposal for the Relocation of 3.6 Km of PTH 6 and Realignment of Carne Ridge Road in the Vicinity of Grahamdale

Submitted to:

Manitoba Conservation and Climate
Environmental Approvals Branch

Submitted by:

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Executive Summary

Manitoba Infrastructure (MI) is proposing to relocate a 3.6 km section of Provincial Truck Highway (PTH) 6 and realign approximately 1.1 km of Carne Ridge Road near the community of Grahamdale. The relocation of 3.6 km of PTH 6 is required in order to correct two substandard back to back curves. Realignment of 1.1 km of Carne Ridge Road is necessarily in order to meet the necessary design criteria for the approach and intersection with a PTH.

This Environment Act Proposal Report for the Proposed Project follows the Environment Act Proposal Report Guidelines (MSD 2018) and considers a range of potential physical, biophysical and socio-economic factors. Potential Project effects were evaluated, with consideration given to the application of mitigation measures, determination of any residual effects, and their significance. The proposed mitigation measures outlined in this Environment Act Proposal are expected to effectively prevent, avoid or minimize potential effects. Some minor persistent residual effects were identified as part of the analysis including:

- Minor overall increases in GHG and dust emissions associated with vehicle/equipment during construction and maintenance activities;
- Minor overall increases in noise and vibration attributed to construction and general operation of the Project for local residents living in close proximity to the relocated section of PTH 6;
- Permanent minor alteration of local terrain associated with the construction of an elevated road embankment and potential development of quarries or borrow pits;
- Minor loss of vegetation and alteration of local plant community composition within Carne Ridge Road and PTH 6 Rights of way (ROW's) due to select clearing and compaction of soils, and mowing/maintenance of ROW, and possible unintentional introduction of non-native or invasive plant species;
- Minor loss and alteration of wildlife habitat loss along Carne Ridge Road and PTH 6 ROW's;
- Potential for wildlife avoidance of ROW due to noise and vibration associated with construction and operation of the realigned portion of Carne Ridge Road and relocated section of PTH 6; and
- Small potential for overall increase in wildlife mortality over current conditions primarily associated with vehicle collision risks.

These residual effects are considered to be relatively small and are offset by the need to improve the existing provincial road network at this location for the benefit of the travelling public. Based on the review of the Project in conjunction with the application of mitigation measures no significant adverse environmental effects are expected to occur.

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1. INTRODUCTION

Manitoba Infrastructure (MI) is proposing to relocate a 3.6 km section of Provincial Truck Highway (PTH) 6 and realign approximately 1.1 km of Carne Ridge Road near the community of Grahamdale. This Environmental Assessment Proposal (EAP) for the Project is being provided to the Environmental Approvals Branch of Manitoba Conservation and Climate to obtain a license for a Class 2 development under The Environment Act of Manitoba. The following sections of this EAP summarize the Project and associated components, reviews existing environmental conditions, assesses potential Project-related effects in conjunction with proposed mitigation measures.

2. BACKGROUND

PTH 6 is part of Canada's National Highway System, and is the primary north-south arterial roadway in Manitoba. This section is a two lane undivided roadway with 3.7m asphalt travel lanes, 1.8m gravel shoulders, and was designed to Road transportation Association of Canada (RTAC) loading design criteria. Traffic volume is an average of 1940 vehicles Annual Average Daily with 16% trucks (AADT-2014). Right-of-way (ROW) width at this location along PTH 6 is 61m.

Review of the PTH 6 alignment at the community of Grahamdale revealed that there are two back to back 30 degree curves with less than 100 m travel distance between them. These curves are substandard and do not meet current departmental design criteria in order to optimize safety for the traveling public. In order to accommodate the relocation of 3.6 km of PTH 6 a new intersection and realigned approach for approximately 1.1. km along Carne Ridge Road is required. The Project location is shown in Figure 1.

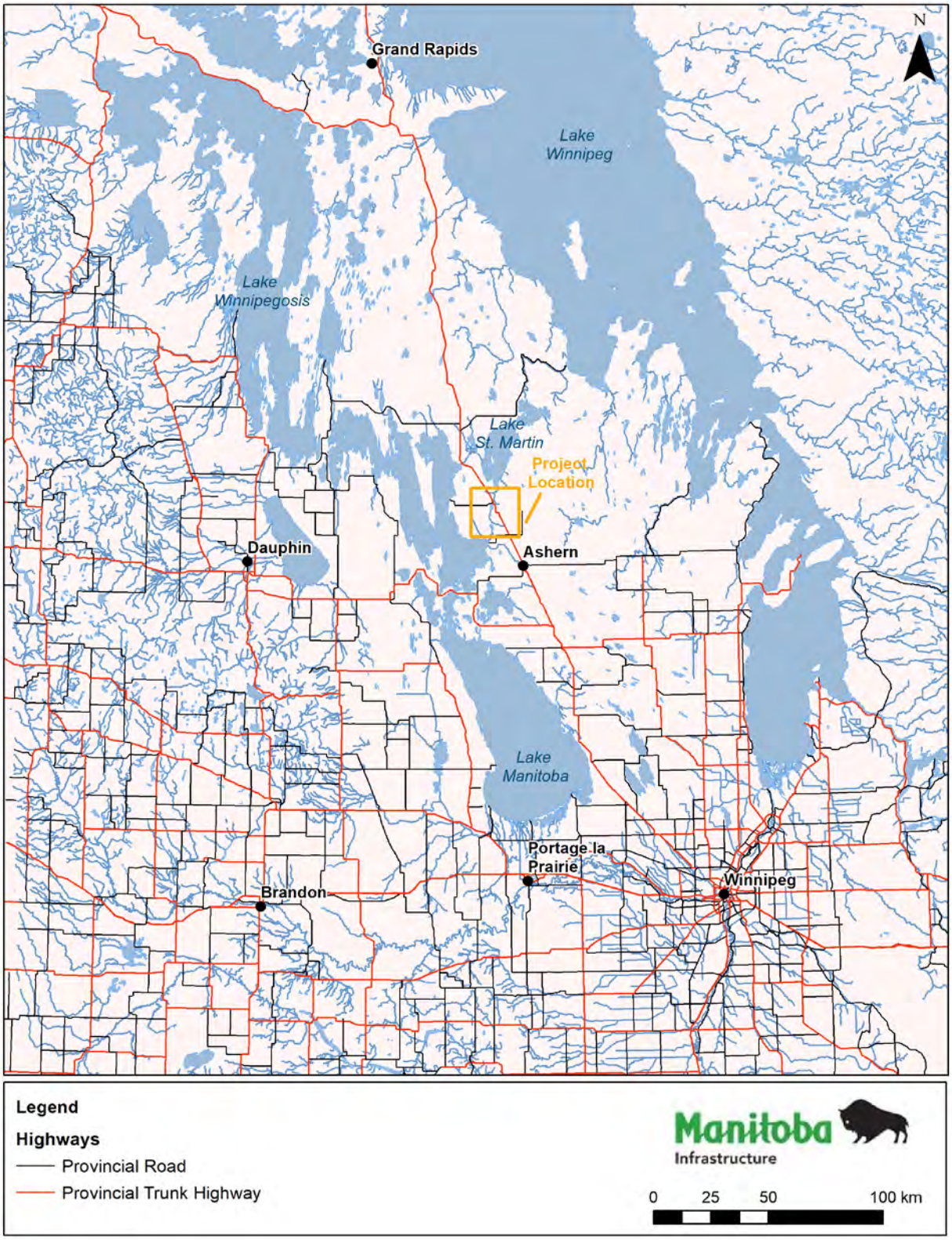

Figure 1 Project Location

2.1. Evaluation of Alternatives

MI's Region 4 offices undertook a planning exercise to best determine the most appropriate alignments for the relocation of PTH 6 and realignment of Carne Ridge Road. A functional design report was developed in order to review and evaluate five alternative alignment options for the Project. Criteria for the evaluation of alternative alignments included highway stewardship, socio-economic, environmental, and cost. Option A2 emerged from the evaluation as the most suitable alternative. Table 1 provides a summary of the factors considered in weighing each of the alternatives.

Table 1 Summary Evaluation of PTH 6 and Carne Ride Road Intersection Alternatives

Evaluation Criteria	Alternative Road Alignment Options				
	A1	A2	A3	B	C
Highway Stewardship					
Increase in Length to Hwy Network	Reduction in length of PTH 6 by 400 m	Reduction in length of PTH 6 by 400 m	Reduction in length of PTH 6 by 400 m	Increase in PTH 6 road length by 200 m	No change to existing PTH 6 road length
Geometric Design Criteria	Meets geometric design criteria	Meets geometric design criteria	Meets geometric design criteria	Meets geometric design criteria	Meets geometric design criteria
Socio-economic					
Minimizes Impact to Home Owners	No impact to yard or home	Impacts 1 yard or home, but is preferable to home owner	Impacts 1 yard or home	Impacts 1 yard or home	No impact to yard or home
Minimizes Loss of Cultivated Land	Minor impact to cultivated land (0.8 ha)	Minor impact to cultivated land (0.7 ha)	No impact to cultivated land	Impacts 2.0 ha of cultivated land	Impacts 2.6 ha of cultivated land
Minimizes Private Land Requirements	Requires 7.1 ha of private land	Requires acquisition of 4.0 ha of private land	Requires 3.8 ha of private land	Requires 17.6 ha of private land	Requires 25.5 ha of private land
Minimizes PTH 6 Through Traffic Travel Distance	Reduces PTH 6 through traffic by 400 m	Reduces PTH 6 through traffic by 400 m	Reduces PTH 6 through traffic by 400 m	Increase in PTH 6 through traffic distance by 200 m	Through traffic distance stays same as existing PTH 6 Alignment
Environmental					
Loss of Wetlands	Little to no loss of wetlands	Little to no loss of wetlands	Little to no loss of wetlands	Loss of 1.7 ha of wetlands	Loss of 15. Ha of wetlands
Loss of Grassland	Loss of < 3 ha grassland	Loss of < 3 ha grassland	Loss of 4.6 ha of grassland	Loss of < 3 ha grassland	Loss of 5 ha of grassland

Loss of Bush-land	Loss of < 12 ha of bush/treed land	Loss of < 5 ha of bush/treed land	Loss of < 5 ha of bush/treed land	Loss of < 12 ha of bush/treed land	Loss of > 18 ha of bush/treed land
Costs					
Estimated Construction Costs	10-11 M	10-11 M	10-11 M	>12 M	>12 M
Road User Costs	Decrease in overall road user costs >10M	Decrease in over-all road user costs >10M	Decrease in over-all road user costs >10M	Overall 3.9M in-crease in road user costs	Overall 0.8 M in-crease in road user costs
Summary Ranking of Alternative Alignment Options	***2***	***1***	***2***	***4***	***3***

3. PROJECT DESCRIPTION

The Project consists of the construction of 3.6 km of new road alignment for PTH 6 and approximately 1.1 km of new road and associated intersection along Carne Ridge Road. The realigned portion of PTH 6 will eliminate three sub-standard curves, relocate PTH 6 to a straight alignment on the east side of Grahamdale. The new PTH 6 alignment will consist of two 3.7m paved lanes and shoulders with 0.8m paved and 2.2m gravel with a 0.25m rounding edge constructed of gravel. The existing horizontal curves will have 2.5m fully paved shoulders and 0.5m gravel. The Project also requires a new intersection and realignment of Carne Ridge Road in order to provide straight lines of sight. The realigned portion of Carne Ridge Road will be built to a Provincial Road (PR) standard in order to accommodate the future relocation of PR 239.

In addition to road works the Project also involves the replacement of through-grade culverts, replacement and/or removal of access culverts, and the re-alignment of a portion of Cabin Creek Drain, a 3rd Order Provincial Drain, to an adjacent ditch with similar capacity within the new PTH 6 ROW. Table 2 provides a summary of culvert replacements associated with the Project.

The existing Cabin Creek Drain runs in a north-westerly direction adjacent to an abandoned CN rail line and associated station grounds currently owned by the local municipality of Grahamdale. MI will be acquiring portions of the abandoned CN Rail Line and Station Grounds in order to realign PTH 6. The existing rail embankment will be incorporated into the design of the new road where possible in order to reduce material requirements and limit the extent of disturbance associated with the work.

Figure 2 shows the proposed relocation of PTH 6 and realigned portion of Carne Ridge Road. Figures 3 and 4 provide typical cross sections of the proposed new road construction. ROW widths for the new portions of PTH 6 and Carne Ridge Road will be 60 m and 50 m respectively.

Table 2 PTH 6 and Carne Ridge Road Culvert Replacements

Site	Station	Existing CSC	Proposed	Embedment (mm)	Fish Habitat	T-G or X-ing (X) *	Direction of Flow	Existing Q	Proposed Q	Comments
1	815+60	900mm x 9.8m	1050mm x 18m CSC	300	D	X	S→N	0.86	1.3	Cyprinid (minnow) habitat
2	815+72.5	900mm x 9.1m	1050mm x 17m CSC	300	D	X	S→N	0.86	1.3	Cyprinid (minnow) habitat
3	818+62	900mm x 22.9m	1050mm x 28m PCC	300	D	T-G	W→E	0.86	1.56	U/S trib. of Cabin Creek Drain
4	818+63	2x750mm x 8.0m	None	N/A	D	Railbed	W→E	1.1	N/A	May be removed (awaiting RM approval)
5	823+12	750mm x 29.8m	900mm x 35m PCC	300	D	T-G	W→E	0.55	1.06	Cyprinid (minnow) habitat
6	823+15	450mm x 12.2m	Will be removed	N/A	E	X	N/A	0.16	N/A	Through railbed
7	824+93	600mm x 17.4m	Will be removed	N/A	E	X	N/A	0.31	N/A	Indirect fish habitat
8	826+13	600mm x 12.1m	Will be removed	N/A	E	X	N/A	0.31	N/A	Indirect fish habitat
9	826+40	450mm x 14.8m	Will be removed	N/A	E	X	N/A	0.16	N/A	Indirect fish habitat
10	832+38	450mm x 9.8m	Will be removed	N/A	E	X	N/A	0.16	N/A	Indirect fish habitat
11	832+43	2 x 900mm x 10.5m	Will be removed	N/A	B	X	N/A	3.22	N/A	Cabin Creek Drain old alignment
		900mmx1600mm x 9.8m	Will be removed	N/A	B	X	N/A			
12	835+02	None	600mm x 17m CSC	100	E	X	S→N	N/A	0.31	Indirect fish habitat
13	835+04	None	3x1400mm x 43m PCC	300	B	T-G	SE→NW	N/A	8.91	3DQ10 fish passage of 0.76 m/s will be provided
14	835+05	3x1200mm x 14.7m	Will be removed	N/A	B	Mun Rd	N/A	5.28	N/A	
15	835+17	600mm x 12.2m	Will be removed	N/A	E	X	N/A	0.31	N/A	Indirect fish habitat
16	835+21	600mm x 11.8m	Will be removed	N/A	E	X	N/A	0.31	N/A	Indirect fish habitat
17	845+07	2x900mm x 9.2m	Will be removed	N/A	E	X	N/A	1.72	N/A	Indirect fish habitat
18	845+11	2x1100x1800mm x 14.2m	Will be removed	N/A	E	Mun Rd	N/A	5.1	N/A	Indirect fish habitat
19	845+60	None	750mm x 34m PCC	100	E	X	E→W	N/A	0.68	Indirect fish habitat
20	211+18	450mm x 9.3m	Will be removed	N/A	E	X	N/A	0.16	N/A	Indirect fish habitat
21	210+80	None	600mm x 27m CSC	100	E	X	W→E	N/A	0.31	Indirect fish habitat
22	209+26	450mm x 9.3m	Will be removed	N/A	E	X	N/A	0.16	N/A	Indirect fish habitat
23	208+94	None	450mm x 26m	100	E	X	W→E	N/A	0.16	Indirect fish habitat

Site	Station	Existing CSC	Proposed	Embedment (mm)	Fish Habitat	T-G or X-ing (X) *	Direction of Flow	Existing Q	Proposed Q	Comments
24	208+95	None	450mm x 25m	100	E	X	W→E	N/A	0.16	Indirect fish habitat
25	208+67	450mm x 9.9m	Will be removed	N/A	E	X	N/A	0.16	N/A	Indirect fish habitat
26	203+32	600mm x 12.2m	Will be removed	N/A	E	X	N/A	0.31	N/A	Indirect fish habitat

Notes:

N/A = Not applicable as culvert is being removed

T-G = Through Grade culvert through PTH 6

X-ing = Access / Crossing Culvert to private property

U/S = Upstream

D/S = Downstream

Mun Rd= Municipal Road through-grade

Figure 2 Proposed Relocation of PTH 6 and Realignment of Carne Ridge Road

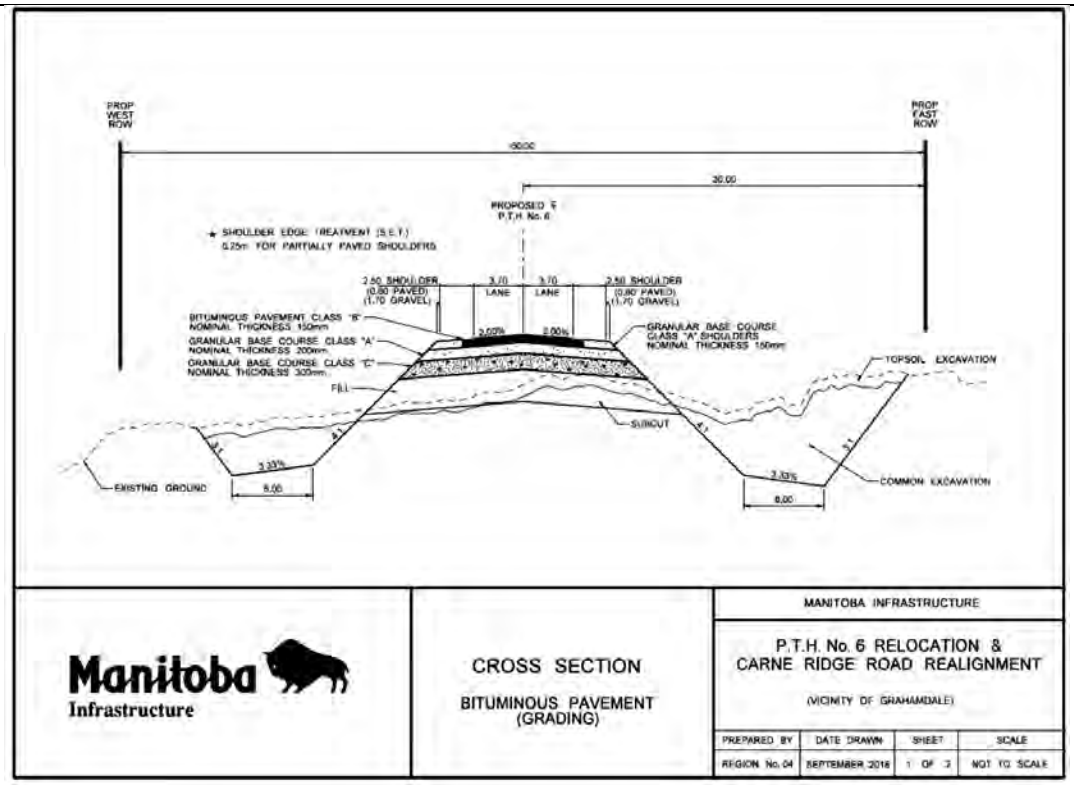

Figure 3 PTH 6 Typical Cross Section

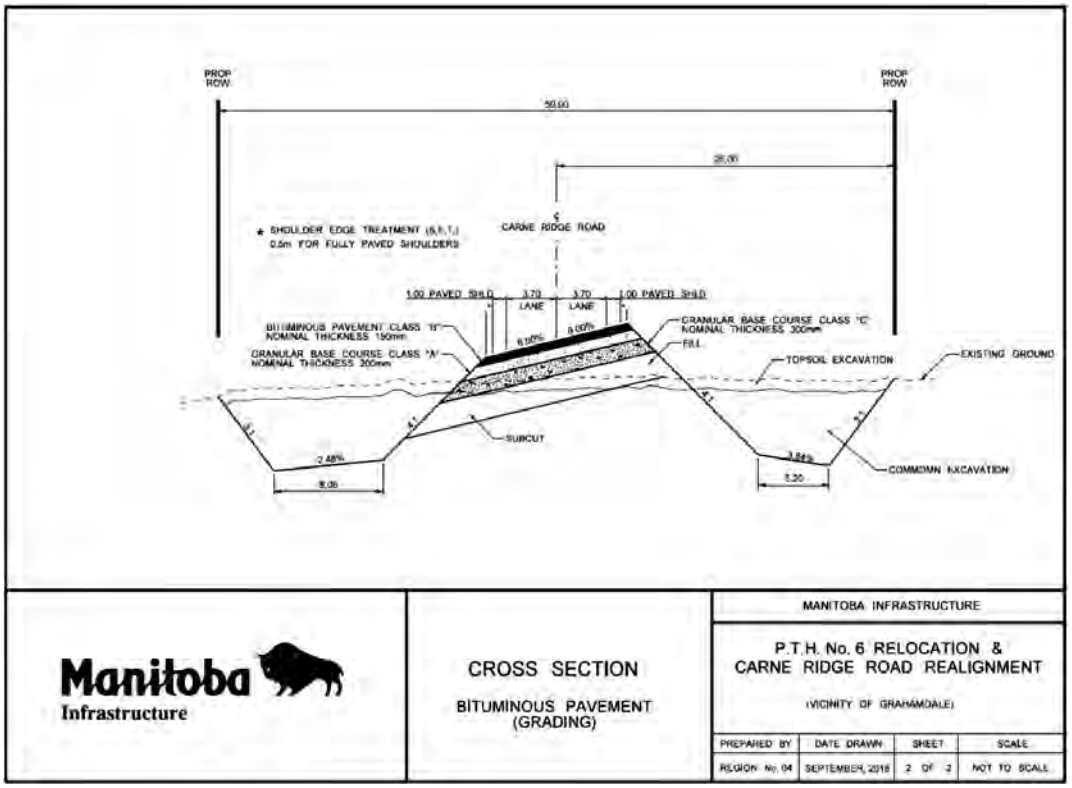

Figure 4 Carne Ridge Road Typical Cross Section

3.1.1. Schedule

The schedule for the proposed project is expected to begin September 2020 with construction completed by June 2021.

3.2. Other Federal/Provincial/Municipal Approvals

Aside from licencing of the Project under Manitoba's Environment Act *C.C.S.M. c. E125* the work may require quarry permits and/or leases to source materials under the Mines and Minerals Act C.C.S.M. c. M162. No other Federal, Provincial, or Municipal approvals are required.

3.3. Funding

This Project is not cost shared and will be funded solely by the Province of Manitoba.

3.4. Legal Description

The legal description for lands involved with the proposed Project are as follows:

- SE 10-28-8W
- NE 10-28-8W
- NW 10-28-8W
- SW 15-28-8W
- SW 15-28-8W
- NW 15-28-8W
- SW 22-28-8W
- SE 21-28-8W

All land required for the project are private properties or held by the Municipality of Grahamdale. This includes 8.1 ha of abandoned rail bed that is owned by the Municipality of Grahamdale. The Project does not require any Crown lands.

3.5. Land Use

The Project is located adjacent to the community of Grahamdale. The Rural Municipality of Grahamdale Development Plan (2006) indicates that land in the vicinity of the Project has been designated as either a General Development Zone or as an Agriculture Rural Area. The General Development Zone establishes land uses for development in the community of Grahamdale. This can include development such as family dwellings, businesses, parks, playgrounds, schools, public services, etc. Lands zoned as Agriculture Rural Areas are intended to facilitate various types of agricultural development and associated secondary industries such as Feed Mills, Outfitters, Golf Courses, and Livestock Production Operations.

Review of the general area revealed that the community of Grahamdale and surrounding area supports relatively little development but includes, farms, small business and a limited number of residential dwellings and their supporting infrastructure (e.g. municipal roads etc.). A portion of the proposed PTH 6 alignment passes through an abandoned CN Rail Line and Station Grounds. The existing rail embankment will be incorporated into the new road alignment. A provincial Drain (Cabin Creek Drain) runs parallel to the abandoned CN rail embankment and proposed PTH 6 alignment. A portion of this provincial drain will be relocated and incorporated in to the new PTH 6 ROW.

3.6. Mineral Rights

Review of available information on mineral dispositions obtained from the Manitoba Conservation and Climate's Mineral Resources Branch identified various cancelled mining claims (2), casual quarry permits (6), and Quarry Leases/Explorations permits (5) throughout the broader area in which the Project is situated as shown in Figure 5. None of the mineral dispositions identified conflict with the proposed Project.

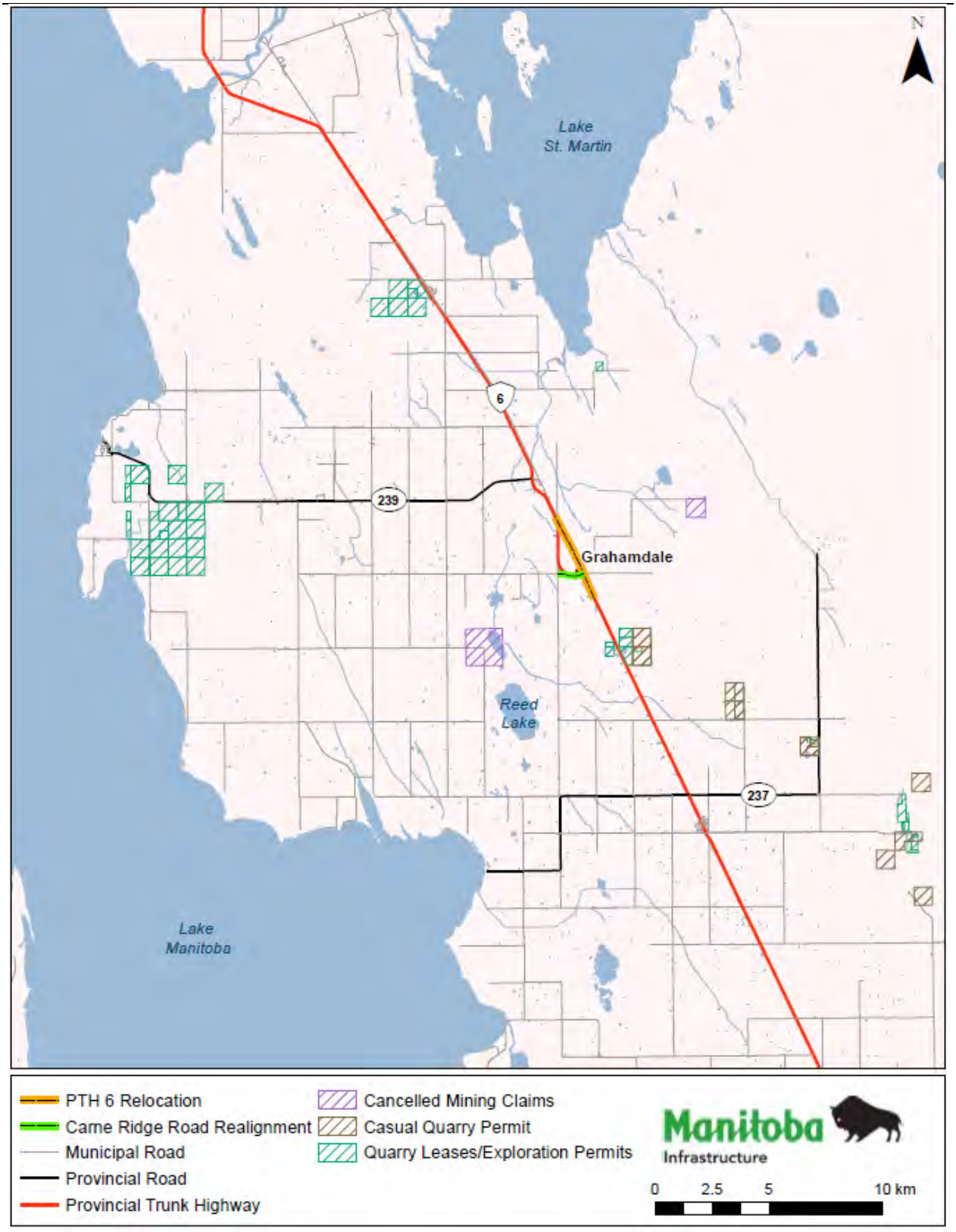

Figure 5 Mineral Dispositions in Proximity to the Project Area

3.7. Public Engagement Activities

MI held information meetings to discuss the Project with various potentially affected land owners and other members of the public living in the area over the 2017 -2018 period. The approach to information meetings included a mix of general meetings with the broader public as well as in person visits with individual landowners. The information meetings generally involved a review of maps followed by a discussion of the Project. Table 3 below identifies the dates and location of information meetings held for the Project.

Table 3 Summary of Landowner and Public Information Meetings

Date	Location	Attendance
November 20, 2017	RM of Grahamdale Boardroom	Mark Lovie (MI) Rick Postlethwaite (MI) Jacqueline Hickman (MI) Brad Dreger (Landowner) Ross & Helen Jermey (Landowner) Robert & Tracy Filion (Landowner) Dan & Nyla Klatt (Landowner)
November 21, 2017	Ashern Infrastructure Office Boardroom	Mark Lovie (MI) Rick Postlethwaite (MI) Jacqueline Hickman (MI) Lyndon Bittner (Landowner) Larry & Jason Yanke (Landowner)
	Clarke Residence	Mark Lovie (MI) Rick Postlethwaite (MI) Jacqueline Hickman (MI) Raymond Clarke (Landowner)
	Koop Residence	Mark Lovie (MI) Rick Postlethwaite (MI) Jacqueline Hickman (MI) Gordon & Lois Koop (Landowner)
	Jantz Residence	Mark Lovie (MI) Rick Postlethwaite (MI) Jacqueline Hickman (MI) Mr. & Mrs. Jantz (Landowners)
	Bankert Residence	Mark Lovie (MI) Rick Postlethwaite (MI) Jacqueline Hickman (MI) Raymond (Paul) Bankert (Landowner)
November 22, 2017	Ashern Infrastructure Office Boardroom	Mark Lovie (MI) Rick Postlethwaite (MI) Jacqueline Hickman (MI) Terry & Elaine Rubidge (Landowner) Hugh Harvey (Landowner) Hans Beil (Landowner) Jeff & Sandi Kipling (Landowner) Tim Tindall (Landowner)
December 6, 2017	Ashern Infrastructure Office Boardroom	Mark Lovie (MI) Rick Postlethwaite (MI) Jacqueline Hickman (MI) Tim Tindall (landowner)
January 18, 2018	Ashern Infrastructure Office Boardroom	Mark Lovie (MI) Rick Postlethwaite (MI) Jacqueline Hickman (MI) Alvain Morris (Landowner)
January 24, 2018	Ashern Infrastructure Office Boardroom	Mark Lovie (MI) Rick Postlethwaite (MI) Jacqueline Hickman (MI) Lyndon Bittner (Landowner)

Date	Location	Attendance
	Clarke Residence	Mark Lovie (MI) Rick Postlethwaite (MI) Jacqueline Hickman (MI) Arnold & Jack Clark (Lanowner)
February 21, 2018	Ashern Infrastructure Office Boardroom	Mark Lovie (MI) Rick Postlethwaite (MI) Jacqueline Hickman (MI) Oli & Allison Olson (Landowner)

The following provides a summary of key issues heard during MI's public information meetings.

- Engine Retarder Brakes Signing – Grahamdale is a small and quiet town, having the high-way go through the town will increase the noise level. The intersection of carne Ridge Road (future PR 239) and PTH 6 will have a lot of semi-truck traffic.
- Drainage – Drain running through town carries a lot of water. This past spring the "old highway road" was flooded from drain. Bankert would like to see the drain flow on the west side of proposed PTH 6.
- Klatt Road Intersection – Klatt's would like to see the intersection built to accommodate semi traffic as well as the graders they use for RM snow removal and dragging of roads.
- Town Lighting – Whenever traffic is slowed there is an increase chance of stopping which increases the risk of crime. Local residents would like to see street lights reinstalled in the community and have the intersection light up like at the existing Carne Ridge Road/PTH 6 intersection.
- Speed Zone – Will there be a speed zone through the community? MI will be keeping railway avenue as a service road for the locals and not have a speed zone through the town.
- Access onto PTH 6 – Access onto PTH 6 will be limited. Beil residence is okay with MI moving access onto Clark Rd and putting up a shelter belt along proposed PTH 6 to limit noise.
- Kipling Property – Landowner would lose some property for Carne Ridge Road/PTH 6 intersection and they are not in favour of this due to having young children and future plans to develop some of the land. The landowner would like to see if MI could push the inter-section further to the south where it would not affect any property.
- Tindall Property – Landowner feels the preferred alignment option would make it harder to sell property due to the noise and semi's using J-Brakes. The landowner would be open to the relocated portion of PTH 6 going through property with the option to sell or paid to move house.

4. EXISTING ENVIRONMENT

4.1. Biophysical Environment

4.1.1. Climate

Climate can be defined as the generally prevailing weather conditions of a region throughout the year, and is typically described by variables such as air pressure, cloud cover, humidity, precipitation, hours of sunshine, temperature, wind speed and wind direction. Environment and Climate Change Canada (ECCC) has collected climate normals data for several areas within Canada from 1961 to 1990, 1971 to 2000 and 1981 to 2010. The ECCC weather station closest to the Project with the most recent climate normals data, i.e., from 1981 to 2010, is located in Lundar, Manitoba. Table 4 summarizes the climate normals data for the Lundar weather station, which is located at Latitude 50°45' N and Longitude 97°56' W at an elevation of 266.7 m.

The 30 year climate normals report an average annual temperature of 1.9 degrees Celsius (°C), with an average maximum of 18.3°C in July, and an average minimum of -18.1°C in January (Government of Canada 2016a). Mean annual precipitation is 480.2 millimetres (mm), of which 385.5 mm falls as rain with the remainder 94.7 mm as snow (approximately 20 %). Precipitation falls primarily as snow during the winter months, with the greatest snowfalls occurring in November, December and January. Precipitation occurs mainly as rain during the spring, summer and fall seasons, with overall levels of precipitation peaking in June, July and August.

Table 4: Climate Normals Summary for Lundar, Manitoba (1981-2010)

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Daily Average Temperature (oC)	-18.1	-13.5	-6.6	3.3	10.9	16.4	18.3	17.7	11.3	4.4	-6.5	-14.6	1.9
Daily Max (oC)	-12.7	-8.0	-1.3	9.4	17.7	22.8	24.7	24.7	17.7	9.7	-2.1	-9.8	7.7
Daily Min (oC)	-23.6	-18.8	-11.9	-2.9	4.1	9.9	11.9	10.6	4.9	-1.1	-10.8	-19.4	-3.9
Rainfall (mm)	0.0	0.2	5.9	14.8	55.2	80.1	74.8	68.9	45.8	35.7	3.0	1.2	385.5
Snowfall (cm)	16.1	13.5	13.4	11.9	0.4	0.0	0.0	0.0	0.0	5.3	16.3	17.7	94.7
Precipitation (mm)	16.1	13.7	19.3	26.7	55.6	80.1	74.8	68.9	45.8	41.0	19.4	18.9	480.2

(Source: Government of Canada 2019)

The large lakes within and around the project area have an influence on the climate and weather. The basin size and position of Lake Manitoba, Lake Winnipegosis and Lake Winnipeg result in the creation of lake and land breeze circulations that can cause highly variable winds in the area (Environment and Climate Change Canada [ECCC] 2019). The presence of the lakes also influence temperature and precipitation patterns in the area, with sudden storms and snow squalls that can produce strong winds over the land and water (ECCC 2019).

4.1.2. Greenhouse Gas Emissions

Climate change has been linked to GHG emissions that contribute to atmospheric increases in levels of CO_2 and other gases (e.g., methane [CH_4], nitrous oxide [N_2O]) that increase global temperatures, change climate and precipitation patterns, and increase the frequency of extreme weather events. Environment and Climate Change Canada (ECCC) currently tracks six GHG substances as part of Canada's efforts to identify, quantify and reduce sources of GHGs. The six substances are CO_2, CH_4, N_2O, sulphur hexafluoride (SH_6), perfluorocarbons and hydrofluorocarbons (ECCC 2016b). Each GHG has a different global warming potential (GWP) and persists for a different length of time in the atmosphere; as such, GHG emissions from different types of gaseous compounds are converted into CO_2 equivalents to be compared and tracked over time (Climate Change Connection 2019). Table 5 provides a summary of GHG emissions by Canadian province and territory for 1990, 2005 and 2014.

Table 5: GHG Emissions by Province and Territory for 1990, 2005 and 2014

Province or Territory	1990 Greenhouse Gas Emissions (Mt of CO_2 Equivalent)	2005 Greenhouse Gas Emissions (Mt of CO_2 Equivalent)	2014 Greenhouse Gas Emissions (Mt of CO_2 Equivalent)
Newfoundland and Labrador (NL)	9.6	10.2	10.6
Prince Edward Island (PE)	2.0	2.1	1.8
Nova Scotia (NS)	20.0	23.5	16.6
New Brunswick (NB)	16.4	20.5	14.9
Quebec (QC)	89.1	89.7	82.7
Ontario (ON)	181.8	210.6	170.2
Manitoba (MB)	18.7	20.7	21.5
Saskatchewan (SK)	45.1	69.6	75.5
Alberta (AB)	175.2	233.0	273.8
British Columbia (BC)	52.9	65.2	62.9
Yukon (YT)	0.5	0.5	0.3
Northwest Territories (NT)	1.6[A]	1.7	1.5
Nunavut (NU)	n/a	0.3	0.3

Notes: [A] 1990 emissions data for the Northwest Territories include emissions for Nunavut, which was part of the Northwest Territories until 1999; Mt = megatonnes; n/a = not applicable; Emission levels for some years have been revised in light of improvements to estimation methods and availability of new data.
Source: Environment and Climate Change Canada (2016c) *National Inventory Report 1990–2014: Greenhouse Gas Sources and Sinks in Canada.*

Based on the data in Table 5, Manitoba was the 6th to 7th largest emitter of GHGs in 1990 and 2005, and the 6th largest emitter of GHGs in 2014, in comparison to all other provinces and territories. ECCC monitors GHGs under the Greenhouse Gas Emissions Reporting Program (GHGRP), which is Canada's legislated, publicly accessible inventory of facility-reported GHG data and information. The most current data available at the time of this writing was the summary for the year 2014, provided in Table 7 (ECCC 2016). In 2014, there were 12 facilities in Manitoba reporting under the GHGRP. These facilities are located about 200 to 600 km from the

Project area, with the exception of the Graymont limestone and gypsum processing plant, which is located on PR 239 between the towns of Steep Rock and Faulkner. The Graymont plant is located approximately 12 km west of the community of Grahamdale. This facility reported the 4th highest level of overall GHG emissions in Manitoba in 2014 (Table 6).

Other sources of GHGs throughout the broader area in which the project is situated can be attributed to agricultural and recreational activities; vehicles travelling PTH 6, which is the main highway in the area and an important route to Thompson, Manitoba; and vehicle use on the other municipal roads and trails throughout the area. Pollutants emitted from motor vehicles include NOx (nitric oxide and nitrogen dioxide), CO (carbon monoxide), volatile organic compounds, and to a lesser extent SO_2 (sulphur dioxide) and particulate matter.

Table 6: Summary of GHG Emissions Reported by Facilities in Manitoba in 2014 (ECCC 2016)

Facility Name	City/Town	Greenhouse Gas (tonnes CO2 eq)						
		CO2	CH4	N2O	HFCs	PFCs	SF6	Total
Brady Road Resource Management Facility – City of Winnipeg, Water & Waste Department	Winnipeg	48,530	332,500	-	-	-	-	381,030
Brandon Generating Station – Manitoba Hydro	Brandon	71,963	34	316	-	-	90	72,404
Faulkner Plant – Graymont Western Canada Inc.	Faulkner	143,454	18	161	-	-	-	143,632
General Scrap - Winnipeg – General Scrap Partnership	Winnipeg	1,659	2	15	-	-	-	1,676
HBMS Metallurgical Complex – Hudson Bay Mining and Smelting Co., Limited	Flin Flon	34,147	20	677	-	-	-	34,844
Kilcona Landfill – City of Winnipeg, Water & Waste Department	Winnipeg	6,125	55,825	-	-	-	-	61,950
Koch Fertilizer Canada, ULC – Koch Fertilizer Canada, ULC	Brandon	568,772	52,033	44,986	-	-	-	665,791
Manitoba Kraft Papers Division – Tolko Industries Ltd.	The Pas	57,350	6,676	4,828	-	-	-	68,854
Minnedosa Ethanol Plant – Husky Oil Operations Limited	Minnedosa	77,514	38	339	-	-	-	77,891
Summit Road Landfill – City of Winnipeg, Water & Waste Department	Winnipeg	10,509	95,775	-	-	-	-	106,284
Thompson Operations – Vale Canada Limited	Thompson	78,049	24	796	14	-	-	78,883
TransCanada Pipeline, Manitoba – TransCanada PipeLines Ltd.	Winnipeg	252,907	11,806	3,487	-	-	-	268,200
Totals		***1,350,979***	***554,751***	***55,604***	***14***	***0***	***90***	***1,961,438***

4.1.3. Air Quality

In Manitoba, air quality issues are mostly local in nature and are primarily related to odour and other pollutants such as wind-blown dust released from specific local sources or activities. Emissions from the metal smelters in Flin Flon and Thompson and smoke from forest fires tend to be the most significant sources of air pollution in northern Manitoba (Government of Manitoba 2009). Southern Manitoba has also experienced poor air quality on occasion due to smoke from forest fires or crop residue burning. Air quality throughout the broader area in which the project is situated can be affected by commercial, agricultural, recreational, rural, transportation and urban activities that occur in the region, as well as from naturally occurring forest fires.

The Province of Manitoba and Environment and Climate Change Canada operate air quality monitoring stations in the cities of Brandon, Flin Flon, Thompson, and Winnipeg, Manitoba. The air quality monitoring stations closest to the Project area are located in the City of Winnipeg at 65 Ellen Street and at 299 Scotia Street. Air quality parameters that are monitored include: carbon monoxide (CO); particulate matter less than or equal to (≤) 10 microns (PM_{10t}); particulate matter ≤ 2.5 microns ($PM_{2.5}$), nitric oxide (NO); nitrogen dioxide (NO_2); nitrogen oxides (NO_x); ground level ozone (O_3); sulphur dioxide (SO_2); wind direction; and wind speed (Government of Manitoba 2016b).

Table 7 provides a summary of the air quality parameters for Winnipeg, Manitoba on January 24, 2019 as an example of the available information.

Table 7: Air Quality Parameters for Winnipeg, Manitoba, January 24, 2019

Station	Date	Time	PM10t	PM	CO	O3	NO	NO2	NOX	SO2	Wind Dir	Wind Speed
			µg/m3	2.5s	ppm	ppb	ppb	ppb	ppb	ppb		
Winnipeg Ellen St.	1/24/2019	12:00 PM	2.8	0.8	-0.024	22.9	0.9	5.8	6.7	0	302	5
Winnipeg Scotia St.	1/24/2019	12:00 PM	-	0.6	-	-	1.2	-1.0	0.2	-	-	-

Source: Government of Manitoba 2019.

PM_{10t} = particulate matter ≤10 microns; µg/m3 = micrograms per cubic meter; $PM_{2.5s}$ = particulate matter ≤2.5 microns; ppm = parts per million; ppb= parts per billion; Wind Dir = wind direction in degrees; Wind Speed = wind speed in kilometers per hour.

The Manitoba Ambient Air Quality Criteria (Government of Manitoba 2005) provides the maximum tolerable, maximum acceptable and maximum desirable concentrations of air pollutants required to protect and preserve air quality for human health. Comparison of the air quality parameters for January 24, 2019 in Table 7 to the Manitoba Ambient Air Quality Criteria indicates that the measured parameters do not exceed the maximum acceptable level and meet the "maximum desirable" concentrations for parameters that have this value defined.

Environment and Climate Change Canada has also developed the "Air Quality Health Index" (AQHI), an index that is based on the relative risk to human health that can be caused by a combination of common air pollutants (ECCC 2016d). These pollutants include ground-level O_3, $PM_{2.5}$ and NO_2. The AQHI is measured on a colour-coded scale from 1 to 10+ and the values are also grouped into risk categories (low, moderate, high, very high) to identify the level of risk. The higher the number, the greater the health risk associated with local air quality (ECCC 2016e). The Province of Manitoba states that "recent monitoring has shown that the health risks associated with air quality for the cities of Brandon and Winnipeg are generally low, with an average AQHI rating of around three or lower in both locations" (Government of Manitoba 2016d). Manitoba's Sustainability Report 2009 indicates air quality as being stable in Manitoba based on the data from three reporting stations in Winnipeg, Flin Flon, and Brandon (Government of Manitoba 2009). The AQHI data summarized for Winnipeg for the period from 1987 to 2008 indicates good air quality for the majority of the time, with one episode of very poor air quality that occurred during 2002 that was likely due to smoke from burning crop residue in surrounding agricultural land (Figure 6) (Government of Manitoba, 2009).

The project area is located approximately 200 km northwest of the City of Winnipeg and supports a much lower density of population and development. It is expected that the ambient air quality within the project area is of similar or higher quality than that of the City of Winnipeg and surrounding area.

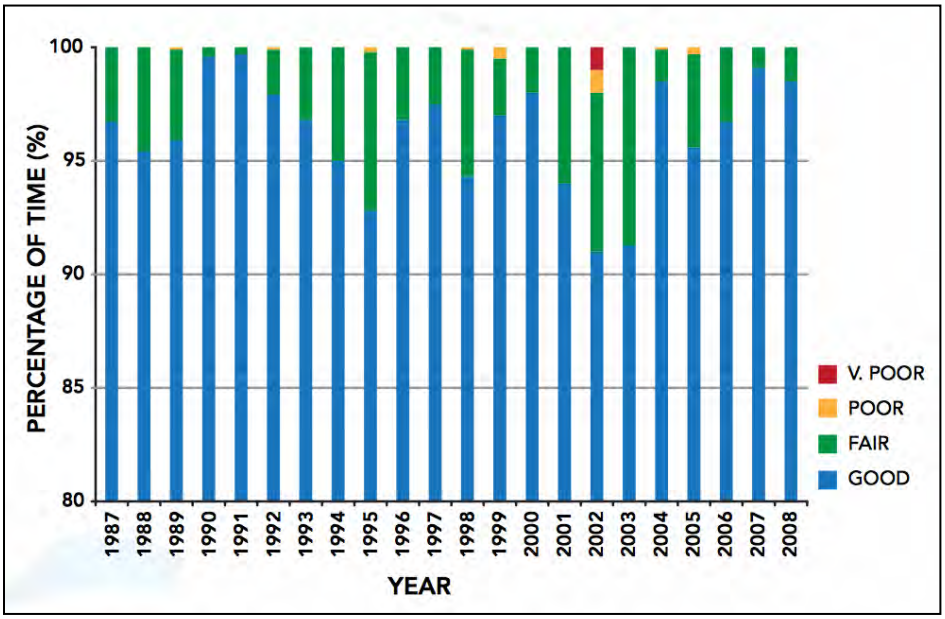

Figure 6: Winnipeg (Downtown) Air Quality Index, 1987-2008 (source Government of Manitoba 2009)

4.1.4. Noise and Vibration

Existing noise and vibration levels in the project area are expected to be typical of those of rural areas that support moderate levels of development, light industry and are located adjacent to a major north-south arterial route such as PTH 6. Major sources of existing noise and vibration in the vicinity of the Project Area include vehicle traffic (cars, light duty and transport trucks, construction equipment, recreational vehicles etc.) and industry (Processing plants, quarries). The Graymont Limestone and Gypsum Processing Plant is located along PR 239 approximately 17 km from the project area.

Traffic noise objectives have not been established in Manitoba for provincial highways; however, highway traffic noise is indirectly controlled by Transport Canada under the Motor Vehicle Safety Regulations (C.R.C., c. 1038) Schedule V.1 – Noise Emissions (Standard 1106), which defines maximum permissible sound levels (PSL) for individual categories of vehicles (Government of Canada 2016b). Common noise levels and typical human reactions are summarized in Table 8.

Table 8: Common Noise Levels and Typical Human Reactions

Source	Decibels (dB)	Effect
Quarry production blast at 500 m	128	-
Car horn/propeller aircraft/air raid siren	120	Threshold of pain
Amplified rock band	110	Maximum vocal effort
Rockbreaker breaking at 7 m	100	
Running train	100	Discomfort
Reversing alarm at 4 m	92	
Heavy truck at 15 metres (m)/ Busy city street	90	Very annoying - Hearing damage (8 hr)
Paver at 15 m	89	-
Jackhammer at 15 m	88	-
Concrete mixer at 15 m	85	-
Bulldozer, Grader or Loader at 15 m	85	-
Pneumatic tool at 15 m	85	-
Generator at 15 m	81	-
Backhoe at 15 m	80	-
Factory floor	80	Annoying
Concrete vibrator at 15 m	76	-
Pump at 15 m	76	-
Passenger car at 65 miles per hour at 8 m	70	Telephone use difficult
Normal conversation	60	Intrusive
Noisy office	50	Speech interference
Light automobile traffic at 30 m	50	-
Public library	40	Quiet
Soft whisper at 5 m	30	Very quiet
Rustle of leaves	10	Just audible
Threshold of hearing	0	-

Sources: Beranek 1988; CMHC 1981; Explosives and Rockwork Technologies Ltd. 2002; HMMH 2014.

As shown in Table 8, noise levels in the vicinity of a highway can be in the range of 50 to 70 decibels (dB), although actual noise levels would be dependent on the volume of traffic, speed of the traffic and distance from the roadway. Road construction equipment noise ranges between about 76 dB and 89 dB at 15 m from the equipment. The general area does support heavy truck traffic which produces 90 dB at 15m.

Regulation of noise in Manitoba is intended for management of worker exposure to noise levels in occupational environments, and local municipal bylaws established for noise nuisance management in the acoustic environment. Noise control guidelines for land use planning are provided through Manitoba's published *Guidelines for Sound Pollution* for daytime and night-time acceptable and desirable noise levels in residential areas (MCWS 1992). For residential areas, the maximum desirable level is 55 dB during the day and 45 dB at night. For road construction, the industrial maximum desirable level would be used, which is 70 dB day or night.

D. J. Martin (1977) conducted a study on ground vibrations due to construction noise generated by different types of equipment on different types of soils and surfaces. The study found that the major sources of vibration in road construction were the tracked earthmoving plant, compaction plant and intermittent impacting plant. Rubber-tired equipment did not generate ground surface vibration levels high enough to be detected by human subjects. At distances greater than 10 m, ground attenuation effects may reduce the vibration levels to values below human sensitivity.

Review of issues identified in association with MI's public engagement activities (Section 3.7) identified some local concerns associated with traffic noise once the project was complete and in operation. Specifically the need to install signage for engine retarder brakes and establishment of select shelter belt areas at some residential properties in order to dampen traffic noise associated with the Project. Despite concerns relating to engine retarder brakes no signage is being proposed at this time. The existing municipal Railway Avenue will be retained as a service road for local use meaning that there will be no speed reduce zone through the community. No change in traffic speed including heavy transports (i.e. maintaining traffic flow at consistent speeds) should reduce the need for engine retarder brakes in the vicinity of the community. Shelter belts will be established at select locations in order to accommodate local concerns surrounding additional traffic noise as required.

4.1.5. Terrain and Topography

The Project is located in the Ashern (723) Ecodistrict situated in Manitoba's Interlake region and between Lake Manitoba to the west and Lake Winnipeg to the east (Smith et al. 1998). The Ashern Ecodistrict has a gently sloping topography oriented toward Lake Winnipeg and westward toward Lake Manitoba (Smith et al. 1998). The physiography is the outcome of Glacial Lake Agassiz's retreat; wave action and iceberg scouring resulted in ridges of coarse-textured small rock (cobble and gravel) and finer-textured depressions (Smith et al. 1998). Forest stand vegetation is dominated by trembling aspen in the ridge areas, but often associated with balsam poplar and white spruce whose distribution is much affected by forest fires (Smith et al. 1998). Willow, sedge, and meadow grass occur in the poorly-drained depressions. Groundwater, the

principal source of water in the ecodistrict, is from shallow sand and gravel aquifers associated with the glacial till deposits (Smith et al. 1998).

4.1.6. Bedrock Geology

The proposed Project is located in the area of Manitoba referred to as the “Interlake” region as it lies between Lakes Manitoba and Lake Winnipeg. The geology of the Interlake region is composed of layers of Devonian, Silurian and Ordovician carbonates and sandstone formed during the Paleozoic era that overly or onlap with Precambrian granites or gneisses (Leybourne et al 2007). The geological history of the area also resulted in large deposits of limestone, dolomite and gypsum, many of which have been mined for use as foundations and building structures, aggregate materials, cement, wallboard and Plaster of Paris (Government of Manitoba 2016e). According to geospatial data obtained from the Manitoba Land Initiative, the geology of the Project area consists primarily of micritic, fossiliferous, stromatolitic and biostromal dolomite interspersed with several sandy/agrillaceous marker beds.

4.1.7. Soils

Soils throughout the broader area in which the project is situated are heavily influenced by the surrounding geology. Review of available geographic information on the general distribution of soils throughout Manitoba (MAFRI 2010) indicates that soils associated with the project area consist of Inwood and Fairford series. Inwood series soils are primarily associated with the new PTH 6 alignment. Soil series in the vicinity of the realigned Carne Ridge Road new PTh 6 intersection consist of a mix of both Inwood and Fairford series soils.

Inwood series soils consist of Gleyed Dark Gray Chernozems that have developed on extremely calcareous, medium textured till and tend to occur on the intermediate and lower landscape position on gently undulating topography. Runoff tends to be slow and permeability occurs at a moderately slow rate. The near surface water table associated with these soils may be high during the spring. The soil profile development of Inwood series soils tends to be very shallow with an average depth of less than 15 cm (MAFRI 2010).

Fairford series soils consist of well drained Eluviated Eutric Brunisol soils, developed on extremely calcareous glacial till. Fariford series soils tend to be fairly stony and occupy much of the well drained land in the Interlake Till Plain and are associated with gently sloping topography (MAFRI 2010).

Figure 7 shows the distribution of soils series throughout the immediate project area. Soil survey investigations were conducted by MI along the proposed Project alignment areas on August 28, 2018. Results of the field investigations revealed that soils consisted of sandy silt, Hi and low plastic clays, clayey silt and sandy clay. A report on the results of the soil survey investigations conducted by MI can be found in Appendix A.

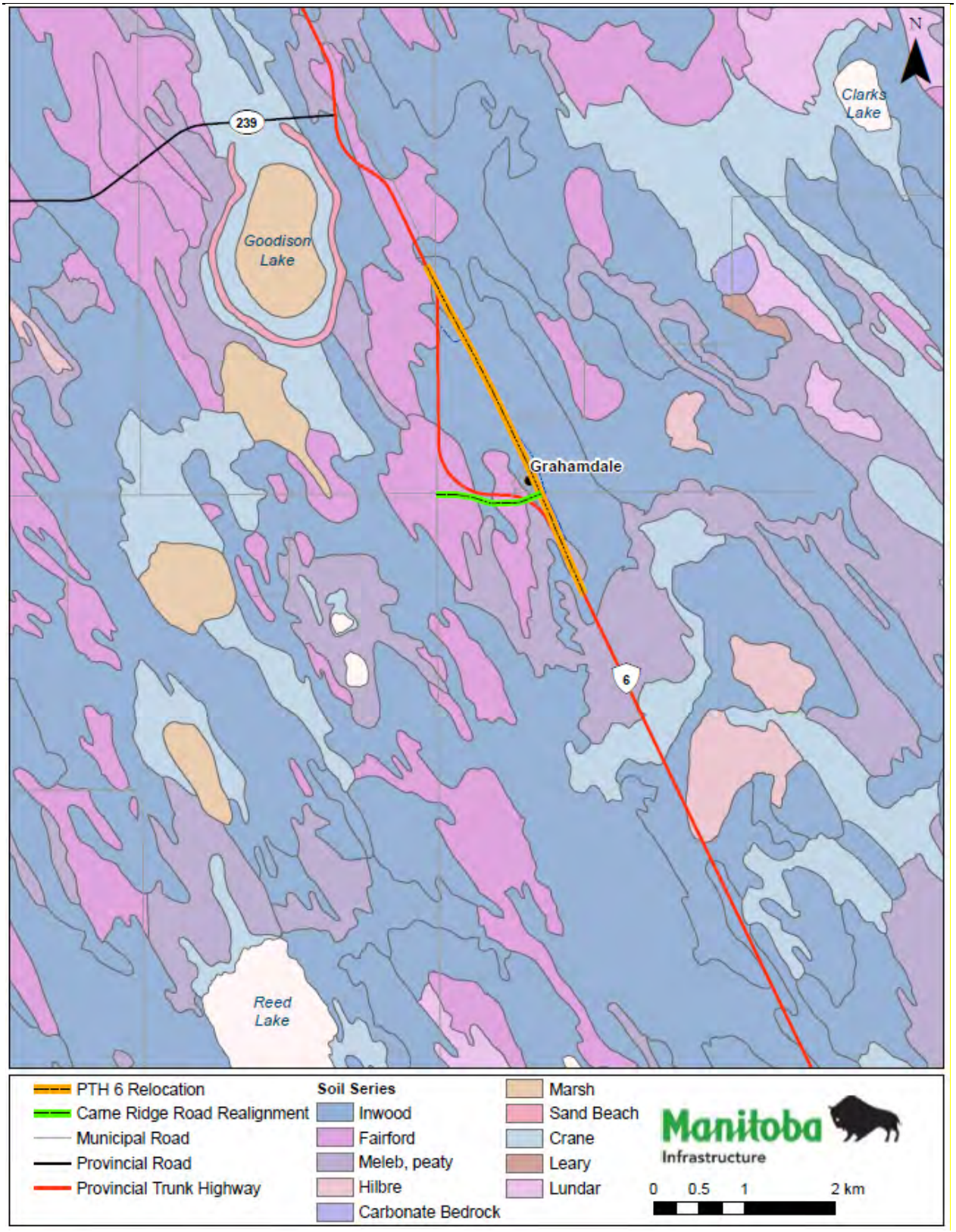

Figure 7 Soils Series Distribution in the Project Area

4.1.8. Groundwater

The project area is located within the Manitoba Lowland physiographic region. This area is underlain by gently southwestwardly dipping Paleozoic and Mesozoic sediments consisting mainly of carbonate rocks with some clastic and argillaceous units, with bedrock overlain by glacial tills and proglacial lacustrine sediments (Betcher et al. 1995). The major lakes of Manitoba occupy portions of this lowland area.

The availability and quality of groundwater throughout the broader area in which the project is located depends on the presence of shallow aquifers, which are generally sand or sand and gravel lenses (Rutulis 1973). The depth to these aquifers may range from less than 6 m where the sand and gravel deposits are near ground surface, to more than 60 m in low-lying areas where thick clay beds cover the aquifer (Rutulis 1973). Water quality in the sand and gravel aquifers ranges from fair to excellent (Betcher et al. 1995; Rutulis, 1973). Areas where the sand and gravel deposits are at or close to the surface are areas of probable or existing groundwater sources which may be susceptible to contamination from surface activities (Rutulis 1973). Review of geospatial information on the distribution of groundwater aquifers indicates that the project is situated near the border of a zone described as containing very few widely scattered sand and gravel aquifers. To the east of the project area bedrock aquifers (Limestone/Dolomite) are the prevalent source of groundwater. Figure 8 shows the general distribution of groundwater aquifers in relation to the Project.

Review of available information obtained from Manitoba Conservation and Climate (MCC) revealed 48 known wells within the project area. The data indicates that 45 of these wells were being used for both domestic and/or livestock purposes. Figure 9 shows the distribution of groundwater wells throughout the Project Area. Three of the wells in the Project Area were designated as test wells. 36 of the wells have an unknown status while 11 are currently identified as being active. One well was noted as being sealed. The closest known well (PID 25636) to the new PTH 6 alignment is located approximately 94 m outside the proposed ROW. No impacts to groundwater is expected to occur at this location as it is beyond the construction area.

The realignment of Carne Ridge Road will require the acquisition of land from a local resident which includes an existing well and septic field. Construction of the new embankment for the realignment of Carne Ridge Road will require decommissioning of the groundwater well, septic field and associated components (perforated pipe, rock, septic tank and cover material). Decommissioning of the septic field and disposal of its associated components will be conducted in accordance with MCC (2009) guideline respecting the decommissioning of wastewater disposal fields. Figure 10 shows the location of the realigned portions of Carne Ridge Road in relation to the local landowner septic field and groundwater well. In the event that any undocumented wells are encountered MI will decommission the well and advise MCC.

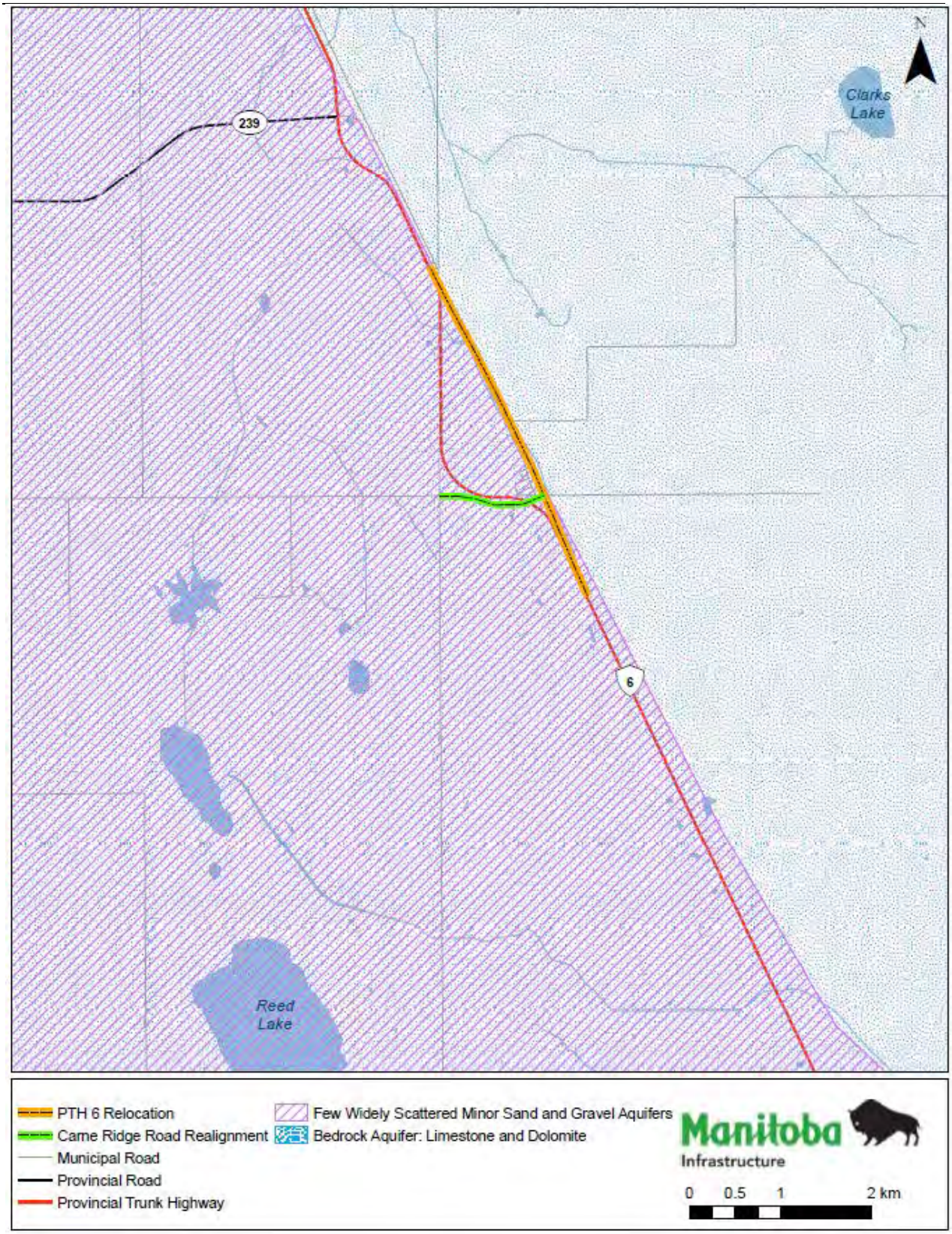

Figure 8 Distribution of Groundwater Resources in the Project Area

Figure 9 Distribution of known Groundwater Wells through the Project Area

Figure 10 Realigned portion of Carne Ridge Road in relation to landowner Septic Field, Septic Tank and Groundwater Well

4.1.9. Surface Water

Surface waters throughout the project area include, beaver ponds and various small creeks, streams and drains (e.g. existing roadside ditches and Cabin Creek Drain). The largest marsh area in close proximity to the Project is named Goodison Lake located directly north of the community of Grahamdale. Although named Goodison Lake it contains significant vegetation and exhibits marsh like qualities. Review of areal images from various years suggests that water levels in Goodison lake fluctuate and under wet years a minor area of open water is present. Review of provincial drainage maps for the Birch Creek and adjacent area watersheds also indicates that Goodison Lake receives water from various drains (e.g. Birch Creek Lateral Drain, Cabin Creek Drain etc.). Goodison Lake also receives water from local unnamed drains via an interconnected system of marshes (Reed Lake and Water Lake). Although the Project does involve relocating a portion of Cabin Creek drain it is not expected to impact Goodison Lake.

Cabin Creek Drain is the primary water course that will be affected by the Project. Cabin Creek Drain is a third order drain that currently runs parallel to PTH 6 to the existing Carne Ridge Road intersection. From that point it runs parallel to a municipal road known locally as Railway Avenue and outlets into Goodison Lake. Cabin Creek Drain is typically wetted and serves to collect local drainage stemming from precipitation events and runoff during the spring melt. Figure 11 shows the relocated portion of Cabin Creek Drain in relation to the Project.

Figure 11 Relocation of Cabin Creek Drain Alignment

4.1.10. Vegetation

Vegetation within the Project area is generally reflective of that found within the broader Ashern Ecodistrict. Forest stands tend to be dominated by Trembling Aspen (*Populus tremuloides*). Balsam Poplar (*Populus balsamifera*) and White Spruce (*Picea glauca*) will often occur as associated species within these treed stands (Smith et al. 1998). Vegetation present in the more poorly drained areas will include willows, sedges, and various meadow grass vegetation. Black Spruce (*Picea mariana*), Tamarack (*Larix laricina*), and Swamp Birch (*Betula alleghaniensis*) form the primary vegetation cover in boggy areas (Smith et al 1998).

Much of the land in the immediate vicinity of the Project alignments for both PTH 6 and the existing Carne Ridge Road have experienced some level of development/disturbance. The proposed Project makes use of existing decommissioned CN Railway and municipal road embankments as much as possible. In some cases residential lands will need to be acquired in order to facilitate the work. Because much of the area is previously disturbed much of the vegetation expected to be present within the foot print of the Project likely includes various grasses and sedges common to the areas as well as residual trees, smaller shrubs and other woody vegetation. Review of geospatial data provided by MCC's Conservation Data Center did not reveal the presence of any vegetation species of concern or those protected under legislation within the Project Area.

4.1.11. Wildlife

The proposed Project is located within the Interlake Plains Ecoregion. The Interlake Plains Ecoregion covers a relatively broad area and includes a variety of habitat types that support a wide range of wildlife species. Appendix B includes a listing of mammals, birds, reptiles, amphibians known to occur in the Interlake Plains Ecoregion. Desktop studies of the Project Area considered a review of available information from sources such as MCC's Conservation Data Center, The Manitoba Herpes Atlas, The Manitoba Breeding Bird Atlas and others.

According to Smith et al. (1998) the Interlake Plain Ecoregion contains extensive habitat for white tailed deer, black bear, moose, ruffed grouse, beaver, coyote, snowshoe hare, and various types of waterfowl. Whitetail deer in particular are prevalent and have benefited from the development of agriculture throughout the broader area. The following subsections focus their efforts on available information for the project area including reptiles and amphibians, birds, and protected species.

4.1.11.1. Reptiles and Amphibians

Review of available information from the Manitoba Herpes Atlas identified a single observation each of a Boreal Chorus Frog (*Pseudacris maculate*) and Red Sided Garter Snake (*Thamnophis sirtalis parietalis*) within the Project Area. The Boreal Chorus Frog observation was dated 2009 and noted at the intersection of Kolodka Rd. and Railway Ave. in the community of Grahamdale. The sighting of the Red Sided Garter Snake occurred in 2017 along the shoulder of PTH 6 just south of the community of Grahamdale.

Boreal Chorus Frogs are a relatively common species found throughout Manitoba and much of Canada in general. The Boreal Chorus Frog breeds in small open canopy fish free wetlands with short grassy vegetation. This can include wet meadows, swamps, flooded fields small pounds and ditches in more urbanized areas. Boreal Chorus Frogs will occupy a variety of local habitat types in close proximity to preferred breeding areas such as forests, prairie and various fields etc. (Canadian Herpetological Society 2017a).

The Red-sided Garter Snake is a habitat generalist that is prevalent throughout much of western Canada. During its active season this species occupies forests, shrublands, wetlands, fields and rocky areas. Overwintering occurs below the frostline in a variety of natural and anthropogenic underground cavities. Although not a protected species the greatest threat to the Red-sided Garter Snake is road mortality (Canadian Herpetological Society 2017b). Based on a review of available information no reptiles or amphibian species protected by legislation or of conservation concern were identified in proximity to the Project Footprint.

4.1.11.2. Birds

The Project Area falls within the Manitoba Breeding Bird Atlas (MBBA) Southern Interlake Region (Square 14NB39). The purpose of the MBBA is to collect comprehensive and current information on breeding birds throughout Manitoba. Although no specific bird surveys were conducted for the Project, existing data collected for the MBBA provide a reasonable indication of the species likely to be present throughout the broader area. Review of existing information from the MBBA indicates that 81 species of birds were observed throughout survey square 14NB39. Possible and probable breeding evidence was noted for 37 and 35 of observed bird species respectively. Breeding evidence was confirmed for nine of the species observed. Appendix C include a listing of bird species observed in survey square 14NB39. Three of these bird species are protected under either the Federal Species At Risk Act (SARA) and/or Manitoba's Endangered Species and Ecosystems Act (MESEA). Included are the Least Bittern (*Ixobrychus exilis*), Whip-poor-will (*Antrostomus vociferus*) and Barn Swallow (*Hirundo rustica*) discussed further in section 4.1.11.3 below.

4.1.11.3. Protected Species

Review of existing information indicates that three protected bird species have the potential to be present throughout the broader Project Area. Included are the Least Bittern, Whip-poor-will, and Barn Swallow. Table 9 summarizes the legal status of these bird species. The following subsections provide a brief synopsis of the species under consideration including a brief discussion on habitat preferences for each in relation to the Project Footprint.

Table 9 Summary of Legal Status of Potential Protected Species

Species		Status	Regulatory Protection	
Common Name	***Scientific Name***	***Provincial (S)***	***MESEA***	***SARA***
Least Bittern	*Ixobrychus exilis*	S2B	Endangered	Schedule 1, Threatened
Eastern Whip-poor-will	*Antrostomus vociferus*	S3B	Threatened	Schedule 1, Threatened
Barn Swallow	*Hirundo rustica*	S4B	-	Schedule 1, Threatened

Least Bittern

Accoding to Bazin (2018), the Least Bittern is the smallest member of the heron family. Manitoba is at the northwestern limits of its breeding range. Observations of this species tend to be limited and localized in part due to its specific habitat requirements. Habitat preferences include larger wetlands composed of dense, tall robust emergent vegetation with occasional shrubs interspersed with open water. Most observations of the Least Bittern tend to occur in southern Manitoba in the Prairie Pothole region. The largest threat to the Least Bittern is habitat/wetland loss (Bazin 2018). Existing information furnished by the MBBA did not reveal the location of spefic occurrence of the Least Bittern within the Project Area. Review of aerial photographs and geospatial data indicate that there are some larger wetland areas to the east of the project footprint which may provide suitable habitat in wetter years. The closest larger wetland/marsh which may provide suitable habitat is Goodison Lake located north of the community of Grahamdale. Review of geospatial data obtained from the Conservation Data Center (CDC) did not identify any known sightings of the Least Bittern within close proximity to the project footprint. The Project itself will not impact any of the larger wetland areas identified within the general project area (i.e. primarily roadwork along existing provincial/municipal road alignments).

Eastern whip-poor-will

The Eastern whip-poor-will is an aerial insectivore that tends to be most active during twilight and bright moonlight. As a species it is generally inactive during daylight hours. The Eastern whip-poor-will is listed as threatened under both the Manitoba Endangered Species and Ecosystem Act and the federal Species At Risk Act. The primary range for this species is a band that extends from the boreal hardwood transition zone northwest through the interlake region of the boreal taiga plains. The Eastern Whip-poor-will tends to avoid wide open spaces and has a preference for open forests (i.e. those that have been subject to disturbance such as fire) coupled with the presence of pine and trembling aspen. Threats to the species are not well understood, but there are widespread declines in most North American aerial insectivores (Mills 2018). Review of geospatial data obtained from the CDC identified a single observation of the Eastern whip-poor-will to the east of PTH 6 at the southern limits of the Project. The sighting

was located approximately 250-300 m from the existing highway. At this location the Project involves minor reconstruction/resurfacing of PTH 6. Work will be limited to the existing ROW and not expected to involve clearing or removal of vegetation.

Barn Swallow

Barn Swallows are the most widely distributed swallow in the world. They are widespread throughout Manitoba but are most prevalent in the south-western parts of the province outside areas of undisturbed boreal forest (Poole 2018). Barn Swallows were listed in 2017 as Threatened on Schedule 1 of SARA, but are not protected under the MESEA. Barn Swallows once nested in caves, rock crevices, and tree cavities but have adapted to breeding on anthropogenic structures (under bridges/roofs, old wooden barns etc.) (Poole 2018). Habitat preferences for this species generally include open areas necessary for foraging, suitable nesting location and a nearby body of water in order to source mud as their primary nest building material. As a result barn swallows are typically found in the vicinity of farmlands, wetlands, and human settlements etc. (Poole 2018). Population declines for the species are not well understood, but may be attributed to loss of foraging habitat (conversion of wetlands into pasture lands), declines in insect populations, and the demolition of old agricultural buildings (Poole 2018). Review of geospatial data obtained from the CDC did not reveal any Barn Swallow sightings within the Project Area. The closest observation is located approximately 20 km northwest of the Project Footprint. Habitat conditions within the general vicinity of the Project appear to be amenable to the presence of Barn Swallows (farmland, wetlands, and various structures associated with the community of Grahamdale). The Project will require acquisition of some private land and removal of existing structures (shed, garage, dwelling) in order to facilitate the realignment of Carne Ridge Road. However, based on a review of available information no specific observations of Barn Swallows were noted within close proximity to the Project.

4.1.12. Fish and Fish Habitat

Fish and fish habitat associated with the project is primarily related to local ditches and drains. Numerous culverts will be replaced or decommissioned during the project including the relocation of a segment of Cabin Creek Drain. Table 2 identifies the culvert works and the corresponding fish habitat classification at each site. Ditches within the project area contain either Type E (indirect) or Type D (channelized watercourse containing cyprinids / minnows) fish habitat. Cabin Creek Drain is Type B habitat (channelized watercourse containing large-bodied fish) at times, and likely only supports northern pike and/or white suckers during spring runoff or flood events. Water flows slowly northwest over flat terrain to Goodison Lake approximately 3 km downstream, and eventually into Lake Winnipeg as part of the Nelson River drainage system. Goodison Lake is a very large wetland and considered to be Type A habitat and likely contains a small but diverse population of large-bodied and cyprinid fish species. Table 10 identifies the potential fish species likely to be found in the Project Area.

Table 10 Potential Fish Species in the Project Area

Common Name	Species	Family	SARA Status	COSEWIC Status
Golden Shiner	*Notemigonus crysoleucas*	Cyprinidae	Not Listed	Not Listed
Emerald Shiner	*Notropis atherinoides*	Cyprinidae	Not Listed	Not Listed
Blacknose Shiner	*Notropis heterolepis*	Cyprinidae	Not Listed	Not Listed
Northern Redbelly Dace	*Phoxinus eos*	Cyprinidae	Not Listed	Not Listed
Finescale Dace	*Phoxinus neogaeus*	Cyprinidae	Not Listed	Not Listed
Fathead Minnow	*Pimephales promelas*	Cyprinidae	Not Listed	Not Listed
Northern Pike	*Esox lucius*	Esocidae	Not Listed	Not Listed
Central Mudminnow	*Umbra limi*	Umbridae	Not Listed	Not Listed
Brook Stickleback	*Culaea inconstans*	Gasterosteidae	Not Listed	Not Listed
White Sucker	*Catostomus commersoni*	Catostomidae	Not Listed	Not Listed
Yellow Perch	*Perca flavescens*	Percidae	Not Listed	Not Listed
Walleye	*Sander vitreus*	Percidae	Not Listed	Not Listed

At Station 835+04 on the proposed new alignment of PTH 6, Cabin Creek Drain will be relocated from the east to the west ditch of the new highway. The west ditch has very similar hydraulic capacity as the east ditch, and is already vegetated with cattails, sedges and other water-tolerant vegetation.

The substrate of Cabin Creek Drain is a well-graded mixture of sand, gravel, and cobble. Ditches and riparian zones are vegetated with sedges, cattails, bulrushes, willows and other species typical of the Ashern Ecodistrict. The new culverts installed through Cabin Creek Drain will be embedded a minimum of 0.3m and sized to provide 3dQ10 fish passage of 0.76 m/s. This velocity will be slower than the existing culverts, and is appropriate for the very flat terrain of the Interlake Region. New culverts in Type D habitat will be embedded 0.3m to ensure connectivity of the aquatic habitat, and culverts in Type E habitat will be embedded 0.1m.

4.2. Socio-Economic Environment

4.2.1. Regional Communities and Population

The nearest community to the Project is Grahamdale located in the Municipality of Grahamdale. Other communities within the Municipality of Grahamdale include Mulvihill, Camper, Moosehorn, Spearhill, Faulkner, Steep Rock, Fairford, St. Martin and Gypsumville. The communities in the area are typically small hubs providing local services to the regional population and tourists. At present, the Municipality of Grahamdale has a population of 1,359 people. Overall, the population is declining at an average of -0.64% per year over the past 15 years. In the last two census, its population grew by 5 people, an average growth rate of 0.07% from 2011 to 2016 (Rural Municipality of Grahamdale 2017).

The average employment rate in the Municipality of Grahamdale is declining at an average of -0.92% per year over the past 15 years. In the last two census, its employment rate grew by 1

per cent, an average growth rate of 0.66% from 2011 to 2016 (Rural Municipality of Grahamdale 2017). Labour force characteristics vary. Statistical data indicates that the bulk of employment occurs in the following sectors: Agriculture 29.3%, Construction 12.8%, Retail 10.5%, Healthcare 9.8%, and Education 7.5% (Rural Municipality of Grahamdale 2017).

4.2.2. Indigenous Population

The broader area in which the Project is located includes a number of indigenous communities. Of these Pinaymootang (Fairford), Little Saskatchewan, and Lake St. Martin First Nations are located in closer proximity to where the Project occurs. Geographically each of these communities are located approximately 17, 30, and 38 km away respectively from the northern limits of the Project. Peguis First Nation is located roughly 61 km east of the Project. However, Peguis First Nation has a Community Interest Zone (CIZ) whose western limits are approximately 13 km from the Project Footprint. None of the First Nation communities are situated within the general Project Area. Figure 12 shows the location of the three First nation communities in relation to the Project. There are also a number of people of Métis descent that reside in the RM of Grahamdale. The following sections provide a brief summary description of the Indigenous communities identified and located within reasonable proximity to the Project Area.

4.2.2.1. Pinaymootang (Fairford) First Nation

Pinaymootang First Nation is located on the Fairford River at PTH 6 (Figure 12). The First Nation includes Dunsekikan Island in LSM, and has a land area of 7,412 ha. Access to the first Nation is via PTH 6. The population in 2011 was recorded as 989 people (Statistics Canada 2016).

4.2.2.2. Little Saskatchewan First Nation

Little Saskatchewan First Nation is located along the shoreline of Lake St. Martin (Figure 12). The First Nation is composed of two land parcels, Little Saskatchewan 48 and 48B. The community is accessible from the north by PR 513 or from the south through the Fairford First Nation. The Little Saskatchewan First Nation population was recorded as 399 people in 2011 (Statistics Canada 2016).

4.2.2.3. Lake St. Martin First Nation

Lake St. Martin First Nation is located on the north shore of Lake St. Martin (LSM) west of The Narrows (Figure 12). Lake St. Martin First Nation has two parcels, The Narrows 49 and The Narrows 49A. The First Nation has a land area of about 3,600 ha. Access to the First Nation is by PR 513 east from Gypsumville. The population was recorded as 826 in the 2011 census (Statistics Canada 2016).

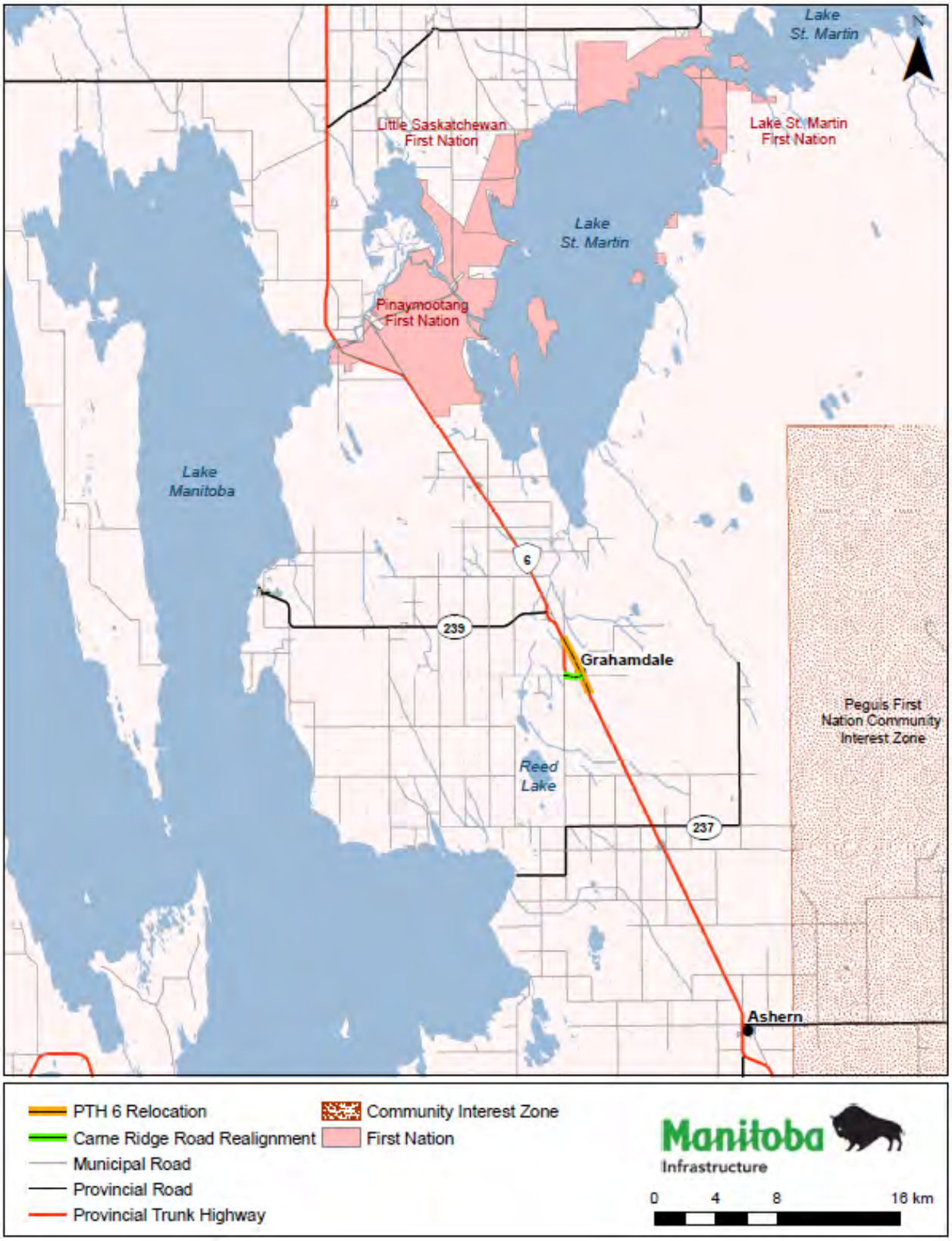

Figure 12 First Nation Communities in Relation to the Project

4.2.2.4. Peguis First Nation

Peguis First Nation does not have a community in the broader area in which the Project is situated. However, the First Nation has a large Community Interest Zone (CIZ) in the region as shown in Figure 12. CIZs are areas of land selected by First Nations as part of Treaty Land Entitlement negotiations and processes with the Province of Manitoba (Treaty Land Entitlement Committee 2016). The process of Treaty Land Entitlement has several steps and requires time for selection, assessment and acquisition of the land; as such, the 1997 *Treaty Land Entitlement Framework Agreement* stipulates that the province must provide notification to the community if there are any other interests or proposed changes to the lands within a CIZ (Treaty Land Entitlement Committee 2016).

4.2.2.5. Métis

The 2011 Statistics Canada Census showed that Métis people made up 6.7% of the population of Manitoba (Statistics Canada 2016). The 2006 Manitoba Bureau of Statistics Census data for the RM of Grahamdale indicated that 285 of the 1415 residents identified as Métis, which represented 20% of the total population of the RM (Manitoba Bureau of Statistics 2008a).

Based on rulings in 2012 by the Supreme Court of Canada involving Aboriginal rights for Métis people, the government of Manitoba partnered with the Manitoba Métis Federation (MMF) to recognize Métis rights to harvest natural resources for food and domestic use in Manitoba, and allocated Métis Natural Resource Harvesting Zones based on the established Game Hunting areas (GHA's) for the province (Government of Manitoba 2012b, MMF 2015). PTH 6 serves as the dividing line between GHA's 21 and 25. Review of geographic and map information indicates that while situated on the cusp of these GHA's the bulk of the project is primarily situated in GHA 21. Figure 13 shows the location of the project in relation to GHA's 21 and 25.

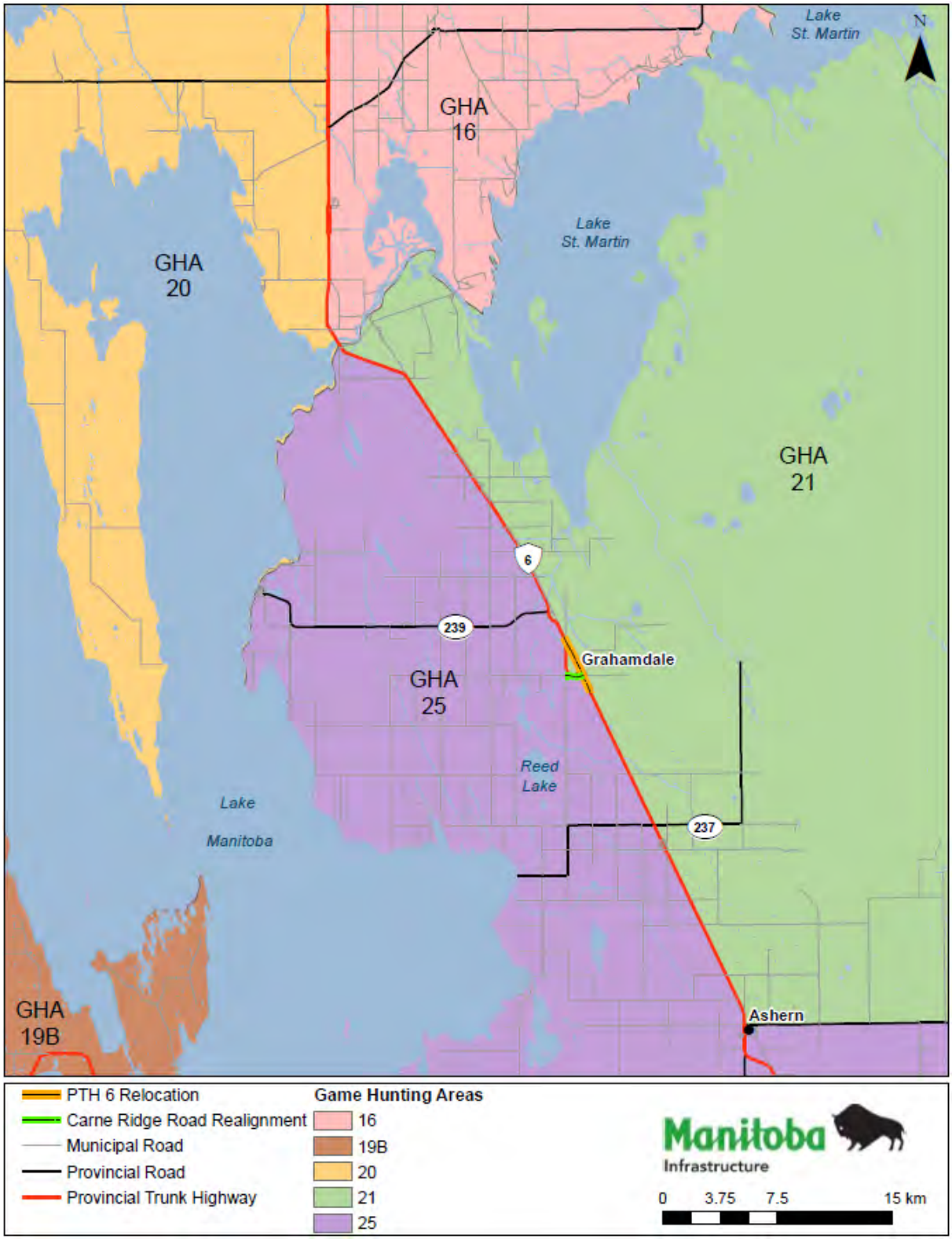

Figure 13 Game Hunting Areas in Relation to the Project

4.2.3. Resource Use

4.2.3.1. Forestry

The province of Manitoba manages and regulates forestry activities in Manitoba through the establishment of administrative boundaries. Forest Management Units (FMUs) and Integrated Wood Supply Areas (IWSAs) are used to delineate and manage harvestable timber areas and wood supply areas. The Project is located in the Interlake Forest Management Section (Section 4) and Forestry Management Unit 43. The western limit of IWSA 2 is located adjacent to the Project Area approximately 3.8 km east of the community of Grahamdale (Figure 14). The general area in which the Project occurs is not subject to a Forest Management Licence (FML) Agreement. FML-2 and FML-3 are the only two Forest Management Licence Agreements currently in place within Manitoba. FML-2 was originally established with Repap Manitoba Inc. in 1989 but is now managed by Canadian Kraft Paper Industries Limited and supplies timber to the kraft paper mill in The Pas. FML-3 was established with Louisiana-Pacific Canada Ltd. in 1994. FML-3 is currently managed by LP Canada Ltd. and supplies timber to the oriented strand board mill in Minitonas. Neither of FML's currently operating within the Province of Manitoba are located in close proximity to the Project Area. The eastern limits of FML-3 is located approximately 34 km west of the Project Area. Figure 14 shows the Project in relation to FMU's and IWSA 2 administrative boundaries.

The Project itself will require clearing of vegetation (trees, shrubs etc.) in order to facilitate the realigned portion of Carne Ridge Road and the relocated segment of PTH 6. Table 11 identifies the primary clearing locations and amounts. Figure 14 shows the locations at which clearing for the Project will be undertaken.

Table 11 Summary of Project Clearing

Project Area	Clearing Area (ha)
PTH 6 – Start to Kolodka Road	1.02
PTH 6 – Kolodka Road to Clark Road	3.12
PTH 6 – Clark Road to end of project limits	2.62
Carne Ridge Road	3.12
Total Clearing	***9.88***

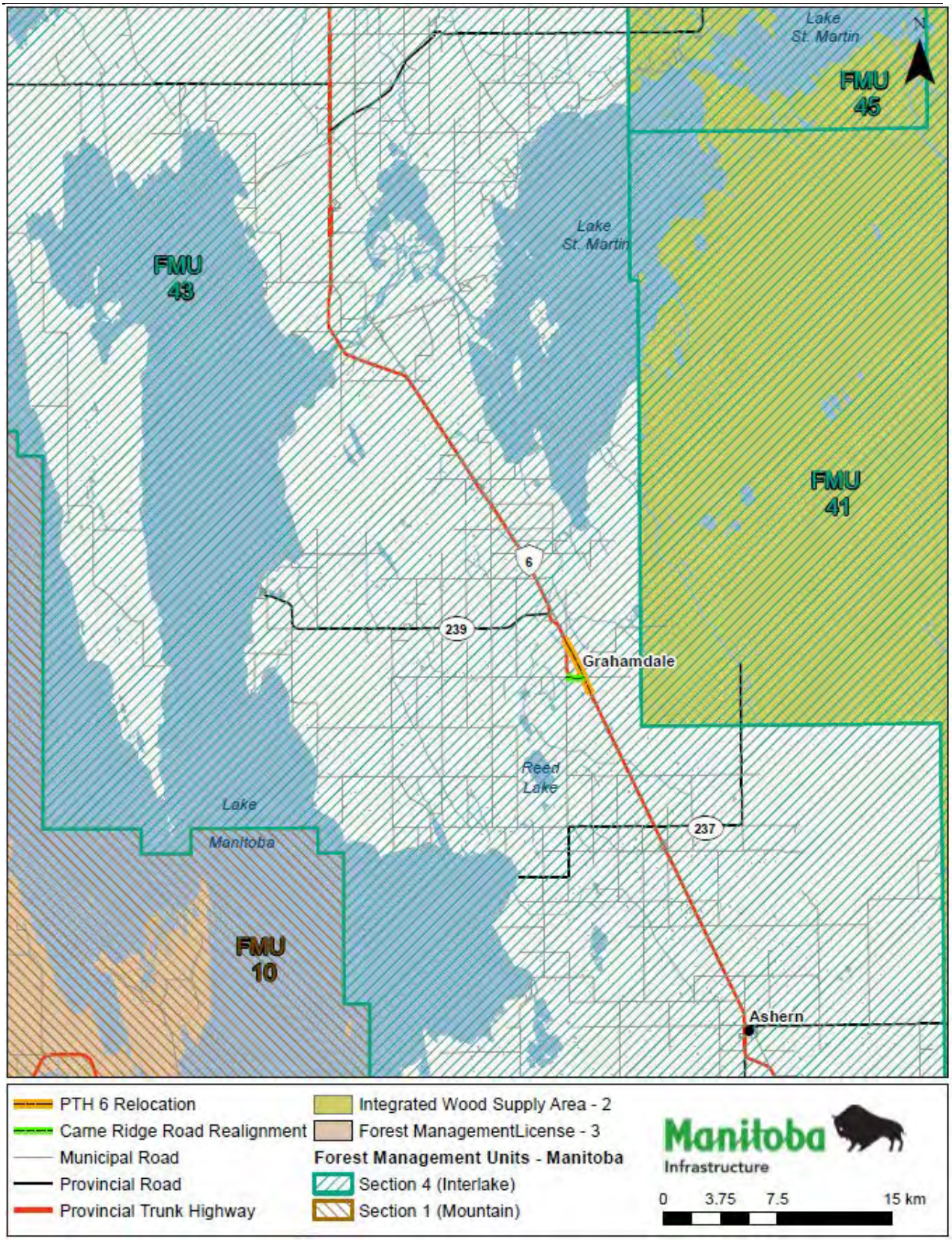

Figure 144 IWSA-2 and FMU Boundaries in Relation to the Project

Figure 15 Project Areas that Require Clearing

In addition to the management of forest resources on Crown Land a number of Provincial Forests have also been established under The Forest Act C.C.S.M. c. F150. No Provincial forests were noted as being within close proximity to the project area. The closest Provincial Forest to the LSM Access Road Project is Moose Creek Provincial Forest located on Lake Winnipeg approximately 90 km to the east (Figure 16).

Review of available geographic information revealed that four forest fires occurred within or in close proximity to the Project area (Figure 17). The largest of these occurred in 1961 extending northeast throughout the broader region. No forest fires have occurred in close proximity to the Project area since 1990.

4.2.3.2. Hunting

The proposed Project is located in GHA 21 on the west side of Lake Winnipeg (Figure 13). PTH 6 serves as the dividing boundary between GHA 21 and 25. Depending on its location within the Province and the status of wildlife populations, different rules and/or restrictions may be established in order to assist in managing hunting and trapping activities within each of the GHA's. For example, according to the Manitoba Hunting Guide (MSD 2019a) moose season has been cancelled in GHA's 21 and 21A. Hunting activities in the immediate vicinity of the project area are unknown although hunters and outfitters are expected to be present throughout the general area. According to the 2019 Manitoba Hunting Guide (MSD 2019a) hunting is prohibited on PR's and PTH's, meaning that no person may discharge a firearm or bow from, across or along any provincial road or provincial trunk highway including the road allowance. Note that the Project is located along existing PTH, PR and municipal roads. Similar restrictions exist for municipal and local government district and other public roads. A good portion of the Project occurs within the vicinity of the community of Grahamdale where various residential homes exist. Although hunting and outfitting is expected to occur throughout the area it is unlikely to take place in close proximity of the actual footprint (i.e. working area) of the Project itself.

4.2.3.3. Trapping

Commercial trapping of furbearers is administered by MCC through the Registered Trap Line (RTL) system (MCWS 2014). The Project is located within an open trap area identified as Open Block #3. MCC does not track production within an open block. Therefore, production data for the Open Block #3 is not available. However, the Project is located in the immediate vicinity of the existing PTH 6, Carne Ridge Road, and local municipal roads associated with the community of Grahamdale. In short the Project is situated within an established transportation corridor. No adverse environmental effects associated with the work is expected to occur on trapping activities.

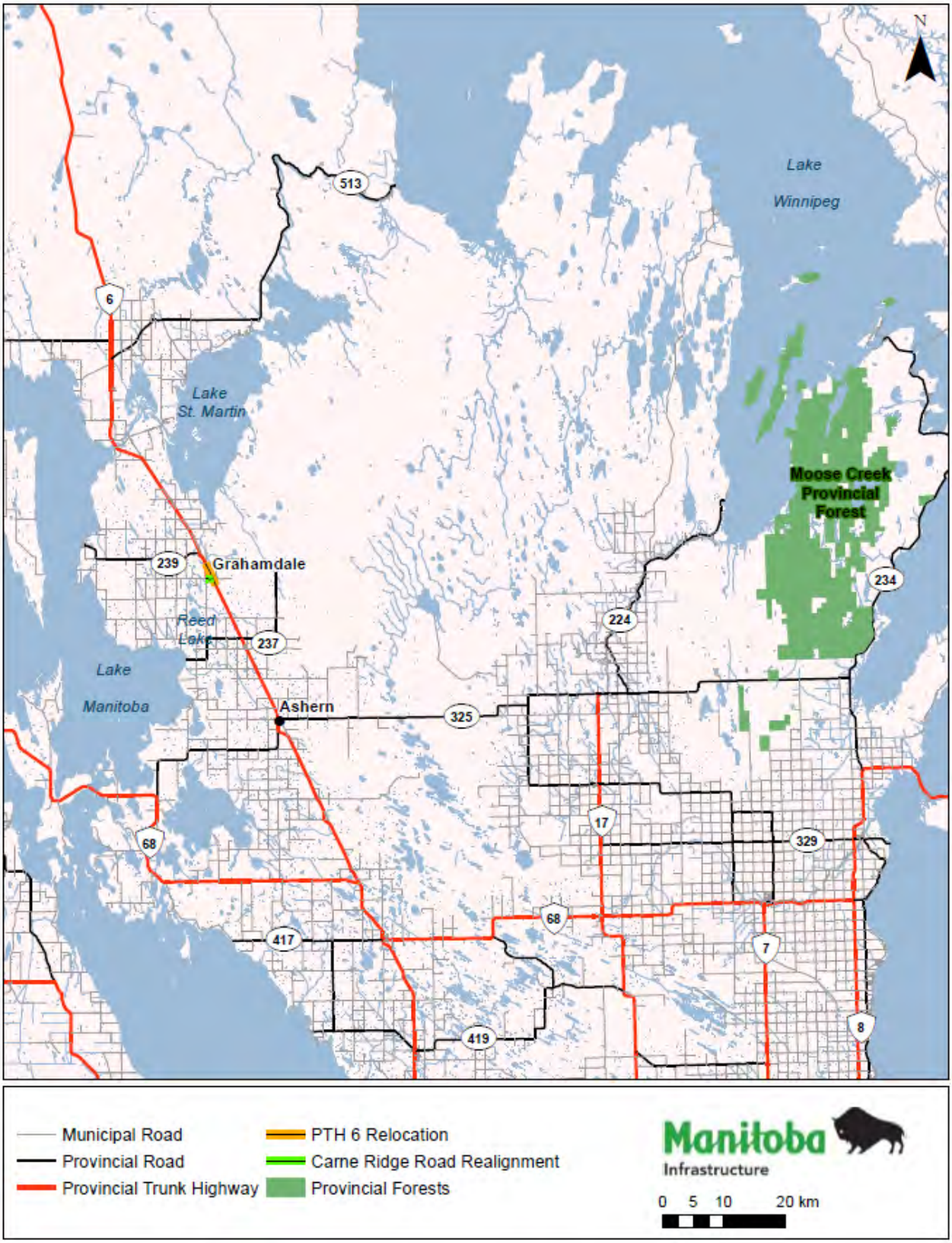

Figure 16 Provincial Forests in Relation to the Project

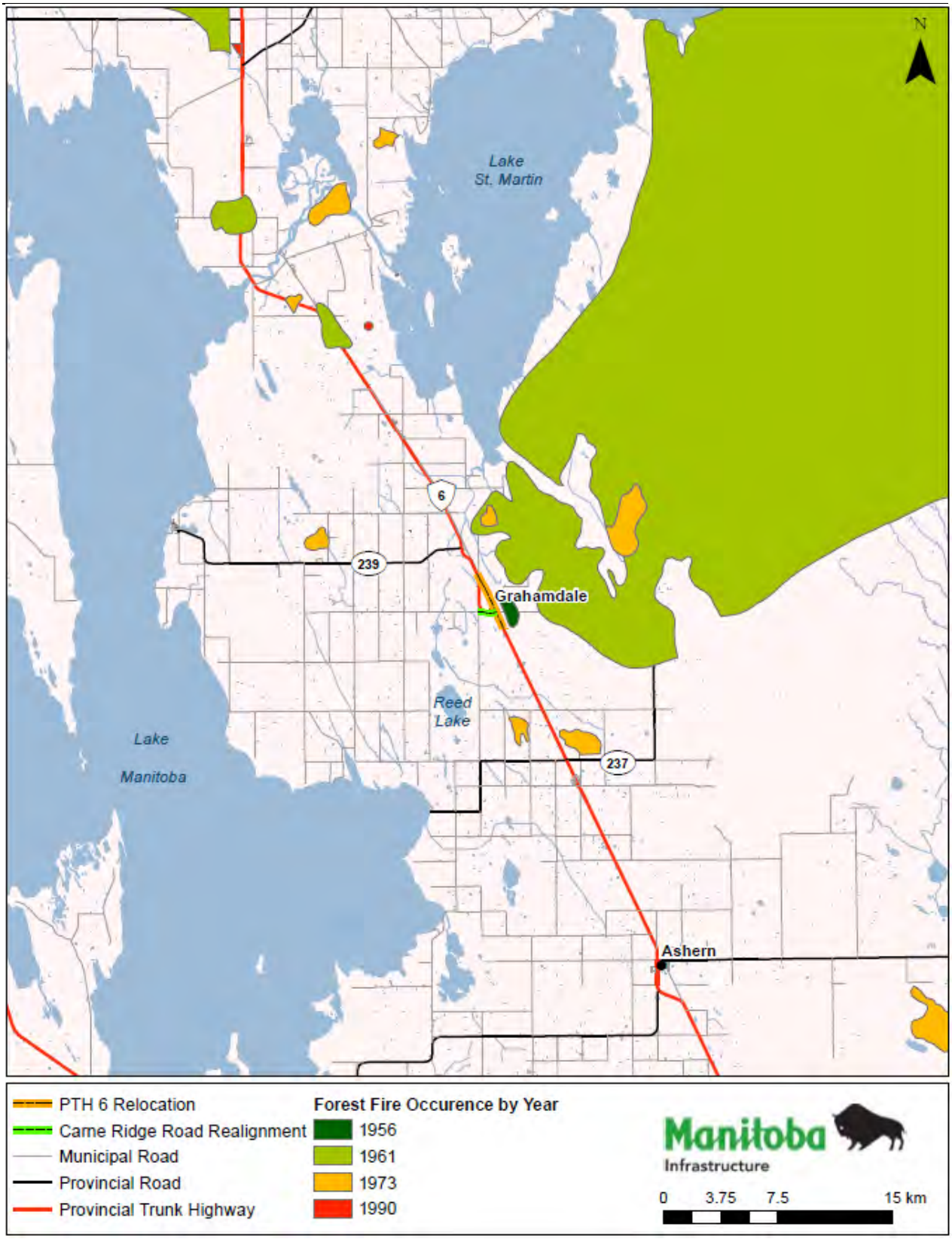

Figure 17 Forest Fire Occurrence in in Relation to the Project Area

4.2.4. Parks, Protected Areas, and Areas of Special Interest

The Project is located within an established transportation corridor and located in the immediate vicinity of the existing PTH 6, Carne Ridge Road and other municipal roads associated with the community of Grahamdale. There are no parks, protected areas, or areas of special interest situated within the Project Area. The broader area in which the Project is located does include a number of Wildlife Management Areas (WMA's) and an Area of Special Interest (ASI). However, these are geographically distant from the project itself. Figure 18 shows the spatial distribution of WMA's and ASI's throughout the broader area in which the Project is situated. No adverse environmental effects area expected to occur on WMA's and ASI as a result of the Project.

4.2.5. Culture and Heritage Resources

The Project is located in an area which has previously been impacted by development including the existing roads (PTH 6, local municipal roads etc.), abandoned CN Rail line and station grounds, Cabin Creek Drain, and some residential development associated with the community of Grahamdale. MI contacted Manitoba's Heritage Resources Branch (HRB) to inquire about potential concerns related to culture and heritage resources in association with the project. HRB advised MI that they did not have any concerns with the proposed work at this time (Appendix D).

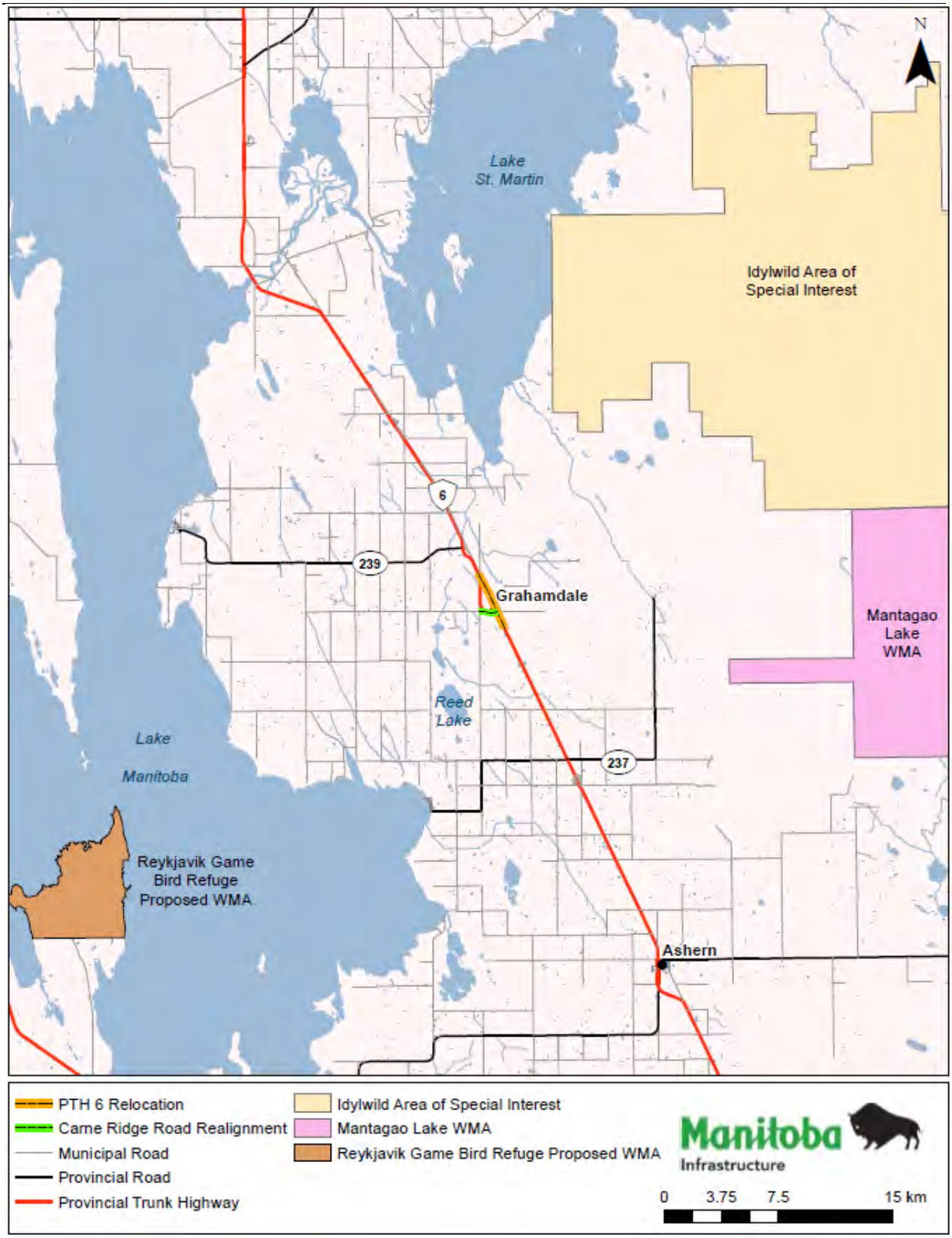

Figure 18 Parks, Protected Area and ASI's in Relation to the Project Area

4.2.6. Human Health and Safety

As noted previously PTH 6 is a primary arterial route which supports an annual average daily traffic (AADT) of 1640 vehicles (13.5% trucks). The existing configuration of PTH 6 which circles west around Grahamdale consists of two back to back 30 degree curves with less than 100 m travel distance between them. These curves are substandard and do not meet current departmental design criteria. The Project itself is intended to improve existing safety concerns for the traveling public (accidents and potential for rollover etc.) associated with the existing configuration of PTH 6 in the vicinity of Grahamdale.

Review of the information collected during MI's public Engagement Program (Section 3.7) identified a few operational concerns associated with the relocation of PTH 6 near the community of Grahamdale. The issue of town lighting was noted in relation to perception/potential for increased crime. Although lighting within the community of Grahamdale is beyond the scope of the Project, some residents did identify a desire to ensure that the new intersection for the realigned portion of Carne Ridge Road at PTH 6 be adequately lit similar to current conditions. MI will install lighting at the new PTH 6/Carne Ridge Road intersection in accordance with its traffic management standards and to accommodate local concerns. Further health and safety concerns included the need to establish a speed zone through the community of Grahamdale in order to prevent accidents. Establishing a speed zone through Grahamdale is beyond the scope of the Project. Railway Ave. located adjacent to the proposed PTH 6 alignment will be incorporated as a local service road and be available for community use. This is intended to create separation between the local community traffic allowing vehicles traveling along the relocated section of PTH 6 to bypass Grahamdale safely and negate the need for a speed zone.

During construction there is always an increased risk for traffic delays and accidents. Construction is expected to take approximately 2 years in order to complete the Project. The work will be staged in order to minimize delays and potential traffic safety concerns associated with workers and moving equipment. For example, this would entail building the new section of PTH 6 "offline" while traffic continues to use the existing alignment. The new portion of PTH 6 would be tied in and put into service upon completion. Similarly, while construction is underway MI's preferred contractor will ensure proper safety standards are in place and that work areas are appropriately signed in order to minimize human health and safety concerns.

5. ENVIRONMENTAL EFFECTS ANALYSIS

The following section presents the environmental effects analysis for the relocation of PTH 6 and realignment of Carne Ridge Road Project. The following considers potential environmental effects of the Project during construction and operation/maintenance phases. Decommissioning of the Project will not occur in the foreseeable future and was not considered as part of the environmental effects analysis. Key to the mitigation of potential project related effects is the application of mitigation measures. Appendix E includes a copy of MI's standard mitigation measures that apply to all departmental infrastructure projects. Where necessary additions and/or modifications are identified throughout the environmental effects analysis in order to accommodate site or project

specific concerns. The environmental effects analysis considered physical processes as well as relevant biophysical and socio-economic attributes as follows:

Physical Processes	Biophysical Attributes	Socio-Economic
Greenhouse Gases & Air Quality	Vegetation	Land Use
Noise and Vibration	Wildlife & Wildlife Habitat	Resources Use
Terrain and Topography	Fish & Fish Habitat	Protected Areas, ASI's
Geology and Soils	Protected Species	Culture and Heritage Resources
Groundwater		Human Health & Safety
Surface Water		

The following sections describe the environmental effects assessment for attributes in conjunction with the application of mitigation measures, assessment of residual effects, determination of significance, and if necessary the need for any follow-up and/or monitoring program. Potential environmental effects were assessed as being significant, not significant, or unknown. Table 13 provides an environmental effects interaction matrix of key project components in relation to assessment attributes under consideration.

Table 12 Relocation of PTH 6 and Realignment of Carne Ridge Road Environmental Effects Interaction Assessment Matrix

	Physical Environment						Biophysical Environment				Socio-Economic Environment				
	Greenhouse Gases & air Quality	Noise & Vibration	Terrain & Topography	Geology and Soils	Groundwater	Surface Water	Vegetation	Wildlife	Fish & Fish Habitat	Protected Species	Land Use	Resource Use	Protected Areas & ASI's	Cultural & Heritage Resources	Human Health & Safety
Construction Phase															
Mobilisation of Equipment and Supplies	X	X			X	X		X		X					X
ROW Clearing and Grubbing	X	X	X	X		X	X	X		X					
Brush and Timber Disposal							X								
Rock Quarries and Borrow Sites (sand, gravel, rock, composite material)	X	X	X	X			X	X		X					X
Road Construction (grading, fill placement, road bed excavation etc.)	X	X	X	X	X	X		X	X		X				X
Crossings and Culvert Installation			X			X			X						
Construction Site Restoration/Revegetation	X	X		X			X	X							
Accidents & Malfunctions	X	X			X	X			X	X					X
Operation Phase															
Road usage	X	X						X		X					X
Maintenance[1]	X	X		X	X	X	X	X		X					X

5.1. Physical Environment

5.1.1. Greenhouse Gases & Air Quality

5.1.1.1. Construction Effects

During construction the Project is expected to generate additional air emissions primarily associated with dust and exhaust. The source of these additional emissions is expected to include quarry and borrow areas, temporary access roads, staging areas, ROW clearing/grubbing, use of equipment and general vehicle movement. Local air quality may be affected by dust and particulates that have some potential to effect human health (including respiratory issues), vegetation (dust deposition), and public safety (visibility) for the traveling public (i.e. residents of Grahamdale and others making use of existing PTH 6 and Carne Ridge Road). Dust primarily occurs during the summer and fall, with a greater likelihood or occurrence during dry and windy conditions. During construction raising of dust throughout the project area is expected to be short-term, localized, and temporary over the course of construction.

Clearing and grubbing involves removing and disposing of all trees, shrubs, fallen timber, and other surface litter. In total the project involves clearing approximately 9.88 ha of vegetation (trees, shrubs etc.) as discussed in Section 4.2.3.1 at various locations along the extent of the project. Due to the proximity of the project to the community of Grahamdale and existing PTH 6 cleared vegetation will not be disposed of by burning. Cleared vegetation will either be buried, hauled, or chipped and spread as required. Any merchantable timber will be salvaged.

During construction, exhaust emissions will be generated during the delivery of aggregate materials to the construction site and construction equipment movement. Construction equipment used for the work may include crushing spreads, haul trucks, excavators, loaders, dozers, graders, packers, water trucks, backhoes, half ton trucks, and fuel tanks. Emissions released during construction could decrease the quality of the air by increasing the local concentration of carbon monoxide, carbon dioxide, particulate matter, and nitrogen oxides in the air with potential for subsequent effects on human health. During construction increases in exhaust emissions are expected to be localized, temporary and short-term for the duration of construction activities.

5.1.1.2. Operation Effects

During the operation the frequency of dust and exhaust emissions are expected to similar to pre-construction levels. Both PTH 6 and Carne Ridge Road are existing components of the Provincial/local transportation network. The relocated section of PTH 6 will be shorter and be more direct than the existing route which detours around the community of Grahamdale. A shorter more direct alignment may result in an overall net decrease in localized exhaust emissions associated with traffic. No mitigation measures are being proposed for greenhouse gas emissions and air quality during operation.

5.1.1.3. Mitigation Measures

Dust and exhaust emissions will be mitigated through the application of MI's General Environmental Requirements (GERs) (Appendix E). Specifically, contractors will be required to adhere to Dust and Particulate Control requirements.

5.1.1.4. Residual Effects

Residual effects of the project include an overall minor increase GHG emissions linked to dust and exhaust stemming from vehicles and equipment used during construction. Once the work is complete levels are expected to return to existing conditions. Effects on Air Quality and GHG emissions are expected to be localized to the immediate work areas, and be temporary and short-term in duration. With the implementation of mitigation measures, the overall residual effects on air quality and GHG emissions is expected to be not significant.

5.1.2. Noise and Vibration

5.1.2.1. Construction Effects

Sources of noise and vibration during construction would be typical of heavy equipment such as graders, excavators, loaders, compactors, and haul trucks. Material production such as rock, sand and gravel will take place within quarries. Construction activities are anticipated to generate intermittent noise over the construction period (approximately 24 months of construction). The closest human receptors will include construction workers and local residents of the Community of Grahamdale. While there is no known risk of hearing loss associated with sound levels below 70 dBA, the duration of daily exposure becomes an important risk factor for hearing loss. Generally, the louder the noise, the shorter the exposure time before hearing protection is required. Road construction site noise typically ranges from 85 to 100 dBA when heavy equipment is operating or blasting is occurring (Eaton 2000). For environments where a worker is likely to be exposed to a noise that exceeds 85 dBA Lex 9, standard construction practices would mitigate risk to workers. Because of the Projects close proximity to the community of Grahamdale local bylaws concerning noise will be adhered to. Noise levels are expected to be temporary, localized and short-term for the duration of construction and return to existing levels once the project is complete.

5.1.2.2. Operation Effects

During the operation phase, sources of noise will generally be associated with vehicles use along PTH 6 and Carne Ridge Road including the use of engine retarder brakes associated with heavy transport (specifically along PTH 6). Traffic volumes are not currently projected to experience any increases for the area. During operation noise levels are expected to be similar to existing conditions throughout the area. Of note would be a permanent shift in the source location of noise stemming from vehicle use along PTH 6. The Project involves relocation of the existing PTH 6 from the west side of Grahamdale to the east which brings it nearer to the community and its residents. Local residents will likely experience a greater intensity of noise as a result of to being in closer proximity to the PTH 6 transportation corridor. This will be a permanent effect of the project on the community of Grahamdale during operation of the project. Given buffers associated with ROW width and similar conditions elsewhere in Manitoba in conjunction with the

application design mitigation measures, it is expected that residents will acclimatize to the additional intensity of noise and should not be a significant source of concern.

5.1.2.3. Mitigation Measures

Mitigation measures to offset the potential effects of the project associated with noise and disturbance include those integrated into the project design as well as those associated with the construction phase of the project.

Design mitigation measures include establishing the existing Railway Avenue as a service road for local use. This means that there will be no speed reduction zone near the community and allow for a more steady flow of traffic. No change in traffic speed or flow will reduce the need for engine retarder brakes by heavy transport vehicles and serve to minimize excessive nose in the vicinity of the community. Treed buffer areas will also be established in order to further minimize traffic noise at select locations.

During construction MI's GERs related to Noise and Noise Limitations (see Appendix E) will be applied. The Noise and Noise Limitations requirements stipulate that equipment be "sound reduced" (by use of mufflers, silencers or other means), that noise by-laws be adhered to (where applicable), and that equipment not be operated beyond regulated operating hours unless authorized in writing (where applicable). MI staff are required to wear hearing protection gear and undertake regular hearing assessments.

Where a worker is likely to be exposed to a noise that exceeds 85 dbA Lex, standard construction practices such as informing the worker about the hazards of the level of noise and providing workers with hearing protector that complies with CAN/CSA Z94.2-02, as required by the Manitoba Workplace Safety and Health Regulation 217/2006 part 12, would mitigate the effects on workers. Given that construction sites are closed to non-construction workers for safety reasons, others are not at risk. Regulations that would be followed regarding worker exposure to noise are provided in the Workplace Safety and Heath Regulation of Manitoba's Workplace Health and Safety Act 1993 and would include the use of appropriate personal protective equipment (including hearing protection)etc.

No mitigation measures are being proposed during the Project operation stage beyond those identified as part of project planning and design (service road, maintenance of traffic speed/flow, and establishing select treed buffer areas). Although more traffic noise may be experienced due to closer proximity to the relocated section of PTH 6, it is expected that residents will acclimatize to the additional noise levels generated by traffic and should not be a significant source of concern or nuisance.

5.1.2.4. Residual Effects

Residual effects include an overall increase in temporary, short-term and transient levels of noise and vibration during construction. Upon completion of the work local residents will experience a permanent increase in noise intensity due associated with traffic due to closer proximity with the relocated section of PTH 6. This will be a permanent effect of the Project but it is ex-

pected that local residents will acclimatize over the short term. With the implementation of mitigation measures, the project is not expected to result in any significant adverse environmental effects associated with noise and vibration.

5.1.3. Terrain and Topography

5.1.3.1. Construction Effects

Potential effects of the Project on terrain and topography include changes to local drainage patterns, erosion associated with exposed soils, and the removal of some local vegetation. The landscape throughout the broader project area is generally flat consisting of treed areas, wetlands, and bogs. Terrain and topography in the vicinity of the project footprint has already been altered by development including municipal roads, PTH 6, CN station grounds, as well as some residential development. Local drainage patterns are also well established via an existing network of ditches and drains. Although the construction of the new Carne Ridge Road and PTH 6 road embankments will create a new permanent landscape feature, these will not be substantially different than what currently exists. A portion of the existing Cabin Creek Drain will be relocated within the new PTH 6 ROW as part of the work. This is intended to facilitate ease of ongoing drain maintenance and will not result in a change to local drainage patterns or capacity. Culverts will be sized and be installed in accordance with accepted design criteria similar to other locations throughout Manitoba.

Exposed soils present some temporary and short term risk of erosion during the spring melt and summer rain events. Similarly the removal of select treed areas as described in Table 11 will be necessary to facilitate the construction of the new road embankments. The loss of these treed areas will be permanent where necessary to maintain sightlines for road users. Other areas where vegetation is disturbed as part of the construction activities is expected to be short-term and temporary and will reestablish in one to two growing seasons.

Establishing quarries and borrow pits will be important for sourcing construction materials and could result in permanent alterations to the terrain in localized areas. Where possible existing material sources will be employed. This will include the use of existing pits and capitalizing on the existing Carne Ridge Road and CN staging ground embankment where possible in order to construct the new intersection and road embankments. Quarries and borrow pits used during construction will be decommissioned as required in accordance with accepted methods. Quarries for sand and gravel that continue to be used during operation will have a longer term terrain-related effect until they are decommissioned.

5.1.3.2. Operation Effects

The Operation effects on terrain and topography associated with Project include minor risk of impacts to local drainage linked to collapsed or plugged culverts. Silt deposition and excessive vegetation growth can impede flow along ditches/drains associated with the project. Culvert repair/replacement and cleanout of ditches and drains are common activities that MI addresses on a regular and ongoing basis as part of the delivery of its infrastructure program. Any potential

effects on local drainage patterns during the operational phase of the project are expected to be short term and temporary and repaired as required as part of MI's maintenance program.

5.1.3.3. Mitigation Measures

Design mitigation measures to maintain local drainage patterns include the installation of appropriately sized culverts in accordance with Provincially accepted methods and criteria. Table 2 includes a listing of culverts and their respective sizes to be installed as part of the Project.

Additional mitigation measures associated with potential Project-related effects to terrain and topography (including culvert installations and clearing and grubbing) include the application of MI's GERs (Appendix E) for the following:

- Erosion and Sediment Control;
- Clearing, Grubbing and Brushing;
- In-Water Work;
- Revegetation; and,
- Other.

The above listed sections of MI's GERs include measures to minimize terrain and topography effects which could result from construction and operation activities.

5.1.3.4. Residual Effects

Following the application of appropriate mitigation measures some minor residual effects on terrain and topography will remain as a result of construction and operation of the Project. The primary residual effect to terrain and topography will be the permanent alteration resulting from construction of the elevated road embankments and the development of quarries and borrow pits. As noted previously the immediate area in which the project occurs has already been impacted by local development. The relocated portions of Carne Ridge Road and PTH 6 are new however they make use of existing embankments or will be in close proximity to areas already under development. Although these long-term effects will continue throughout the projects operational period they are not substantially different than what currently exists. No additional mitigation measures are being proposed to address residual impacts associated with the new Carne Ridge Road and PTH 6 road embankments.

In considering the potential effects and application of mitigation measures no significant adverse effects are expected to occur on terrain, topography or local drainage patterns as a result of the construction, operation/maintenance of the Project.

5.1.4. Geology and Soils

5.1.4.1. Construction Effects

Construction of the Project will require the use of borrow pits and quarries as sources of materials for construction. The project will also capitalize on material sources including the existing CN

Rail and Carne Ridge Road embankments to the degree possible in order to reduce construction costs and minimize the impact on geology and soils in the Project Area. Temporary quarry permits and/or leases will be obtained from Manitoba Mineral Resources by MI's contractor for the work and all permitting requirements will be met. Other than the potential extraction of rock, sand, gravel and the production of aggregate materials in localized sites, the Project is not expected to have any significant adverse effects on bedrock geology.

Soil may mobilize during the construction phase due to exposure and erosion by runoff, wind and precipitation. Key construction activities during which soils are exposed and erosion may occur include clearing, grading, excavating, stockpiling, site restoration, and movement of equipment.

5.1.4.2. Operation Effects

Maintenance of the Project during the operational phase may periodically and infrequently require the use of borrow pits and potentially quarries to generate traffic gravel and other material needed for the ongoing maintenance of the road. Source material will likely be extracted from existing borrow areas and quarries in proximity to the Project Area. The Project is not expected to have a significant adverse effect on bedrock geology.

5.1.4.3. Mitigation

Mitigation measures include maximizing construction during winter months in which the ground is frozen. This will facilitate minimizing the potential for soil erosion. Additionally, specific measures related to erosion control are included in MI's GERs as follows (Appendix E):

- Erosion and Sediment Control; and
- Revegetation.

In addition to the use of existing material sources from the CN Rail and Carne Ridge Road embankments, and meeting permitting requirements for quarries and borrow pits, no additional mitigation measures are being proposed.

5.1.4.4. Residual Effects

Given the nature of the effects in conjunction with the application of mitigation measures, residual effects on geology and soils are not anticipated beyond the footprint of the Project, quarries or borrow pits. Potential effects beyond the Project will be mitigated through the application of erosion and sediment control measures and revegetation and are expected to be temporary and short-term.

In considering the potential effects and application of mitigation measures no significant adverse effects are expected to occur on geology and soils as a result of the construction, operation and maintenance of the Project.

5.1.5. Groundwater

5.1.5.1. Construction Effects

No groundwater investigations or studies have been completed specific to this Project. Available information on the distribution of groundwater aquifers indicates that the project is situated near the border of a zone described as containing very few widely scattered sand and gravel aquifers. To the east of the project area bedrock aquifers (Limestone/Dolomite) are the prevalent source of groundwater. Information under review also identified a number of groundwater wells present through the project area primarily for domestic, livestock and related purposes. The closest well (PID 25636) to the new PTH 6 alignment is located approximately 94 m outside the proposed ROW and is not expected to be impacted by construction activities. One well, septic field and septic tank will be impacted through the realignment of Carne Ridge Road. The land where the well and septic field are located along Carne Ridge Road will be purchased by MI. Both the well and septic field will be decommissioned in accordance with MSD guidelines (2009 and 2017). There is some potential for groundwater contamination associated with infiltration resulting from spills, leaks, accidents or malfunctions stemming from equipment use but is unlikely to occur given that sand and gravel aquifers are limited and widely scattered throughout the area.

5.1.5.2. Operation Effects

There are no notable groundwater effects expected to be associated with operation of the Project. There is a negligible chance for accidents and malfunctions to occur along the road in association with vehicles and equipment used to inspect and maintain the road. These activities will be sporadic and, if they occur, there is no known pathway to groundwater on or immediately adjacent to the road. The single well closest to PTH 6 is far enough away from the ROW that it should not present a significant source of concern.

5.1.5.3. Mitigation

The following mitigation measures found in MI's GERs (Appendix E) will be implemented in order to reduce the impacts of construction, operation and maintenance of the proposed Project on groundwater resources.

- Machinery, Fuel Handling and Storage;
- Emergency Response Plan for Spills; and
- Disposal.

In the event that any undocumented wells are encountered MI will decommission the well and advise Manitoba Sustainable Development.

Realignment of Carne Ridge Road and the new intersection at PTH 6 will require decommissioning of an existing groundwater well, septic field and septic tank in order to facilitate the work. Decommissioning of both the groundwater well and septic field will be in accordance with MCC's guidelines including:

- 2009 Onsite Wastewater Disposal Field Decommissioning. Guideline 2009-01E. https://www.gov.mb.ca/sd/pubs/environmental-approvals/owms/decommissioning_guideline_form.pdf

- 2017 Guide for Sealing Abandoned Water Wells in Manitoba: Technical Information for Well Owners. https://www.gov.mb.ca/sd/pubs/water-science-management/groundwater/publication/2017_guide_for_sealing_abandoned_wells_for_well_owners.pdf

5.1.5.4. Residual Effects

Given the nature of the effects in conjunction with the application of mitigation measures related to construction and operation, the project is not likely to result in any significant residual or adverse environmental effects on groundwater resources.

5.1.6. Surface Water

5.1.6.1. Construction Effects

Surface waters associated with the project are generally limited to local ditches and drains. Existing ditches will be tied into the realigned Carne Ridge Road and relocated segment of PTH 6. Cabin Creek Drain is the primary watercourse that will be affected by the Project. The work includes a minor relocation of a portion of the drain to bring it within the PTH 6 ROW (Section 4.19). The bulk of drainage (including Cabin Creek Drain) throughout the immediate project area flows into Goodison Lake which is a larger wetland area located to the north of Grahamdale and the Project itself. The primary risks to surface waters during construction include leaks, spills stemming from equipment accidents and malfunctions as well as erosion and sedimentation associated with exposed soils. Risks to Goodison Lake associated with erosion and sedimentation are considered to be minor due to the prevalence of vegetation within local ditches and drains between the Project Area and receiving waterbody itself. In addition to the application of erosion and sediment control measures, the presence of vegetation should serve as an additional buffer for any environmental risks associated with exposed soils.

5.1.6.2. Operation Effects

During operation there is a small chance for spills and leaks from vehicular and maintenance traffic to migrate into surrounding surface waterbodies. Maintenance activities will occur very sporadically at sites that have direct contact with surface waters and may seldom or never require equipment, e.g., ongoing culvert maintenance such as clearing debris. Similarly maintenance activities such as grade repairs or ditch and drain cleanouts may result in some exposed soils at discrete areas within the Project limits that presents a small risk for erosion and sedimentation. These are common types of maintenance activities undertaken by MI throughout the Province and are handled in a consistent fashion in order to mitigate potential risks.

5.1.6.3. Mitigation

To reduce potential impacts to surface water quality associated with erosion and sedimentation as well as those stemming from equipment leaks and spills or improper storage and handling of fuel and other hazardous substances, the mitigation measures described in the following sections of MI's GERs (Appendix E) will be implemented:

- Erosion and Sediment Control;
- In-Water Work;
- Clearing, Grubbing and Brushing;
- Revegetation;
- Machinery, Fuel Handling and Storage;
- Emergency Response Plans for Spills; and,
- Disposal.

5.1.6.4. Residual Effects

In considering the nature of potential effects in conjunction with the application of mitigation measures the construction, operation and maintenance of the proposed Project is not likely to result in any residual or significant adverse effects on surface water quality.

5.2. Biophysical Environment

5.2.1. Vegetation

5.2.1.1. Construction Effects

Vegetation throughout the immediate project area has been somewhat impacted by previous development. This includes existing provincial and municipal roads, ditches/drains, residential dwellings and the CN station grounds. With the exception of some treed areas previously identified in Table 11, most of the Project Footprint is not under natural vegetation cover. The total amount of clearing expected to take place is approximately 9.88 ha. During construction potential effects on vegetation include a permanent alteration in vegetation cover in select areas within the proposed ROW for the relocated/realigned sections of Carne Ridge Road and PTH 6. Dust associated with road construction activities can also have an effect on local vegetation communities.

There is potential for an increased number of invasive or non-native plants to establish themselves in the area through seed transport from equipment, or by providing favorable conditions for establishment. Soil compaction resulting from construction equipment in particular can alter conditions and make it easier for invasive plants to become established. Resulting soil compaction and removal of established vegetation during construction can therefore lead to localized changes in plant species composition within the Project Footprint.

Vegetation may be lost or impaired due to the accidental spills or releases of deleterious substances such as oil, fuel (diesel and gasoline) or hydraulic fluids during construction, maintenance and operation. A spill or release of fuels and other potentially toxic substances may have an effect on vegetation species or communities and could occur when vegetation is trying to establish or flower. This would be primarily associated with the operation of construction equipment. The release of fuels or other hazardous substances can result in the loss or impairment of vegetation due to toxicity. The potential for spills would, however, be limited to the Project Footprint where construction activities are occurring. The potential impairment to vegetation may occur sporadically during discrete spills or accidents. Vegetation loss and impairment is reversible in the long term.

5.2.1.2. Operation Effects

During operation potential effects on vegetation are expected to be limited. Some short-term, temporary and sporadic disturbance is likely to occur as a result of periodic maintenance activities such as mowing, ditch/drain cleanouts, and grade repairs. As well some risk to vegetation during operation exists in association with leaks and spills stemming from the use of maintenance equipment and potential traffic collisions. Again, the release of fuels and other toxic substances have the potential to result in localized vegetation impairment and loss. Potential effects on vegetation associated with leaks and spills during operation are expected to be minor, short-term, temporary and reversible. During operation the potential for introducing invasive species within the new Carne Ridge Road and PTH 6 ROW exists and is associated with vehicle use during maintenance activities. Displaced native plant communities and modified vegetation composition and structure in the area is considered reversible over a long period with control of the invasive species.

5.2.1.3. Mitigation

The following mitigation measures found in MI's GERs (Appendix E) will be implemented in order to reduce the potential effects on vegetation during the construction and operation/maintenance stages of the Project.

- Clearing, Grubbing, and Brushing
- Revegetation
- Dust and Particulate Control
- Machinery, Fuel Storage and Handling

In addition to the application of MI's GERs noted above, revegetation efforts will also include the development and installation of a native seed mix appropriate to the local area. Treed buffered areas will also be installed at select locations primarily to dampen traffic noise for residents along the new PTH 6 alignment.

5.2.1.4. Residual Effects

Residual effects will include a permanent loss and permanent alteration of natural vegetation cover in select areas within the project. As noted previously much of the area in which the Project will take place is previously impacted and has experienced varying levels of development. There will be some minor permanent changes to species composition within the ROW including related to clearing and compaction of local soils. However, changes to species composition will be tempered with the use of a native seed mix for revegetation. Although some minor changes are expected they should generally be consistent with species found throughout the area. Use of a native seed mix will further reduce the risk of invasive and non-native plant species becoming established along the ROW.

In considering the potential project related effects on vegetation and the application of mitigation measures, no significant residual or adverse environmental effects on vegetation are expected to occur.

5.2.2. Wildlife and Wildlife Habitat

5.2.2.1. Construction Effects

Potential construction effects on wildlife include the permanent loss and alteration of some available habitat, and sensory disturbance while construction activities are underway. Leaks and spills associated with the equipment maintenance and use as well as the handling of fuel and other hazardous substances also present a risk of local wildlife species including reptiles and amphibians noted as being present within close proximity to the Project Footprint.

The Project occurs in an area that has previously been disturbed and supports a moderate level of rural development (residential, municipal and provincial infrastructure etc.). The Project itself has been designed to capitalize on portions of the existing built environment in order to limit costs and minimize local environmental impacts. For example, the design for the relocated segment of PTH 6 will incorporate where possible the existing CN station grounds and rail embankment. Although the project area has previously been disturbed the construction of the new road embankments associated with Carne Ridge Road and PTH 6 and reconfigured ROW's will result in both a permanent loss and alteration in existing undisturbed vegetation community.

The loss of wildlife habitat is primarily associated with clearing and removal of existing vegetation within the new road ROW's. As shown in Table 11 approximately 9.88 ha of clearing will be required at select locations in order to facilitate construction and maintain sightlines for road users. Although some regeneration of habitat will occur over time, periodic maintenance activities to maintain sightlines for road user safety (i.e. mowing and brushing) will return it to a disturbed condition. The permanent loss of available habitat is associated with the construction of the new Carne Ridge Road and PTH 6 road embankments. The permanent alteration of available wildlife habitat is attributed to the reconfigured portions of the Carne Ridge Road and PTH 6 ROW that have not already been disturbed by existing development.

Potential effects associated with the construction include the destruction or disturbance of bird nests due to clearing, grubbing and brushing. If not mitigated, clearing, grubbing and brushing activities risk destroying bird nests or eggs. However, such activities will only take place between September and April of any given year, avoiding the primary bird nesting season; this is consistent with application of MI's GERs.

Noise generated from construction, maintenance activities and traffic may result in sensory disturbance or avoidance of the area by wildlife species. Construction of the Project is expected to take approximately two years and will be conducted in a staged manner. Noise and vibration generated by construction activities will be concentrated in active work locations and closely affiliated with the road alignment. Sensory effects and temporary avoidance of the immediate area by wildlife is anticipated to be short-term, temporary, and adjacent to work areas as the work progresses. MI's GERs related to Noise and Noise Limitations (Appendix E) will be applied to construction activities.

Reptiles and Amphibians are known to be very sensitive to environmental change. Observations of both the Boreal Chorus Frog (*Pseudacris maculate*) and Red Sided Garter Snake (*Thamnophis sirtalis parietalis*) were noted within the Project Area. If not mitigated, erosion and sedimentation associated with exposed soils during construction may reduce reproductive success (by impacting eggs or larva) of amphibians found in wetlands or other low lying areas located adjacent to work areas. Similarly leaks and spills associated with equipment maintenance and use, as well as accidents and malfunctions can be detrimental to both reptiles and amphibians.

Improperly stored food waste and garbage at temporary facilities such as storage and equipment maintenance areas have the potential to attract some wildlife species. Wildlife species such as black bears (*Ursus americanus*) may be attracted to work sites and become habituated or dependent on waste. Some animals that become habituated to, or dependent on, garbage as food sources may become a hazard to human safety.

5.2.2.2. Operation Effects

Most of the construction-related effects will continue on during the operational phase. For example, periodic maintenance activities such as mowing will include short term temporary disruptions to habitat within the new ROW's and reinforce its altered state. Similarly, the potential leaks and spills associated with maintenance equipment use coupled with risk of vehicle collisions also exists but is expected to be minor and much lessened. The habitat-related effects (permanent loss and alteration) that occurred during construction will continue during the operational life of the Project. Noise associated with vehicles is expected to be ongoing as PTH 6 is a major arterial route and experiences high traffic volumes and to a lesser degree on Carne Ridge Road. The broader area in which the Project is located is considered to be underdeveloped and under natural cover. Local wildlife populations are expected to be present within the area but to a lesser degree due to noise and vibration associated with traffic and road use. Tolerance to these types of disturbance will vary among individual species. Depending on species tolerance for sensory disturbance they will likely choose to find habitat suitable to their individual needs elsewhere.

Wildlife mortality associated with vehicle collisions does present a real risk during the operational stages of the Project. This type of risk is similar to any other Provincial highways road maintained and operated by MI. No significant data concerning vehicle-wildlife collisions was identified for this particular project area. If necessary MI will erect signs warning the traveling public of frequent deer or other wildlife crossings should they become apparent. This is a standard approach employed by MI in order to alert traveling public and caution them to be more careful in select areas. This does not appear to be a concern for the Project at this time suggesting that risk or likelihood of occurrence is low.

5.2.2.3. Mitigation

The following are mitigation measures included in MI's GERs (Appendix E) that will be employed to offset potential effects on wildlife:

- Erosion and Sediment Control;
- Clearing, Grubbing, and Brushing;
- Machinery, Fuel Storage and Handling;
- Emergency Response Plan for Spills;
- Disposal;
- Noise and Noise Limitations;
- Wildlife; and
- Other.

In the event that vehicle-wildlife collisions become a concern in the areas MI will erect signage alerting the traveling public to frequent wildlife crossing locations. This is a standard risk management approach employed by MI throughout Manitoba where required.

5.2.2.4. Residual Effects

Although the majority of the roadway is being constructed within an existing corridor, residual effects associated with the construction and operation/maintenance of the proposed Project includes a minor amount of permanent habitat loss and alteration within the Project Footprint. It is also possible that the Project may result in some minor permanent increases in wildlife mortality over current conditions due to vehicle collisions. With the exception of some minor and negligible risk associated with periodic maintenance activities (mowing), all other effects are anticipated to be restricted to the construction phase and will be mitigated by implementation of MI's GERs (Appendix E).

In considering the potential Project-related effects on wildlife and the application of mitigation measures and restriction of public access, no notable direct adverse effects on wildlife stemming from construction and operation/maintenance of the proposed Project are expected to occur. In considering potential project related effects on wildlife species in conjunction with the application of mitigation measures, no significant residual or adverse environmental effects on wildlife and wildlife habitat are expected to occur. No wildlife monitoring is being proposed.

5.2.3. Fish and Fish Habitat

5.2.3.1. Construction Effects

Fish and fish habitat considerations associated with the Project are primarily related to local ditches and Cabin Creek Drain. Numerous culverts will be replaced or decommissioned during the project including the relocation of a segment of Cabin Creek Drain. Drainage associated with the Project moves in a northwesterly direction ending up in Goodison lake. Fish habitat associated with the Project are either Type E (indirect) or Type D (channelized watercourse containing cyprinids / minnows) (see Table 3). The exceptions include Cabin Creek Drain and Goodison Lake. Cabin Creek Drain is Type B habitat (channelized watercourse containing large-bodied fish) at times, and likely only supports northern pike and/or white suckers during spring runoff or flood events. Although not included as part of the Project Goodison Lake serves as the receiving body for local draining and the potential to be impacted by construction activities. Goodison Lake is a very large wetland likely containing a small but diverse population of large-bodied species of fish as well as various cyprinid species and is considered to be Type A fish habitat.

Potential risks to fish and fish habitat during construction include impediments to fish passage, erosion and deposition of sediments associated with exposed soils as well as the deposition of deleterious substances such as fuel, oil or other chemicals used in operation and maintenance of construction equipment. Deleterious substances associated with erosion and sedimentation as well as fluids used in the maintenance and operation of construction equipment can result in fish mortality and/or mortality of fish eggs as well as interrupt other important life history traits. Erosion, sedimentation and the deposition of deleterious substances are greatest risks to fish and fish habitat during construction. However, if managed correctly these risks are temporary, short-term and reversible with the application of mitigation measures. Undersized or poorly designed culverts can result in an impediment to fish passage particularly under high flow conditions (heavy rain events, spring flood/run-off etc.) when flow velocities are high.

5.2.3.2. Operation Effects

Potential effects on fish and fish habitat during operation are similar to those which may be experienced during construction but at a much reduced scale and level of risk. Common maintenance activities during operation include periodic culvert replacements and spot repairs along the road grade. Both activities involve the use of equipment but occur sporadically on an as required basis in order to maintain the Provincial transportation network.

5.2.3.3. Mitigation

Mitigation measures to offset potential effects on fish and fish habitat include ensuring culverts are adequately designed and embedded in order to facilitate fish passage and connectivity throughout the localized aquatic environment. Table 3 includes a listing of culverts to be removed and replaced including embedment as part of the Project, all of which have been hydraulically sized to facilitate fish passage where required. In addition to the design mitigation measure both contractors and MI maintenance staff will be required to follow MI's GERs (Appendix E)

in order minimize potential effects on fish hand fish habitat. Relevant components of MI's GERs include but are not limited to the following:

- Erosion and Sediment Control;
- Clearing, Grubbing, and Brushing;
- Machinery, Fuel Storage and Handling;
- Emergency Response Plan for Spills;
- Revegetation;
- Disposal; and
- Other.

In addition to the application of erosion and sediment control measures, ditches and drains outside the limits of the project are well vegetated which serves as a buffer against potential impacts to Goodison Lake stemming from the disposition of sediments. No impacts to Goodison Lake are expected to occur.

5.2.3.4. Residual Effects

In consideration of potential Project effects on fish and fish habitat in conjunction with the application of mitigation measures no significant residual or adverse environmental effects are expected to occur.

5.2.4. Protected Species

5.2.4.1. Construction Effects

Three protected bird species (Section 4.1.11.2) were identified during the desktop review as having the potential to be present throughout the Project area. Included are the Least Bittern (Ixobrychus exilis), Eastern Whip-poor-will (Caprimulgus vociferus), and Barn Swallow (*Hirundo rustica).* The Least Bittern is listed as Endangered by the MESEA and as a Schedule 1 Threatened Species under SARA. No specific observations of the Least Bittern were noted by existing data sources in the Project area (CDC, MBBA). Further the Least Bittern has a preference for wetland habitats with dense vegetation and is primarily associated with southern Manitoba. The closest wetland which may support habitat for the Least Bittern is Goodison Lake located north of the Community of Grahamdale. No wetlands will be impacted by the work. A portion of Cabin Creek Drain will be relocated into the new PTH 6 ROW. Although Cabin Creek Drain does discharge into Goodison Lake, the primary risk here is some limited potential for erosion and deposition of sediment which will be managed through the application of standard construction practices relating erosion and sediment control (Appendix E). Given that no known observations of the Least Bittern were noted throughout the Project Area coupled with no impacts to local wetlands there does not appear to be any risk to this species associated with the proposed work.

The Eastern Whip-poor-will is listed as Threatened by the MESEA and as a Schedule 1 Threatened Species under SARA. A single observation of the Eastern Whip-poor-will was noted to the east of PTH 6 at the southern limits of the Project approximately 250-300 m from the existing highway. At this location the project involves minor reconstruction/resurfacing of the existing

road within the ROW. No clearing or removal of vegetation will occur at this location and there will be no habitat loss or alteration for this species. There is some minor potential for temporary and short term disturbance associated with the noise and vibration stemming from equipment use but this will be transient as paving continues along the newly realigned section of PTH 6. Furthermore, the work near the Eastern Whip-poor will observation occurs within an active transportation corridor and is subject to disturbance by noise and vibration on a regular and on-going basis. No potential project related effects are expected to occur on the Eastern whip-poor-will as a result of the Project.

The Barn Swallow is listed as Threatened by the MESEA and as a Schedule 1 Threatened Species under SARA. No specific barn Swallow observations were noted within the Project Area with the closest noted as being 20 km to the northwest. However, Barn Swallows are typically found in the vicinity of farmlands, wetlands, and human settlements. Review of the Project area does suggest that habitat conditions within the general vicinity of the Project Area appear to be amenable to the presence of this species. The project will include the acquisition of land and involve the removal of some structures (house, garage, shed etc.) which present the greatest potential risk to any Barn Swallows that may be found in the area. Although the risk is low the removal of existing structures may result in the permanent loss of some small amount of useable habitat. Land acquisition and in particular the removal of existing structures is limited. Other available habitat is readily available for this species throughout the general area in which the Project occurs. No potential effects on Barn Swallow populations that may be present in the project area are expected to occur.

5.2.4.2. Operation Effects

During the operation of the project there is some minor potential for disruption to the Eastern Whip-poor-will in relation to periodic maintenance activities associated with periodic clearing and brushing of larger woody vegetation along the PTH 6 ROW in order to maintain site lines for road user safety. Although one observation of the Eastern Whip-poor-will was noted outside the project Footprint it is possible that they may be present at some point during the lifespan of the Project. Although vegetation will reestablish itself over time it does represent a minor long-term periodic disturbance and alteration of available habitat within the PTH 6 transportation corridor.

5.2.4.3. Mitigation

The following are mitigation measures included in MI's GERs (Appendix E) that will be employed to offset potential effects on protected species identified in relation to the Project:

- Construction Environmental Management Plan;
- Clearing, Grubbing, and Brushing;
- Machinery, Fuel Storage and Handling;
- Emergency Response Plan for Spills;
- Noise and Noise Limitations; and
- Wildlife.

In addition to the application of the relevant sections of MI's GERs, inspection of the Carne Ridge Road property structures (shed, house etc.) prior to their removal in order to determine if any Barn Swallows are nesting at this location. If necessary removal of these structures will occur before May 15th or after September 30th in order to further mitigate any potential effects to this species.

5.2.4.4. Residual Effects

In consideration of potential Project effects on protected bird species in conjunction with the application of mitigation measures no significant residual or adverse environmental effects are expected to occur.

5.3. Socio-economic Environment

5.3.1. Resource Use

5.3.1.1. Construction Effects

Potential land uses considered in relation to the Project include forestry, hunting and trapping. No forestry activities are currently known to occur in the immediate vicinity of the Project. Similarly the Project is located in close proximity to the community of Grahamdale and some surrounding residences. The area is not likely amenable to hunting or trapping given its location adjacent to a rural community. No potential effects on resources use are expected to occur during construction of the Project.

5.3.1.2. Operation Effects

During operation the Project and its associated components will become part of the provincial transportation network. No potential effects on resource use are expected to occur during the operation of the Project.

5.3.1.3. Mitigation

As no effects on local resource use such as forestry, hunting and trapping are expected to occur. No mitigation measures are being proposed.

5.3.1.4. Residual Effects

No residual or significant adverse environmental effects on resource use are likely to occur as a result of the Project.

5.3.2. Parks, Protected Areas and Areas of Special Interest

5.3.2.1. Construction Effects

There are no parks or protected areas located within the immediate vicinity of the proposed Project. No potential construction related effects on Parks, Protected Areas, and Areas of special Interest are expected to occur as a result of the Project.

5.3.2.2. Operation Effects

There are no parks or protected areas located within the immediate vicinity of the proposed Project. No potential operations related effects on Parks, Protected Areas, and Areas of Special Interest are expected to occur as a result of the Project.

5.3.2.3. Mitigation

As no effects on Parks, Protected Areas, and Areas of Special Interest are expected to occur no mitigation measures are being proposed.

5.3.2.4. Residual Effects

No residual or significant adverse effects on Parks, Protected Areas, and Areas of Special Interest are likely to occur as a result of the Project.

5.3.3. Culture and Heritage Resources

5.3.3.1. Construction Effects

No known heritage resources or potential for heritage resources were identified in the immediate vicinity of the Project. No potential effects are expected to occur on cultural or heritage resources during construction of the Project.

5.3.3.2. Operation Effects

No known heritage resources or potential for heritage resources were identified in the immediate vicinity of the Project. No potential effects on cultural or heritage resources are expected to occur during operation of the Project.

5.3.3.3. Mitigation

No known heritage resources or potential for heritage resources were identified in the immediate vicinity of the Project. However, in the event that any unknown or unsuspected heritage resources are discovered as the Project proceeds the following mitigation measures included in MI's GERs (Appendix E) will be employed:

- Heritage Resources

5.3.3.4. Residual Effects

No residual or significant adverse effects on heritage resources are likely to occur as a result of the Project.

5.3.4. Human Health and Safety

5.3.4.1. Construction Effects

Potential environmental effects of the Project during construction largely include direct and indirect human health effects from local changes to air quality and noise as well as safety hazards associated with traffic and road use, such as vehicle collisions, or other accidents and malfunctions.

The new section of PTH 6 will be constructed “offline” outside of existing traffic flows and will be tied into the provincial highway network upon completion. Staging the work in this manner will allow traffic to use the existing road alignment in order to minimize delays and potential interaction with workers and construction equipment thereby reducing the risk of collisions, accidents and injury significantly.

The realigned approach and intersection improvements at Carne Ridge Road will need to be integrated with local traffic flows. There will be an increased risk of interaction between vehicles, workers and construction equipment. In order to minimize these risks a traffic safety plan will be developed by the preferred contractor which meets all provincial traffic safety standards for the area and expected traffic volumes. This will include but not be limited to traffic cones, flag persons, and signage advising the traveling public of construction activities. The traffic safety plan will be approved by MI prior to the start of work.

During construction there is an increased risk of elevated levels of dust, noise, and vibration associated with the use of construction equipment. Increased levels of dust in the atmosphere can affect visibility for road users if not managed appropriately. Similarly increased levels of noise and vibration can be a nuisance to local residents that live in close proximity to the work sites. In either case any increases in dust, noise and vibration are expected to return to pre-construction conditions once the work is complete. The exception here being noise and vibration associated with traffic along the relocated segment of PTH 6 which will be in closer proximity to the community of Grahamdale and local residents than the existing alignment (see Section 5.1.2).

5.3.4.2. Operation Effects

Potential effects of the Project on human health and safety during operation include a risk of vehicle collisions as well as increased levels of noise and vibration associated with traffic. The risk of vehicle collisions is a common issue for all roads managed as part of the provincial transportation network. The level of risk varies based on traffic volumes and type of vehicles and proximity to urban environments. For the Project the risk will be managed in a similar manner as it is elsewhere throughout Manitoba. For example, a key safety consideration for this Project has been to convert Railway Ave. into a service road in order to maintain separation of local traffic from that using PTH 6 in order to reduce the risk of collisions in addition to the installation of lighting at the Carne Ridge Road intersection.

During operation local residents in close proximity to the newly relocated section of PTH 6 will experience increased levels of noise and vibration associated with traffic. Traffic volumes are not expected to increase as a result of the Project, however, the relocated section of PTH 6 will be in closer to the community of Grahamdale and local residents. Local residents will likely experience a greater intensity of noise and vibration as a result of to being in closer proximity to the PTH 6 transportation corridor. This will be a permanent effect associated with the operation of the Project. Given buffers associated with ROW width and similar conditions elsewhere in Manitoba in conjunction with the application design mitigation measures, it is expected that residents will acclimatize to the additional intensity of noise and vibration but should not be a significant source of concern. Although it may be noticeable at first local residents are expected to acclimatize to the

shift in source noise and vibration over the short term. Planning considerations such as converting Railway Ave. into a service road will further assist in reducing excessive noise associated with the use of engine retarder brakes by maintaining consistent traffic speeds along PTH 6 and not requiring a change in speed limit near the community.

5.3.4.3. Mitigation

Mitigation measures to address potential effects to human health and safety are similar to many of those listed earlier to mitigate potential effects associated with the corresponding physical and biological environments. Mitigation measures will include the implementation of safe work practices, including signage at the construction site. Mitigation measures to reduce the potential effects of the Project on community members and worker safety risk during construction include requiring the preferred contractor to be Core certified and have an appropriate safety program in place.

Public access to construction areas would be restricted to only the approved workforce where possible. The preferred contractor will be responsible for implementing an approved traffic safety plan. During construction dust suppressants (water or other acceptable and approved dust suppressants) will be used as required based on ambient local conditions (i.e. dry, windy etc.) in order to maintain visibility and the safety of road users and construction workers.

Construction workers would be trained in safe practices, including the use of Personal Protective Equipment, would abide by Health and Safety Plans and would attend regular construction site safety briefings. Construction contractors would develop and implement appropriate Health and Safety Plans, conduct regular safety training and inspections, use trained and certified blasting crews (if blasting is required) and equip and maintain construction equipment, machinery and vehicles with appropriate safety features (e.g., back-up warning devices). Spill response and remediation would occur in accordance with the GERs, thereby minimizing the potential effects of hazardous materials and limiting them to a small area that would be quickly cleaned up.

For environments where a worker is likely to be exposed to a noise that exceeds 85 dbA Lex, standard construction practices such as informing the worker about the hazards of the level of noise and providing workers with hearing protection that complies with CAN/CSA Z94.2-02 as required by the Manitoba Workplace Safety and Health Regulation 217/2006 part 12 would mitigate the effects on workers.

Construction activities will adhere to local noise bylaws in order to minimize nuisance and disruption to local residents. Regulations that would be followed regarding worker exposure to noise are provided in the Workplace Safety and Heath Regulation of Manitoba's Workplace Health and Safety Act 1993 and would include the use of appropriate personal protective equipment (including hearing protection) and coordinating the timing of blasting with the period of fewest on-site workers.

Planning and design mitigation measures to reduce impacts on local residents include:

- Construction of PTH 6 “offline” in order to minimize worker/equipment interactions with existing traffic flows;

- Reconfiguration of Railway Ave. as a local service road in order to create serration between local traffic and vehicles travelling along PTH 6. Establishment of a local service road will also assist in reducing noise/vibration from engine retarder brakes by maintaining consistent traffic speeds along PTH 6 (i.e. less need for braking due to a change in speed limits near the community);

- Installation of treed buffer zones at select locations as a measure to further reduce traffic noise along PTH 6; and

- Installation of lighting at the Carne Ridge Road intersection with PTH 6 in order to improve visibility and minimize the potential for vehicle collisions.

Maintenance of the Carne Ridge Road and PTH 6 ROW’s will occur on a periodic basis in order to preserve sight lines. Signage will installed in accordance with accepted MI practices as required to facilitate the safety of those using the road (speed limits, warning signs, wildlife crossings locations etc.).

In addition to the measures described above MI contractors and maintenance personnel will apply the following GERs (Appendix E) to the work in order to further minimize potential effects on human health and safety:

- Clearing, Grubbing and Brushing;
- Machinery, Fuel Storage, and Handling;
- Emergency Response Plan for Spills;
- Dust and Particulate Control; and
- Noise and Noise Limitations.

5.3.4.4. Residual Effects

Despite the application of mitigation measures increased intensity of noise and vibration associated with the relocation of PTH 6 will be a residual effect on local residents. Although traffic volumes (and associated noise and vibration) are not expected to increase the shift in the PTH 6 alignment brings source traffic noise and vibration in closer proximity to the community of Grahamdale and local residents. This is a permanent and long-term effect of the Project on human health and safety. Although the increased intensity of noise and vibration levels may be noticeable at first, local residents are expected to acclimatize to the change over time. No significant adverse effects on human health and safety are likely to occur as a result of the construction and operation/maintenance of the proposed Project.

Table 13: Relocation of PTH 6 and Realignment of Carne Ridge Road Summery of Environmental Effects Analysis

Variables	Attributes	Construction	Operation and Maintenance	Mitigation Measures	Residual Effects	Significance	Follow-Up & Monitoring
Physical Processes	**Air Quality/ Greenhouse Gases**	Minor emissions will be released from the operation of equipment and machinery used in constructing of the Project.	Minor amounts of emissions to be released from the operation of equipment used during maintenance activities and from traffic using the relocated section of PTH 6 and realigned portion of Carne Ridge Road.	Ensure that all equipment is maintained and serviced regularly. Restricted Access limiting use to MI and Contractor Employee's.	Minor residual GHG emissions stemming from operation of vehicles and equipment may escape into the atmosphere.	Not significant.	None.
		Dust from road construction (fill placement and grading) may result in a temporary/minor reduction in air quality at active construction sights.	Dust from operation and maintenance may reduce air quality.	Application of dust palliative as required.	Minor residual raising of dust into the atmosphere.	Not significant.	None.
	Noise and Vibrations	Potential for excessive noise and vibration associated with construction activities.	Potential for short-term/temporary noise/vibration stemming from periodic use (vehicle/maintenance equipment) of access road. Increased intensity of noise and vibration for local residents living in close proximity to the relocated section of PTH 6.	Adherence to MI GERs regarding noise/vibration Conversion of Railway Ave. into service road in order to maintain traffic flows and reduce need for use of engine retarder brakes. Installation of treed buffer areas at select locations in order to reduce increased noise levels for local residents living in close proximity to relocated section of PTH 6.	Increased intensity of noise and vibration associated with traffic for local residents living in close proximity to relocated section of PTH 6.	Not significant.	None.
	Terrain and Topography	Permanent construction of an elevated road embankment.	Permanent elevated road embankment.	Not required	Construction and use of an elevated road embankment will be a localized permanent landscape alteration.	Not significant	None.
		Potential alteration of local drainage patterns associated with construction of road embankments (PTH 6 and Carne Ridge Road) and relocation of a section of Cabin Creek Drain.	Potential for alteration of local drainage patterns due to plugged or collapsed culverts.	Design mitigation measures including the installation and maintenance of appropriately sized equalization culvert in order to maintain local drainage patters through road embankment. Relocation of cabin creek drain is minor and does not change local drainage pattern.	None	Not significant	None

Variables	Attributes	Construction	Operation and Maintenance	Mitigation Measures	Residual Effects	Significance	Follow-Up & Monitoring
Physical Processes	**Geology and Soils**	Potential for localized alteration to local bedrock associated with quarry and material development.	No potential effects on bed rock geology are expected to occur during the operation and maintenance phase of the project.	Contractor adherence to casual quarry permit conditions. Proper decommissioning of quarries and borrow pits.	No residual effects.	Not significant.	None.
		Potential erosion of exposed soils associated with vegetation removal and construction activities (hauling and placement of fill etc.)	Minor potential for exposed soils during periodic maintenance activities may occur (e.g. grade repairs etc.).	Application of MI GERs regarding erosion and sediment control measures, revegetation, clearing/grubbing and brushing, rip rap.	No residual effects.	Not significant	None
	Groundwater	Potential infiltration of fuel and/or other hazardous substances into the groundwater table stemming from the use of equipment/machinery and/or storage/handling of substances used during road construction and improper decommissioning of Carne Ridge Road groundwater well, septic field and septic tank.	Potential infiltration of fuel and/or other hazardous substances into the groundwater table stemming from the use of equipment/machinery, transportation/storage of fuel and other hazardous substances during operation and maintenance activities as well as accidents/collisions associated with vehicle use of roads.	Application of MI GERs concerning machinery, fuel handling and storage, emergency response plan, disposal of materials, and contractor development of an accepted construction environmental management plan.	No residual effects.	Not significant.	None.
		Potential for ground water quality contamination from spill of hazardous substances such as fuel or oil due to the use of heavy equipment during construction and improper decommissioning of Carne Ridge Road groundwater well, septic field and septic tank.	Potential for ground water quality contamination from spill of hazardous substances such as fuel or oil due to the use of heavy equipment during maintenance, and accidents/collisions associated with vehicle use of roads.	Application of MI GERs concerning machinery, fuel handling and storage, emergency response plan, disposal of materials, and contractor development of an accepted construction environmental management plan.	No residual effects.	Not significant.	None.
	Surface Water	Potential changes to TSS from erosion and sedimentation due to exposed soils and high water/run off events during construction.	Some minor potential for elevated levels in water quality parameters such as TSS during high water and/or runoff events associated with open soils during periodic maintenance activities.	Application of MI GERs for Contractor submission of an accepted construction environmental management plan, erosion and sediment control, in-water work (i.e. Site isolation), machinery, fuel storage and handling, revegetation, and disposal.	No residual effects.	Not significant.	None.
		Potential for surface water quality contamination from spill of hazardous substances such as fuel or oil due to the use of heavy equipment.	Some minor potential for surface water quality contamination for fuel leaks and related hazardous materials stemming from vehicles using the access road or equipment during maintenance activity.	Application of MI GERs for Contractor submission of an accepted construction environmental management plan, erosion and sediment control, in-water work (i.e. Site isolation), machinery, fuel storage and handling, revegetation, and disposal.	No residual effects.	Not significant.	None.
Biophysical	**Vegetation**	Permanent loss of minor amount of vegetation at select locations (Table 12) in order to facilitate construction and maintain sightlines for the traveling public.	Permanent alteration of vegetation community in select locations associated with periodic mowing and brushing (maintenance) of Carne Ridge Road and PTH 6 ROW's in order to maintain sightlines for the traveling public.	Revegetation of disturbed areas with an acceptable in accordance with MI GERs. Installation of native seed mix appropriate to the area.	Some minor residual potential for local changes to plant community composition within ROW due to clearing and compaction of soils, and mowing/maintenance of ROW.	Not significant.	None.

		Potential for increases in invasive and/or non-native plant species during construction of roads due to the presence of construction equipment.	Traffic and maintenance activities can bring in foreign plant matter which can aid in the spread of non-native or invasive species.	Adherence to MI GERs relating to revegetation, dust and particulate control, machinery, equipment and fuel storage.	No residual effects.	Not significant.	None.
Variables	**Attributes**	**Construction**	**Operation and Maintenance**	**Mitigation Measures**	**Residual Effects**	**Significance**	**Follow-Up & Monitoring**
Biophysical		Minor permanent habitat loss and alteration will occur in association with clearing for construction of road embankments and sight lines.	Minor potential for minor wildlife avoidance of the Carne Ridge Road and PTH 6 ROW's during operation/maintenance phase. Ongoing minor permanent habitat alteration as a result of periodic maintenance activities (mowing/brushing) with Carne Ridge Rad and PTH 6 ROWs.	No mitigation measures are being proposed for wildlife habitat loss, habitat alteration, and associated road avoidance. Road avoidance could help reduce the potential for collision related mortality.	Habitat loss/alteration will be limited to the ROW, but will be permanent.	Not significant.	None.
		Potential for increased mortality due to wildlife-vehicle collisions during construction.	Potential for increased mortality due to traffic and increases for potential for wildlife-vehicle collisions. The area in which the Project occurs is not currently identified as having a high potential for vehicle-wildlife collisions.	Installation of wildlife crossing signs to alert road users of potential risk should it be required per MI standard operating procedures.	Potential for a minor increase in wildlife mortality due to collisions with vehicles.	Not significant.	None.
	Wildlife	Construction noise may cause minor avoidance of Carne Ridge Road and PTH 6 ROWs by wildlife.	Traffic and maintenance noise/vibration may cause some minor avoidance of localized areas along Carne Ridge Road and PTH 6 ROW's.	Limit noise and vibration per MI GERs during construction and maintenance activities.	Permanent Impact of road avoidance due to noise and vibration, but is expected to be minor.	Not significant.	None.
		Potential destruction of migratory bird nest during clearing operations for road construction.		Clearing activities will be conducted during the fall/winter months in accordance with MI's GERs for clearing, grubbing and brushing.	No residual effects.	Not significant.	None.
		Potential temporary/short-term loss of riparian/aquatic habitat at location of culvert sites.	Potential temporary/short-term loss of riparian/aquatic habitat at location of culvert sites associated with periodic maintenance activities.	Revegetation in accordance with MI GERs and installation of and appropriate native seed mix.	No residual effects	Not significant.	None.
		Erosion and sedimentation associated with exposed soils during construction could have an impact on amphibian eggs/larva.	Erosion and sedimentation periodic maintenance activities (culvert replacements/grade repairs) could have an impact on amphibian eggs/larva.	Application of MI GERs related to erosion and sediment control, revegetation, and rip rap installation.	No residual effects	Not significant.	None.

Variables	Attributes	Construction	Operation and Maintenance	Mitigation Measures	Residual Effects	Significance	Follow-Up & Monitoring
Biophysical	**Fish and Fish Habitat**	Potential for disposition of deleterious substances associated with erosion and sedimentation of exposed soils as well as leaks and spills of fluids used in the operation and maintenance of construction equipment (fuel, lubricants etc.). Impediment of fish passage due to improperly designed culverts (sizing for velocity etc.) and installation (embedment).	Minor potential for disposition of deleterious substances associated with erosion and sedimentation of exposed soils as well as leaks and spills of fluids used in the operation and maintenance of construction equipment (fuel, lubricants etc.). Minor risk associated with impeding fish passage due to improperly designed culverts (sizing for velocity etc.) and installation (embedment) during maintenance activities.	Application of MI's GERs during construction and maintenance activities. Internal review and approval of activities at design stage to address culvert sizing concerns by MI's Environmental Services Section (ESS)	No residual effects	Not significant.	None.
	Protected Species	Negligible potential effects on Eastern Whip-poor-will include permanent habitat loss/alteration associated with minor clearing at select locations in order to facilitate construction and maintain road sight lines. No potential effects on Least Bittern as potential wetland habitat will not be disturbed as part of Project. No Barn Swallows noted in immediate project area. Potential habitat loss through removal of shed/structure at Carne Ridge Road property.	Minor permanent alteration and loss of habitat associated with periodic maintenance activities such as mowing/brushing within ROW's. No potential effects on Barn Swallows during operation and maintenance phase of project. Structures will be removed during construction phase.	Application of MI GERs associated clearing, grubbing and brushing Inspection of Carne Ridge Road property structures prior to removal. If necessary removal will occur before may 15th or after September 30th of any given year.	Minor permanent loss/alteration of potential habitat within Carne Ridge Road and PTH 6 ROW.	Not significant.	None.
Socio-economic	**Resource Use**	No potential effects on land/resource use (forestry, hunting, trapping) are expected to occur as a result of the construction.	No potential effects on land/resource use (forestry, hunting, trapping) are expected to occur as a result of the operation/maintenance.	No mitigation measures are being proposed.	No residual effects.	Not significant.	None.
	Parks, Protected Areas and Areas of Special Interest	No potential effects on parks, protected areas, and areas of special interested are expected to occur as a result construction.	No potential effects are expected to occur on parks, protected areas, and areas of special interest during operation and maintenance.	No mitigation measures are being proposed.	No residual effects.	Not significant.	None.

Variables	Attributes	Construction	Operation and Maintenance	Mitigation Measures	Residual Effects	Significance	Follow-Up & Monitoring
Socio-economic	**Culture and Heritage Resources**	No known heritage resources were identified in the immediate vicinity of the Project.	No potential project related effects are expected to occur on heritage resources during the operation and maintenance.	No specific mitigation measures are being proposed. However, in the event that historic/cultural resources are encountered MI will contact Manitoba's Historic resources Branch in accordance with the GERs.	No residual effects.	Not significant.	None.
	Human Health & Safety	Increases in vehicular traffic has the potential to cause risk to safety.	Increases in vehicular traffic has the potential to cause risk to safety.	Safe work practices and signage will be implemented in all construction and maintenance activities.	No residual effects.	Not significant.	None.

6. CONCLUSIONS

The potential physical, biological and socio-economic effects of the proposed Project have been evaluated, with consideration given to the application of mitigation measures, residual effects and the significance of potential adverse environmental effects. The proposed mitigation measures outlined in this Environment Act Proposal are expected to effectively prevent, avoid or minimize potential effects. Nonetheless, some minor residual effects were identified as part of the analysis including:

- Minor overall increases in GHG and dust emissions associated with vehicle/equipment during construction and maintenance activities;
- Minor overall increases in noise and vibration attributed to construction and general operation of the Project for local residents living in close proximity to the relocated section of PTH 6;
- Permanent minor alteration of local terrain associated with the construction of an elevated road embankment and potential development of quarries or borrow pits;
- Minor loss of vegetation and alteration of local plant community composition within Carne Ridge Road and PTH 6 ROW's due to select clearing and compaction of soils, and mowing/maintenance of ROW, and possible unintentional introduction of non-native or invasive plant species;
- Minor loss and alteration of wildlife habitat loss within Carne Ridge Road and PTH 6 Row;
- Potential for wildlife avoidance of ROW due to noise and vibration associated with construction activities and during operation of the realigned portion of Carne Ridge Road and relocated section of PTH 6; and
- Small potential for overall increase in wildlife mortality over current conditions primarily associated with vehicle collision risks.

These residual effects are considered to be relatively small and are offset by the need to improve the existing provincial road network at this location for the benefit of the travelling public. Based on the review of the Project in conjunction with the application of mitigation measures no significant adverse environmental effects are expected to occur.

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Appendix A: Soil Survey Results

MANITOBA INFRASTRUCTURE
MATERIALS ENGINEERING BRANCH
SOIL SURVEY REPORT

Field Book No.:			
Client:	Region 04	**From:**	PTH 6, Grahamdale
Project:	PTH 6 Grahamdale Re-Alignment	**To:**	
Control Section:		**Survey Location:**	Travel Lanes
Project No.:		**Survey Purpose:**	Preliminary Engineering
Soil Survey No.:	2018SS23		
Internal Order No.:	200040281	**Sampled By:**	Mobile Operations
Contract No.:		**Dated Sampled:**	August 28, 2018

Field Book Notes:

MANITOBA INFRASTRUCTURE
MATERIALS ENGINEERING BRANCH - CENTRAL LAB

SOIL SURVEY PROPERTY SUMMARY SHEET

Field Book No.:		From:	PTH 6, Grahamdale	Report To:	Mark Lovie, Rick Postlethwaite
Client:	Region 04	To:		Date Requsitioned:	2018-08-08
Highway:	PTH 6	Contract No.:		Date Reported:	2018-10-23
Control Section:		Survey Location:	Travel Lanes		
Project No.:		Survey Purpose:	Preliminary Engineering		
Soil Survey No.:	2018SS23	Sampled By:	Mobile Operations		
Internal Order No.:	200040281	Date Sampled:	2018-08-28	Page:	1 2

Sample Data							Particle Size Analysis					Soil Properties/Classification											
Northing	Easting	Site No.	Lane	Lab Sample Number	Depth(m)	Field Sample No.	Coarse Aggregate (%)	Coarse Sand (%)	Fine Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (-1 = NP)	AASHTO	Group Index	Soil Type	Moisture Content (%)	Frost Susceptibility	Organic Content (%)	Maximum Density (kg/m^3)	Optimum Moisture (%)	Field Description
		Site 1		WSS181771	0.000 - 3.000	(1-1)	7	5	27	35	26	19	11	8	A-4	5	Sandy Silt	8					TAN SILT, TRACE CLAY AND GRANULAR
		Site 2		WSS181772	0.000 - 1.100	(2-1)	8	5	11	31	46	36	16	20	A-6	12	Low Plastic Clay	13					TAN SILT, TRACE CLAY AND GRANULAR
		Site 2		WSS181773	1.100 - 1.900	(2-2)	9	1	13	33	44	37	15	22	A-6	13	Low Plastic Clay	16					BROWN CLAY, TRACE SILT
		Site 2		WSS181774	1.900 - 3.000	(2-3)	9	5	17	38	32	21	12	9	A-4	7	Clayey Silt	12					LIGHT BROWN SILTY CLAY
		Site 3		WSS181775	0.000 - 0.400	(3-1)	10	4	15	40	31	19	13	6	A-4	7	Clayey Silt	10					LIGHT BROWN SILT
		Site 3		WSS181776	0.400 - 1.600	(3-2)												14					LIGHT BROWN CLAY, TRACE SILT
		Site 3		WSS181777	1.600 - 3.000	(3-3)	5	4	12	38	41	34	13	21	A-6	12	Low Plastic Clay	16					FIRM LIGHT BROWN CLAY, TRACE GRANULAR
		Site 4		WSS181778	0.000 - 1.250	(4-1)	9	5	18	41	27	20	12	8	A-4	7	Clayey Silt	10					TAN SILT, SMALL AMOUNT OF TRACE CLAY
		Site 4		WSS181779	1.250 - 1.800	(4-2)												15					LIGHT BROWN CLAY, TRACE SILT
		Site 4		WSS181780	1.800 - 3.000	(4-3)	9	4	21	41	24	18	11	7	A-4	6	Clayey Silt	7	FS				LIGHT BROWN SILT, TRACE CLAY
		Site 5		WSS181781	0.000 - 1.700	(5-1)	11	4	19	43	22	18	12	6	A-4	6	Clayey Silt	8	FS				TAN SILT, TRACE GRANULAR
		Site 5		WSS181782	1.700 - 2.500	(5-2)	6	5	19	40	30	19	12	7	A-4	7	Clayey Silt	10					TAN SILT, TRACE CLAY
		Site 6		WSS181783	0.000 - 1.600	(6-1)												7					TAN SILT, TRACE GRANULAR
		Site 7		WSS181784	0.000 - 1.500	(7-1)	10	6	21	40	23	18	12	6	A-4	6	Sandy Silt	7	FS				TAN SILT, TRACE GRANULAR
		Site 8		WSS181785	0.000 - 0.400	(8-1)	6	4	21	40	30	24	12	12	A-6	8	Low Plastic Clay	12					GREYISH TAN SILT CLAY, TRACE GRANULAR
		Site 8		WSS181786	0.400 - 1.500	(8-2)	5	4	46	32	13	15	13	2	A-4	2	Sandy Silt	12	FS				TAN SILTY SAND, TRACE GRANULAR
		Site 9		WSS181787	0.000 - 2.500	(9-1)	10	4	18	38	31	25	12	13	A-6	8	Low Plastic Clay	14					TAN CLAY, TRACE GRANULAR
		Site 9		WSS181788	2.500 - 3.000	(9-2)	12	4	19	40	25	20	13	7	A-4	6	Sandy Silt	10					TAN SILTY CLAY, TRACE GRANULAR
		Site 10		WSS181789	0.000 - 2.600	(10-1)	9	3	10	32	46	44	16	28	A-7-6	16	High Plastic Clay	18					TAN CLAY, TRACE GRANULAR
		Site 10		WSS181790	2.600 - 3.000	(10-2)	9	5	16	41	30	23	13	10	A-4	7	Clayey Silt	11					TAN SILTY CLAY, TRACE GRANULAR

Field Book information is represented by the shaded area NS - Not Sampled NT - Not Tested FS - Frost Susceptible

MANITOBA INFRASTRUCTURE
MATERIALS ENGINEERING BRANCH - CENTRAL LAB

SOIL SURVEY PROPERTY SUMMARY SHEET

Field Book No.:		From:	PTH 6, Grahamdale	Report To:	Mark Lovie, Rick Postlethwaite
Client:	Region 04	To:		Date Requisitioned:	2018-08-08
Highway:	PTH 6	Contract No.:		Date Reported:	2018-10-23
Control Section:		Survey Location:	Travel Lanes		
Project No.:		Survey Purpose:	Preliminary Engineering		
Soil Survey No.:	2018SS23	Sampled By:	Mobile Operations		
Internal Order No.:	200040281	Date Sampled:	2018-08-28	Page:	2 2

Sample Data							Particle Size Analysis					Soil Properties/Classification											
Northing	Easting	Site No.	Lane	Lab Sample Number	Depth(m)	Field Sample No.	Coarse Aggregate (%)	Coarse Sand (%)	Fine Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (-1 = NP)	AASHTO	Group Index	Soil Type	Moisture Content (%)	Frost Susceptibility	Organic Content (%)	Maximum Density (kg/m^3)	Optimum Moisture (%)	Field Description
		Site 11		WSS181791	0.000 - 0.250	NS																	GRANULAR BASE
		Site 11		WSS181792	0.250 - 0.700	(11-1)	9	4	16	28	43	41	20	21	A-7-6	12	High Plastic Clay	20					DARK GREY CLAY
		Site 11		WSS181793	0.700 - 2.350	(11-2)	7	5	15	41	33	28	12	16	A-6	10	Low Plastic Clay	15					TAN CLAY
		Site 11		WSS181794	2.350 - 3.000	(11-3)	10	5	17	40	27	22	13	9	A-4	7	Clayey Silt	13					TAN CLAY, TRACE SILT AND GRANULAR
		Site 12		WSS181795	0.000 - 0.300	NS																	GRANULAR BASE
		Site 12		WSS181796	0.300 - 3.000	(12-1)												10					TAN CLAY, TRACE GRANULAR
		Site 13		WSS181797	0.000 - 0.310	NS																	GRANULAR BASE
		Site 13		WSS181798	0.310 - 1.200	(13-1)	6	4	10	34	46	42	17	25	A-7-6	14	High Plastic Clay	22					GREYISH BROWN CLAY
		Site 13		WSS181799	1.200 - 3.000	(13-2)	6	4	11	32	46	37	14	23	A-6	13	Low Plastic Clay	20					FIRM BROWN CLAY
		Site 14		WSS181800	0.000 - 0.300	NS																	GRANULAR BASE
		Site 14		WSS181801	0.300 - 3.000	NS																	TAN CLAY
		Site 15		WSS181802	0.000 - 0.320	NS																	GRANULAR BASE
		Site 15		WSS181803	0.320 - 1.000	(15-1)	6	5	17	32	40	45	24	21	A-7-6	13	High Plastic Clay	25					DARK GREY CLAY, TRACE SILT
		Site 15		WSS181804	1.000 - 3.000	(15-2)	9	5	18	41	26	21	13	8	A-4	6	Clayey Silt	11					TAN CLAY, TRACE SILT
		Site 16		WSS181805	0.000 - 0.350	(16-1)	13	7	20	25	35	44	21	23	A-7-6	11	Sandy Clay	22					DARK GREY SILT-GRANULAR MIX
		Site 16		WSS181806	0.350 - 1.650	(16-2)												24					DARK GREY CLAY, TRACE SILT
		Site 16		WSS181807	1.650 - 2.600	(16-3)	5	3	9	35	47	46	17	29	A-7-6	17	High Plastic Clay	19					FIRM TAN CLAY
		Site 16		WSS181808	2.600 - 3.000	(16-4)	10	4	17	41	29	22	12	10	A-4	7	Clayey Silt	13					SOFT LIGHT TAN CLAY
		Site 17		WSS181809	0.000 - 1.900	(17-1)	10	4	15	35	35	30	13	17	A-6	10	Low Plastic Clay	12					TAN SILT, TRACE CLAY AND GRANULAR
		Site 17		WSS181810	1.900 - 3.000	(17-2)	9	5	14	40	32	25	13	12	A-6	8	Low Plastic Clay	15					TAN CLAYEY SILT

Field Book information is represented by the shaded area NS - Not Sampled NT - Not Tested FS - Frost Susceptible

Manitoba Infrastructure

Materials Engineering Branch

GEOTECHNICAL SOIL PROPERTY SUMMARY SHEET

Client:	Region 04	Site/File No. :		Date Requisitioned:	2018-08-08
Project:	PTH 6	Internal Order No. :	200040281	Date Reported:	2018-10-23
Location:	Grahamdale Relocation	Sampled By:	Mobile Operations	Report To:	Mark Lovie, Rick Postlethwaite
Municipality:		Date Sampled:	2018-08-28	Page:	1 of 1

Lab No.	SAMPLE DATA					Unified Classification	Moisture Content %	ATTERBERG LIMITS			GRAIN SIZE					Organic Content %	Reactivity with HCl *	STRENGTH								Visual Classification
	Test Hole No.	Sample No.	Station	Centerline	Depth(m)			Liquid Limit % (-1 = NP)	Plastic Limit % (-1 = NP)	Plasticity Index % (-1 = NP)	Gravel % (pass 75mm)	Sand % (pass 4.75mm)	Silt % (pass 0.075mm)	Clay % (pass 0.005 mm)	Silt/Clay % (pass 0.075 mm)			Field SPT (N)	Field PP (kpa)	Field Torvane Value (kpa)	Unconfined qu (kpa)	Bulk Dry Density (kg/cu.m.)	Direct Shear Performed	Consolidation Performed	Permeability Performed	
WSS181771		(1-1)			0.000 - 3.000	CL-ML		19	11	7	6	27	44	23												
WSS181774		(2-3)			1.900 - 3.000	CI		21	12	9	3	25	45	27												
WSS181777		(3-3)			1.600 - 3.000	CI		34	13	20	4	18	38	40												
WSS181782		(5-2)			1.700 - 2.500	CL-ML		19	12	7	6	28	42	25												
WSS181785		(8-1)			0.000 - 0.400	CL		24	12	11	6	26	44	24												
WSS181786		(8-2)			0.400 - 1.500	ML		16	13	2	3	41	46	11												
WSS181789		(10-1)			0.000 - 2.600	CI		44	16	28	5	16	40	39												
WSS181792		(11-1)			0.250 - 0.700	CI		41	20	21	7	24	32	37												
WSS181798		(13-1)			0.310 - 1.200	CI		42	17	25	6	19	37	38												

* 1 - Non effervescent 2 - Very slightly effervescent 3 - Slightly effervescent 4 - Strongly effervescent 5 - Violently effervescent

NT = Not Tested, US = Unsuitable sample, IS = Insufficient Sample

MANITOBA INFRASTRUCTURE
MATERIALS ENGINEERING BRANCH - CENTRAL LAB

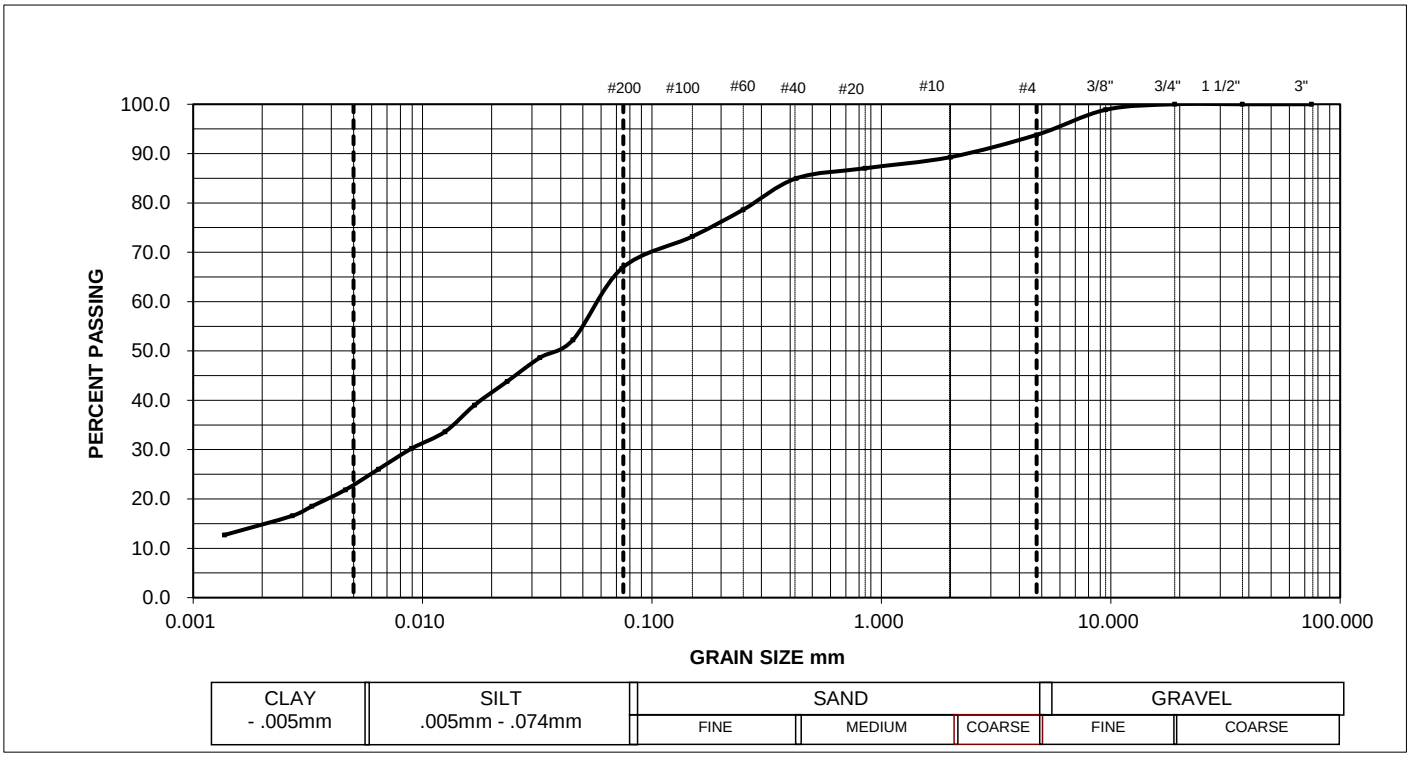
PARTICLE SIZE ANALYSIS of SOILS - ASTM D 422

PROJECT: **PTH 6** **Technician:** **LW**
LOCATION: **Grahamdale Relocation** **Checked By:** **MO**

LAB.NO. WSS181771 FIELD NO. (1-1) HOLE NO. DEPTH (m) 0.000 - 3.000

SIEVE ANALYSIS			HYDROMETER ANALYSIS				
SIEVE U.S. STANDARD	DIAMETER (mm)	% PASSING	TIME MINUTES	HYDROMETER READING R_O	HYDROMETER READING R_C	DIAMETER (mm)	% PASSING
3.00	75.0	100.0	1	21.8	18.5	0.0453	52.3
1.50	37.5	100.0	2	20.5	17.2	0.0325	48.6
0.75	19.0	100.0	4	18.8	15.5	0.0234	43.8
0.375	9.5	98.9	8	17.1	13.8	0.0168	39.0
#4	4.75	93.8	15	15.2	11.9	0.0125	33.6
#10	2.00	89.3	30	14.0	10.7	0.0090	30.2
#20	0.850	87.0	60	12.5	9.2	0.0064	26.1
#40	0.425	85.0	120	11.0	7.7	0.0046	21.9
#60	0.250	78.6	240	9.8	6.5	0.0033	18.5
#100	0.150	73.2	360	9.1	5.9	0.0027	16.6
#200	0.075	66.8	1440	7.9	4.5	0.0014	12.7

% GRAVEL	% SAND	% SILT	% CLAY
6	27	44	23



MANITOBA INFRASTRUCTURE
MATERIALS ENGINEERING BRANCH - CENTRAL LAB

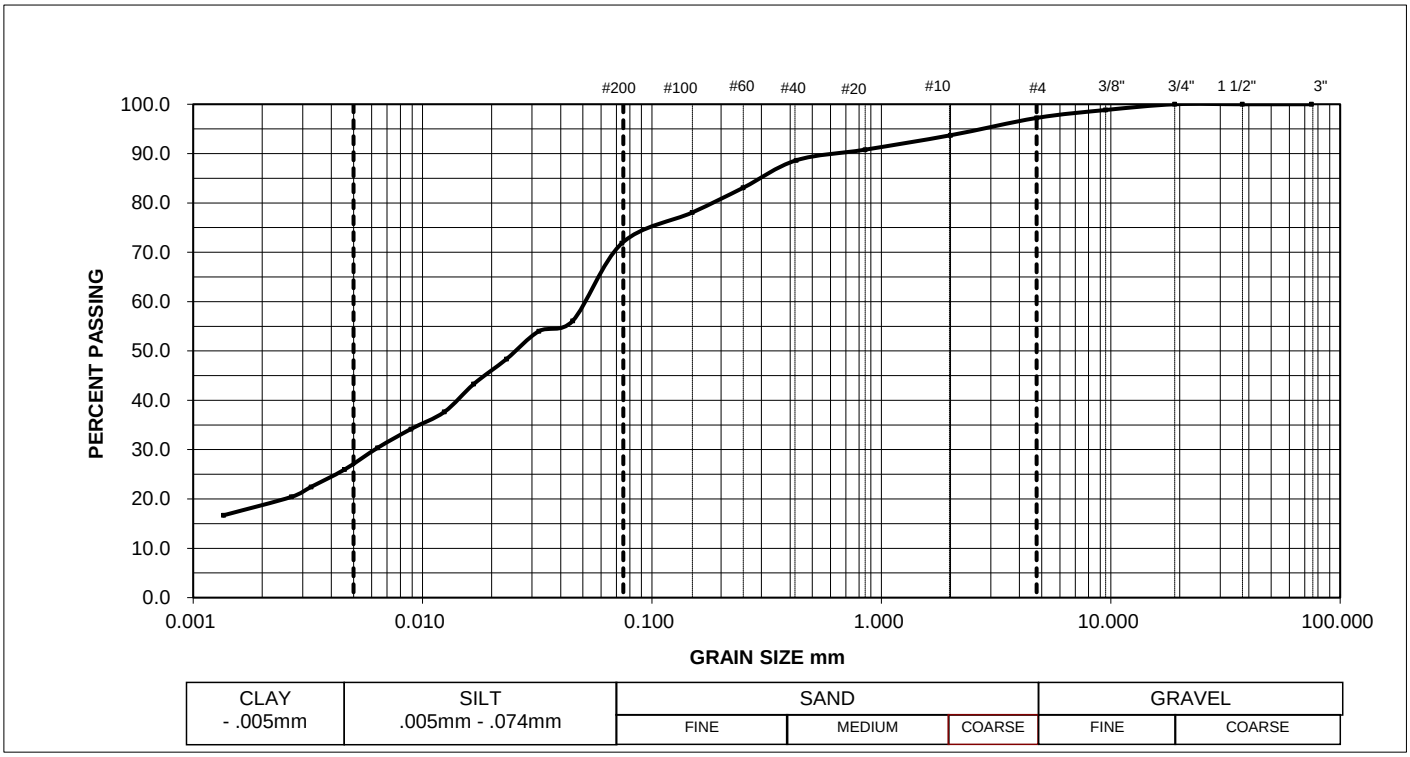
PARTICLE SIZE ANALYSIS of SOILS - ASTM D 422

PROJECT: **PTH 6** **Technician:** **LW**
LOCATION: **Grahamdale Relocation** **Checked By:** **MO**

LAB.NO. WSS181774 FIELD NO. (2-3) HOLE NO. DEPTH (m) 1.900 - 3.000

SIEVE ANALYSIS			HYDROMETER ANALYSIS				
SIEVE U.S. STANDARD	DIAMETER (mm)	% PASSING	TIME MINUTES	HYDROMETER READING R_O	HYDROMETER READING R_C	DIAMETER (mm)	% PASSING
3.00	75.00	100.0	1	22.2	18.8	0.0451	56.1
1.50	37.50	100.0	2	21.5	18.1	0.0321	54.0
0.75	19.00	100.0	4	19.6	16.2	0.0232	48.4
0.375	9.50	98.8	8	17.9	14.5	0.0167	43.3
#4	4.75	97.2	15	16.0	12.6	0.0124	37.6
#10	2.00	93.7	30	14.8	11.5	0.0089	34.2
#20	0.850	90.8	60	13.5	10.2	0.0064	30.4
#40	0.425	88.6	120	12.0	8.7	0.0046	26.0
#60	0.250	83.1	240	10.8	7.5	0.0033	22.4
#100	0.150	78.1	360	10.1	6.9	0.0027	20.4
#200	0.075	71.8	1440	9.0	5.6	0.0014	16.7

% GRAVEL	% SAND	% SILT	% CLAY
3	25	45	27



MANITOBA INFRASTRUCTURE
MATERIALS ENGINEERING BRANCH - CENTRAL LAB

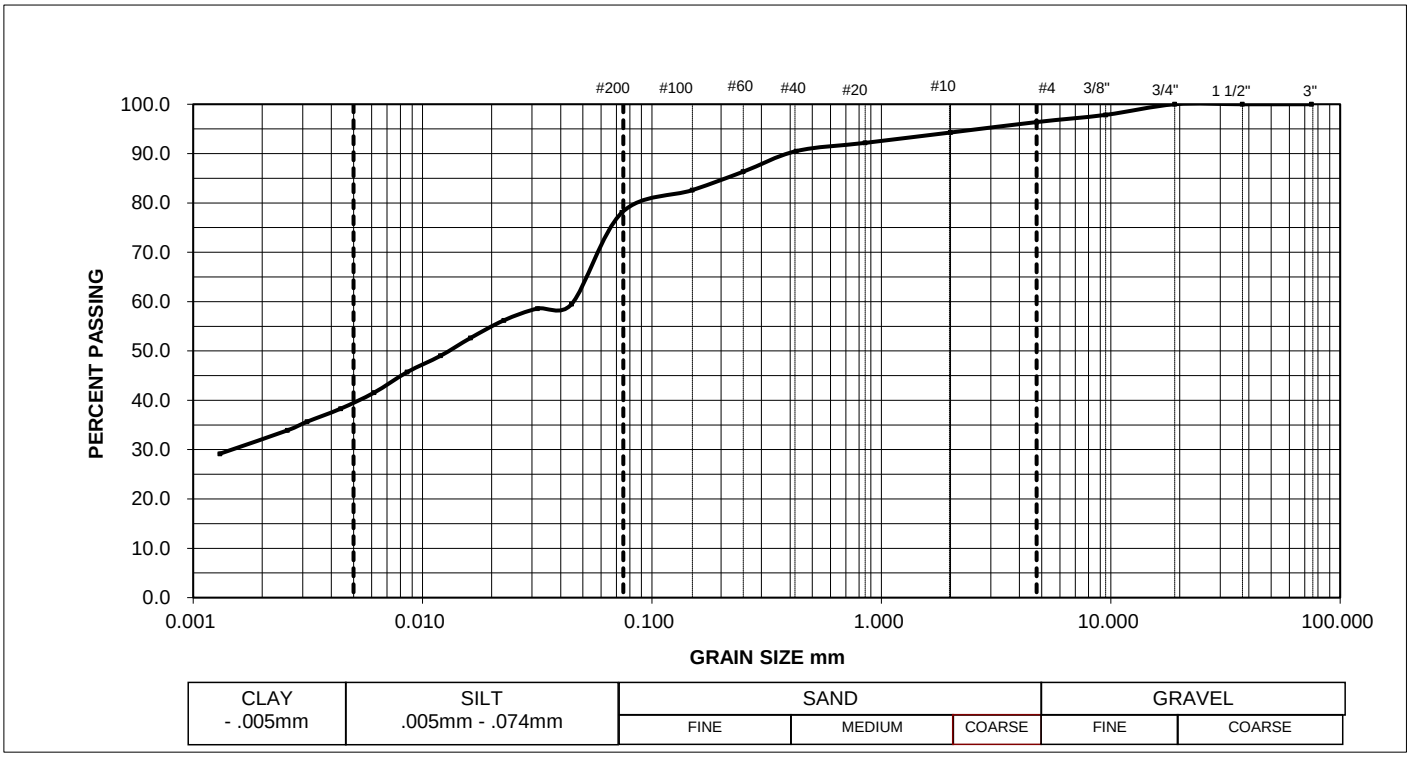
PARTICLE SIZE ANALYSIS of SOILS - ASTM D 422

PROJECT: **PTH 6** **Technician:** **LW**
LOCATION: **Grahamdale Relocation** **Checked By:** **MO**

LAB.NO. WSS181777 FIELD NO. (3-3) HOLE NO. DEPTH (m) 1.600 - 3.000

SIEVE ANALYSIS			HYDROMETER ANALYSIS				
SIEVE U.S. STANDARD	DIAMETER (mm)	% PASSING	TIME MINUTES	HYDROMETER READING R_O	HYDROMETER READING R_C	DIAMETER (mm)	% PASSING
3.00	75.00	100.0	1	23.1	19.8	0.0446	59.5
1.50	37.50	100.0	2	22.8	19.5	0.0317	58.6
0.75	19.00	100.0	4	22.0	18.7	0.0226	56.2
0.375	9.50	97.8	8	20.8	17.5	0.0162	52.6
#4	4.75	96.4	15	19.6	16.3	0.0120	49.0
#10	2.00	94.3	30	18.5	15.2	0.0086	45.7
#20	0.850	92.2	60	17.1	13.8	0.0061	41.6
#40	0.425	90.5	120	16.0	12.7	0.0044	38.3
#60	0.250	86.3	240	15.1	11.8	0.0031	35.7
#100	0.150	82.6	360	14.5	11.3	0.0026	33.9
#200	0.075	78.1	1440	13.1	9.7	0.0013	29.2

% GRAVEL	% SAND	% SILT	% CLAY
4	18	38	40



MANITOBA INFRASTRUCTURE
MATERIALS ENGINEERING BRANCH - CENTRAL LAB

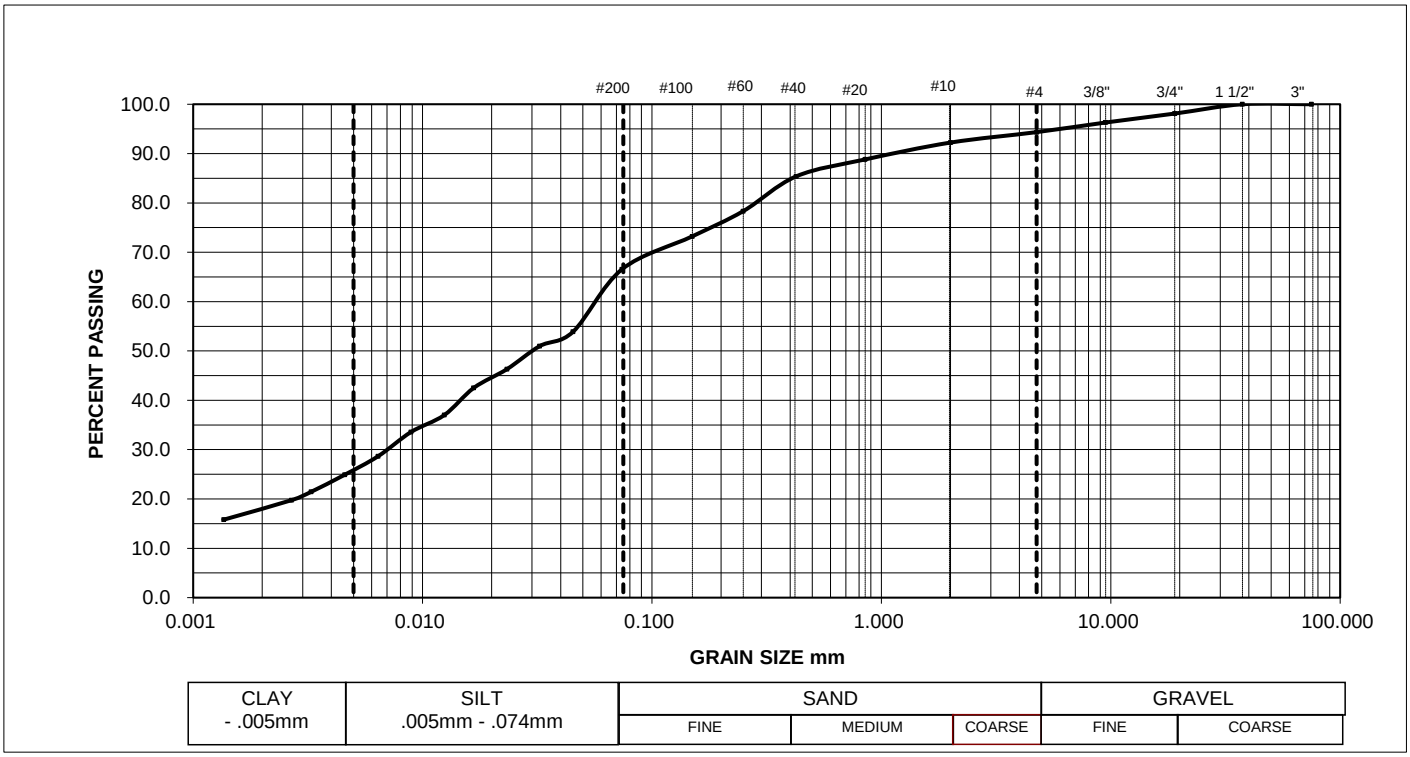
PARTICLE SIZE ANALYSIS of SOILS - ASTM D 422

PROJECT: **PTH 6** **Technician:** **LW**
LOCATION: **Grahamdale Relocation** **Checked By:** **MO**

LAB.NO. WSS181782 FIELD NO. (5-2) HOLE NO. DEPTH (m) 1.700 - 2.500

SIEVE ANALYSIS			HYDROMETER ANALYSIS				
SIEVE U.S. STANDARD	DIAMETER (mm)	% PASSING	TIME MINUTES	HYDROMETER READING R_O	HYDROMETER READING R_C	DIAMETER (mm)	% PASSING
3.00	75.0	100.0	1	21.8	18.4	0.0453	53.9
1.50	37.5	100.0	2	20.8	17.4	0.0324	51.0
0.75	19.0	98.1	4	19.2	15.8	0.0233	46.3
0.375	9.5	96.3	8	17.9	14.5	0.0167	42.5
#4	4.75	94.4	15	16.0	12.7	0.0124	37.0
#10	2.00	92.2	30	14.8	11.5	0.0089	33.6
#20	0.850	88.8	60	13.1	9.8	0.0064	28.6
#40	0.425	85.4	120	11.8	8.5	0.0046	24.9
#60	0.250	78.3	240	10.6	7.3	0.0033	21.5
#100	0.150	73.2	360	10.0	6.8	0.0027	19.8
#200	0.075	66.6	1440	8.8	5.4	0.0014	15.8

% GRAVEL	% SAND	% SILT	% CLAY
6	28	42	25



MANITOBA INFRASTRUCTURE
MATERIALS ENGINEERING BRANCH - CENTRAL LAB

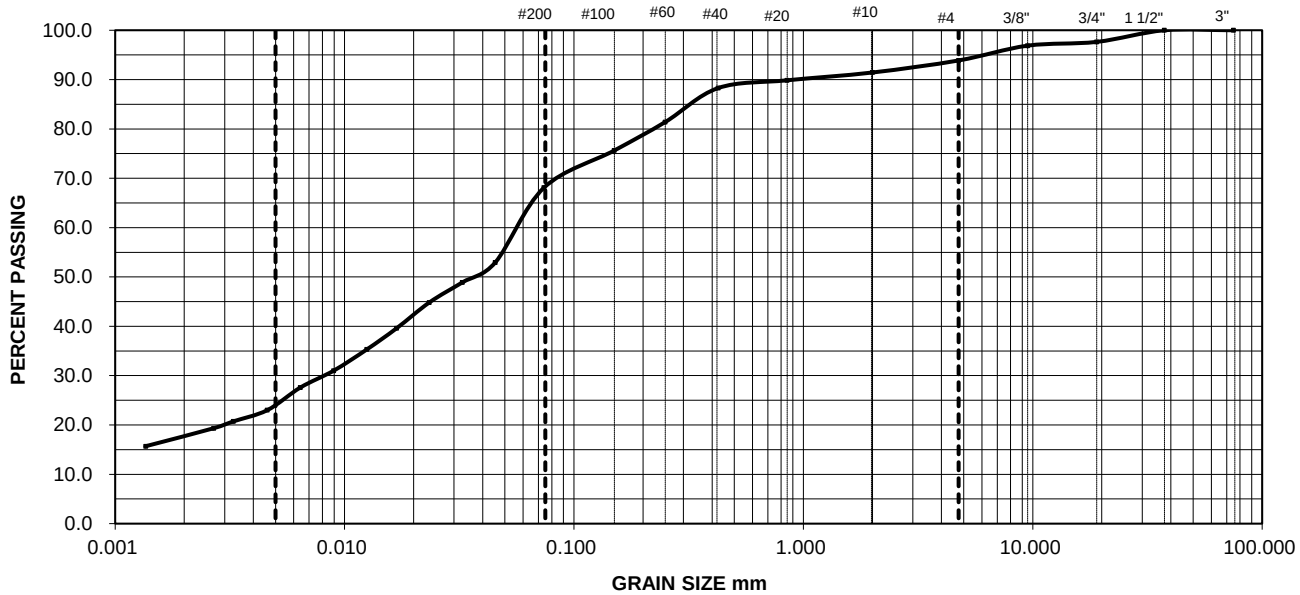
PARTICLE SIZE ANALYSIS of SOILS - ASTM D 422

PROJECT: **PTH 6** **Technician:** **LW**
LOCATION: **Grahamdale Relocation** **Checked By:** **MO**

LAB.NO. WSS181785 FIELD NO. (8-1) HOLE NO. DEPTH (m) 0.000 - 0.400

SIEVE ANALYSIS			HYDROMETER ANALYSIS				
SIEVE U.S. STANDARD	DIAMETER (mm)	% PASSING	TIME MINUTES	HYDROMETER READING R_O	HYDROMETER READING R_C	DIAMETER (mm)	% PASSING
3.00	75.00	100.0	1	21.6	18.2	0.0454	53.0
1.50	37.50	100.0	2	20.2	16.8	0.0326	48.9
0.75	19.00	97.6	4	18.8	15.4	0.0234	44.8
0.375	9.50	96.9	8	17.0	13.6	0.0169	39.6
#4	4.75	93.9	15	15.5	12.2	0.0125	35.3
#10	2.00	91.4	30	14.0	10.7	0.0090	31.0
#20	0.850	89.9	60	12.8	9.5	0.0064	27.6
#40	0.425	88.3	120	11.2	7.9	0.0046	23.0
#60	0.250	81.4	240	10.4	7.1	0.0033	20.7
#100	0.150	75.6	360	9.9	6.7	0.0027	19.3
#200	0.075	68.1	1440	8.8	5.4	0.0014	15.7

% GRAVEL	% SAND	% SILT	% CLAY
6	26	44	24



MANITOBA INFRASTRUCTURE
MATERIALS ENGINEERING BRANCH - CENTRAL LAB

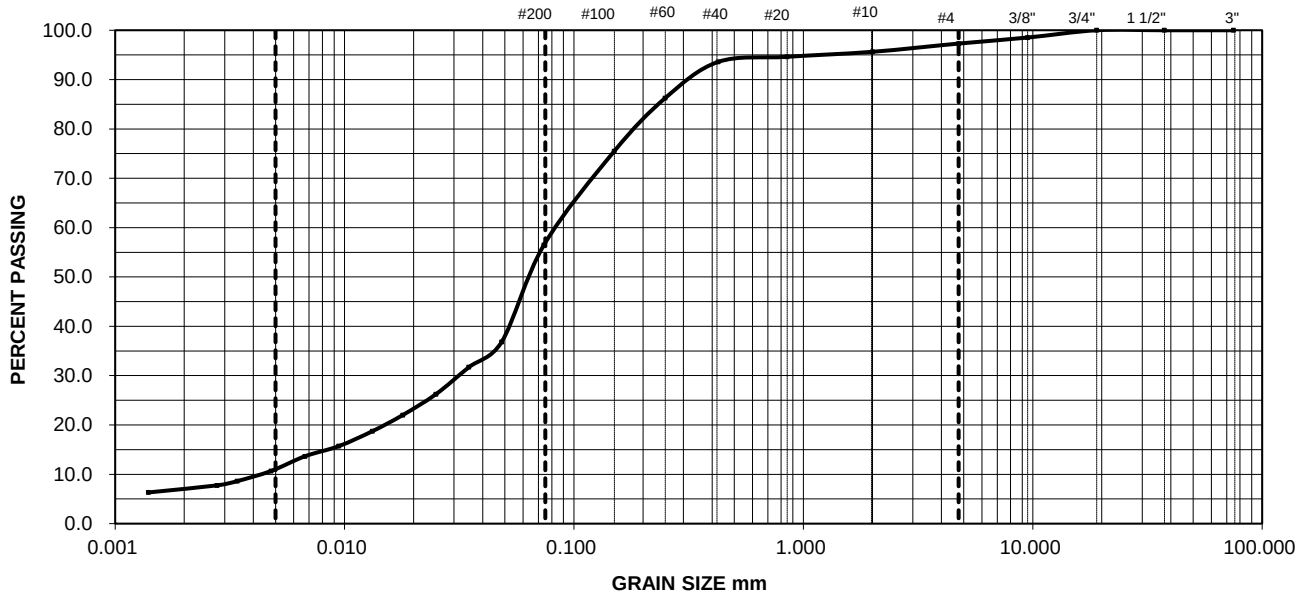
PARTICLE SIZE ANALYSIS of SOILS - ASTM D 422

PROJECT: **PTH 6** **Technician:** **LW**
LOCATION: **Grahamdale Relocation** **Checked By:** **MO**

LAB.NO. WSS181786 FIELD NO. (8-2) HOLE NO. DEPTH (m) 0.400 - 1.500

SIEVE ANALYSIS			HYDROMETER ANALYSIS				
SIEVE U.S. STANDARD	DIAMETER (mm)	% PASSING	TIME MINUTES	HYDROMETER READING R_O	HYDROMETER READING R_C	DIAMETER (mm)	% PASSING
3.00	75.00	100.0	1	15.5	12.2	0.0484	36.9
1.50	37.50	100.0	2	13.8	10.5	0.0348	31.7
0.75	19.00	100.0	4	12.0	8.7	0.0250	26.2
0.375	9.50	98.5	8	10.6	7.3	0.0179	22.0
#4	4.75	97.3	15	9.5	6.2	0.0132	18.7
#10	2.00	95.6	30	8.5	5.2	0.0094	15.7
#20	0.850	94.6	60	7.8	4.5	0.0067	13.6
#40	0.425	93.6	120	6.8	3.5	0.0048	10.7
#60	0.250	86.3	240	6.1	2.8	0.0034	8.6
#100	0.150	75.5	360	5.8	2.6	0.0028	7.8
#200	0.075	56.5	1440	5.5	2.1	0.0014	6.3

% GRAVEL	% SAND	% SILT	% CLAY
3	41	46	11



CLAY	SILT	SAND			GRAVEL	
- .005mm	.005mm - .074mm	FINE	MEDIUM	COARSE	FINE	COARSE

MANITOBA INFRASTRUCTURE
MATERIALS ENGINEERING BRANCH - CENTRAL LAB

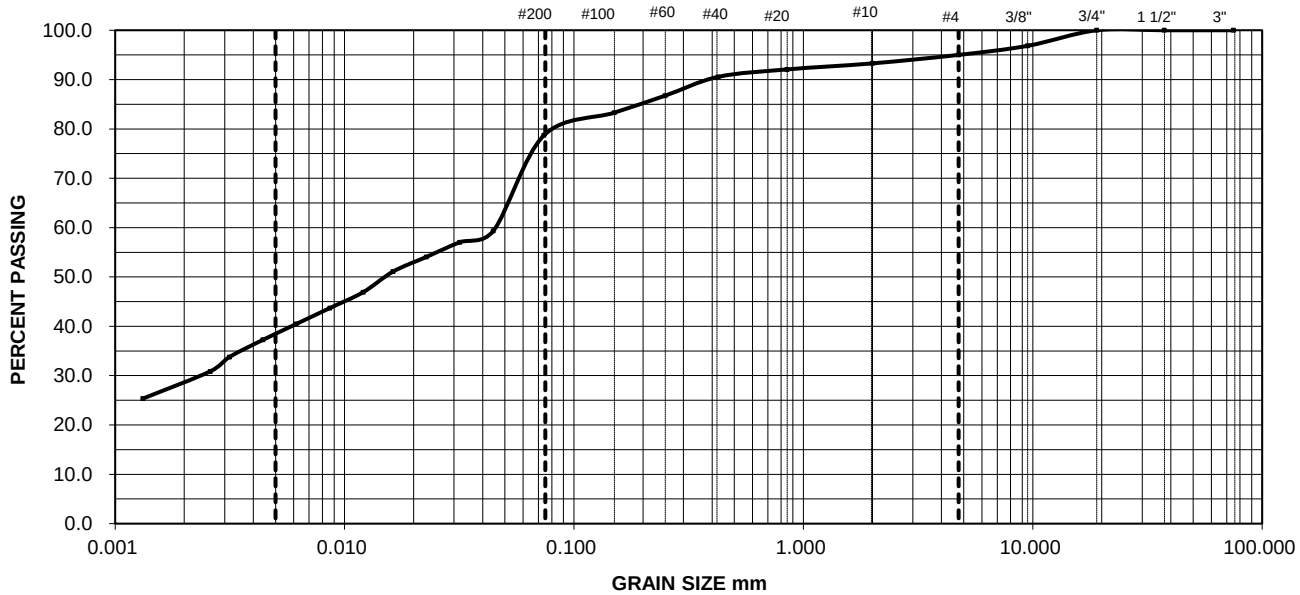
PARTICLE SIZE ANALYSIS of SOILS - ASTM D 422

PROJECT: **PTH 6** **Technician:** **LW**
LOCATION: **Grahamdale Relocation** **Checked By:** **MO**

LAB.NO. WSS181789 FIELD NO. (10-1) HOLE NO. DEPTH (m) 0.000 - 2.600

SIEVE ANALYSIS			HYDROMETER ANALYSIS				
SIEVE U.S. STANDARD	DIAMETER (mm)	% PASSING	TIME MINUTES	HYDROMETER READING R_O	HYDROMETER READING R_C	DIAMETER (mm)	% PASSING
3.00	75.00	100.0	1	23.3	19.9	0.0445	59.4
1.50	37.50	100.0	2	22.5	19.1	0.0318	57.0
0.75	19.00	100.0	4	21.5	18.1	0.0227	54.1
0.375	9.50	96.8	8	20.5	17.1	0.0163	51.1
#4	4.75	95.0	15	19.1	15.7	0.0120	46.9
#10	2.00	93.3	30	18.0	14.7	0.0086	43.7
#20	0.850	92.1	60	16.9	13.6	0.0062	40.5
#40	0.425	90.6	120	15.8	12.5	0.0044	37.2
#60	0.250	86.8	240	14.6	11.3	0.0032	33.8
#100	0.150	83.3	360	13.6	10.4	0.0026	30.9
#200	0.075	78.7	1440	11.9	8.5	0.0013	25.3

% GRAVEL	% SAND	% SILT	% CLAY
5	16	40	39



CLAY	SILT	SAND			GRAVEL	
- .005mm	.005mm - .074mm	FINE	MEDIUM	COARSE	FINE	COARSE

MANITOBA INFRASTRUCTURE
MATERIALS ENGINEERING BRANCH - CENTRAL LAB

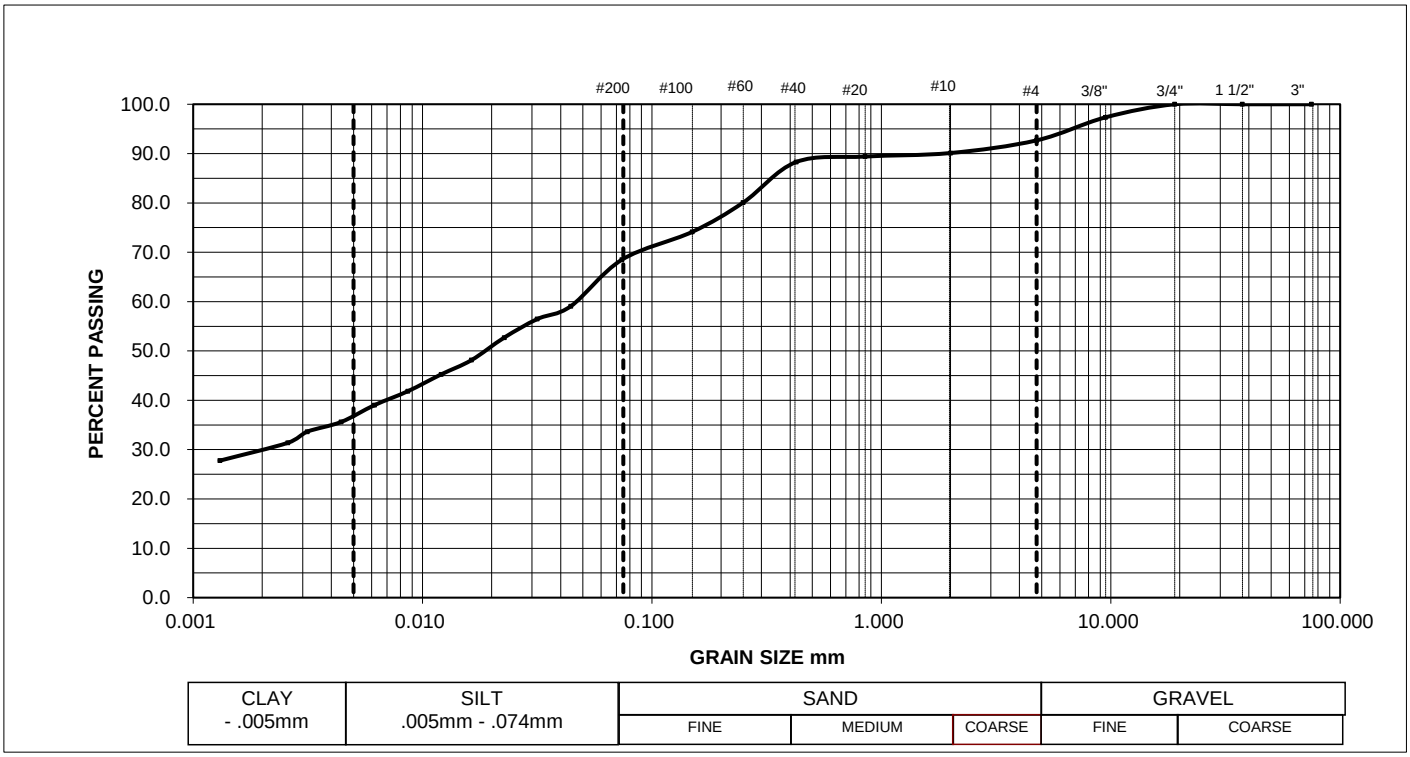
PARTICLE SIZE ANALYSIS of SOILS - ASTM D 422

PROJECT: **PTH 6** **Technician:** **LW**
LOCATION: **Grahamdale Relocation** **Checked By:** **MO**

LAB.NO. WSS181792 FIELD NO. (11-1) HOLE NO. DEPTH (m) 0.250 - 0.700

SIEVE ANALYSIS			HYDROMETER ANALYSIS				
SIEVE U.S. STANDARD	DIAMETER (mm)	% PASSING	TIME MINUTES	HYDROMETER READING R_O	HYDROMETER READING R_C	DIAMETER (mm)	% PASSING
3.00	75.00	100.0	1	23.8	20.4	0.0443	59.1
1.50	37.50	100.0	2	22.9	19.5	0.0316	56.5
0.75	19.00	100.0	4	21.6	18.2	0.0227	52.7
0.375	9.50	97.4	8	20.0	16.7	0.0163	48.1
#4	4.75	92.7	15	19.0	15.7	0.0121	45.3
#10	2.00	90.1	30	17.8	14.5	0.0086	41.8
#20	0.850	89.4	60	16.8	13.5	0.0062	39.0
#40	0.425	88.3	120	15.6	12.3	0.0044	35.6
#60	0.250	80.1	240	14.9	11.6	0.0031	33.6
#100	0.150	74.2	360	14.1	10.9	0.0026	31.4
#200	0.075	68.5	1440	13.1	9.6	0.0013	27.8

% GRAVEL	% SAND	% SILT	% CLAY
7	24	32	37



CLAY	SILT	SAND			GRAVEL	
- .005mm	.005mm - .074mm	FINE	MEDIUM	COARSE	FINE	COARSE

MANITOBA INFRASTRUCTURE
MATERIALS ENGINEERING BRANCH - CENTRAL LAB

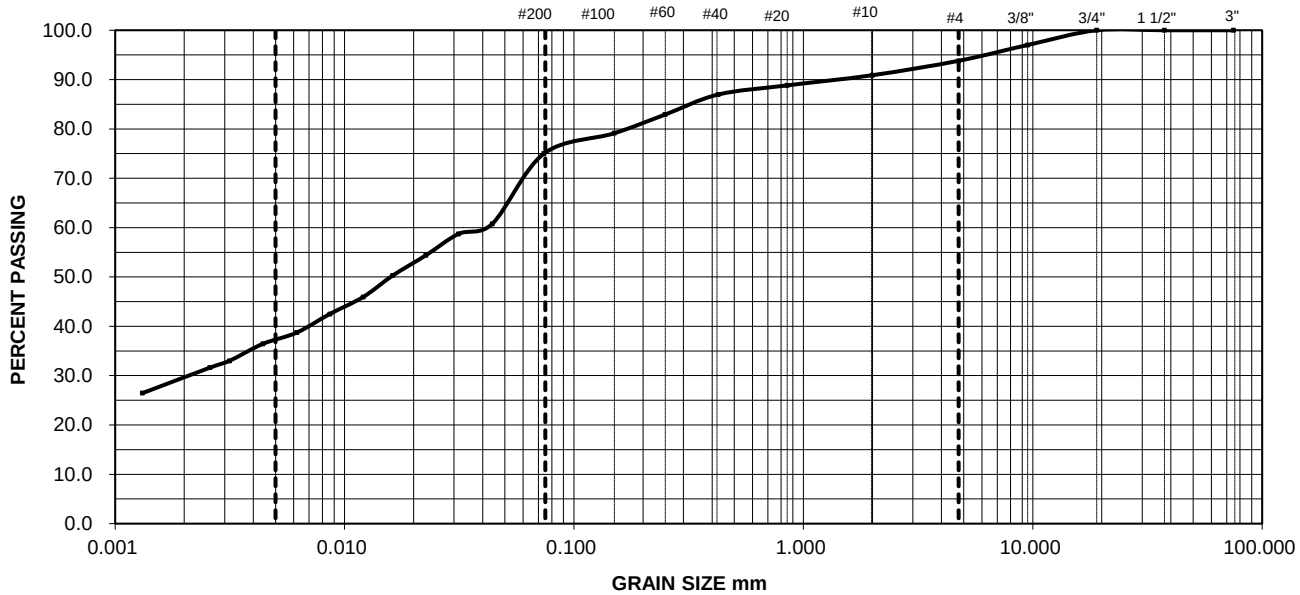
PARTICLE SIZE ANALYSIS of SOILS - ASTM D 422

PROJECT: **PTH 6** **Technician:** **LW**
LOCATION: **Grahamdale Relocation** **Checked By:** **MO**

LAB.NO. WSS181798 FIELD NO. (13-1) HOLE NO. DEPTH (m) 0.310 - 1.200

SIEVE ANALYSIS			HYDROMETER ANALYSIS				
SIEVE U.S. STANDARD	DIAMETER (mm)	% PASSING	TIME MINUTES	HYDROMETER READING R_O	HYDROMETER READING R_C	DIAMETER (mm)	% PASSING
3.00	75.00	100.0	1	24.2	20.9	0.0440	60.8
1.50	37.50	100.0	2	23.5	20.2	0.0314	58.7
0.75	19.00	100.0	4	22.0	18.7	0.0226	54.4
0.375	9.50	97.0	8	20.6	17.3	0.0162	50.3
#4	4.75	93.8	15	19.1	15.8	0.0120	45.9
#10	2.00	90.9	30	17.9	14.6	0.0086	42.5
#20	0.850	88.8	60	16.6	13.3	0.0062	38.7
#40	0.425	87.0	120	15.8	12.5	0.0044	36.4
#60	0.250	82.9	240	14.6	11.3	0.0032	33.0
#100	0.150	79.1	360	14.1	10.9	0.0026	31.6
#200	0.075	75.0	1440	12.5	9.1	0.0013	26.4

% GRAVEL	% SAND	% SILT	% CLAY
6	19	37	38



CLAY	SILT	SAND			GRAVEL	
- .005mm	.005mm - .074mm	FINE	MEDIUM	COARSE	FINE	COARSE

Appendix B: Plant and Animal Species Listing

Interlake Plains Ecoregion: Listing of Potential Plant and Animal Species (MSD 2019)

Ecoregion	Category	Scientific Name	Common Name	S Rank
Interlake Plain	Amphibian	*Ambystoma tigrinum*	Eastern Tiger Salamander	S2?
Interlake Plain	Amphibian	*Lithobates pipiens*	Northern Leopard Frog	S4
Interlake Plain	Animal Assemblage	*Gull Colony*		SNR
Interlake Plain	Animal Assemblage	*Gulls*	Gulls	SNR
Interlake Plain	Animal Assemblage	*Snake Hibernaculum*	Snake Hibernaculum	SNR
Interlake Plain	Animal Assemblage	*Tern Colony*		SNR
Interlake Plain	Bird	*Aechmophorus occidentalis*	Western Grebe	S4B
Interlake Plain	Bird	*Ammodramus savannarum*	Grasshopper Sparrow	S3B
Interlake Plain	Bird	*Antrostomus vociferus*	Whip-poor-will	S3B
Interlake Plain	Bird	*Ardea alba*	Great Egret	S2S3B
Interlake Plain	Bird	*Ardea herodias*	Great Blue Heron	S5B
Interlake Plain	Bird	*Asio flammeus*	Short-eared Owl	S2S3B
Interlake Plain	Bird	*Buteo lagopus*	Rough-legged Hawk	S3B,SUM
Interlake Plain	Bird	*Cardellina canadensis*	Canada Warbler	S3B
Interlake Plain	Bird	*Chaetura pelagica*	Chimney Swift	S2B
Interlake Plain	Bird	*Charadrius melodus*	Piping Plover	S1B
Interlake Plain	Bird	*Chlidonias niger*	Black Tern	S4B

Interlake Plain	Bird	*Chordeiles minor*	Common Nighthawk	S3B
Interlake Plain	Bird	*Coccothraustes vespertinus*	Evening Grosbeak	S3
Interlake Plain	Bird	*Contopus cooperi*	Olive-sided Flycatcher	S3B
Interlake Plain	Bird	*Contopus virens*	Eastern Wood-pewee	S4B
Interlake Plain	Bird	*Coturnicops noveboracensis*	Yellow Rail	S3B
Interlake Plain	Bird	*Cygnus buccinator*	Trumpeter Swan	S1B
Interlake Plain	Bird	*Dolichonyx oryzivorus*	Bobolink	S4B
Interlake Plain	Bird	*Hirundo rustica*	Barn Swallow	S4B
Interlake Plain	Bird	*Hydroprogne caspia*	Caspian Tern	S3B
Interlake Plain	Bird	*Ixobrychus exilis*	Least Bittern	S2B
Interlake Plain	Bird	*Lanius ludovicianus migrans*	Loggerhead Shrike	S1B
Interlake Plain	Bird	*Larus argentatus*	Herring Gull	S4B
Interlake Plain	Bird	*Larus californicus*	California Gull	S3B
Interlake Plain	Bird	*Larus delawarensis*	Ring-billed Gull	S5B
Interlake Plain	Bird	*Leucophaeus pipixcan*	Franklin's Gull	S4B
Interlake Plain	Bird	*Melanerpes erythrocephalus*	Red-headed Woodpecker	S3B
Interlake Plain	Bird	*Nycticorax nycticorax*	Black-crowned Night-heron	S4B
Interlake Plain	Bird	*Pelecanus erythrorhynchos*	American White Pelican	S4B

Interlake Plain	Bird	*Phalacrocorax auritus*	Double-crested Cormorant	S5B
Interlake Plain	Bird	*Podiceps auritus*	Horned Grebe	S4B
Interlake Plain	Bird	*Podiceps nigricollis*	Eared Grebe	S4B
Interlake Plain	Bird	*Riparia riparia*	Bank Swallow	S5B
Interlake Plain	Bird	*Sterna forsteri*	Forster's Tern	S4B
Interlake Plain	Bird	*Sterna hirundo*	Common Tern	S5B
Interlake Plain	Bird	*Strix nebulosa*	Great Gray Owl	S4
Interlake Plain	Bird	*Vermivora chrysoptera*	Golden-winged Warbler	S3B
Interlake Plain	Fish	*Coregonus zenithicus*	Shortjaw Cisco	S2
Interlake Plain	Insect	*Danaus plexippus*	Monarch	S3S4B
Interlake Plain	Insect	*Erynnis martialis*	Mottled Dusky Wing	S1
Interlake Plain	Insect	*Hesperia dacotae*	Dakota Skipper	S2
Interlake Plain	Insect	*Oarisma powesheik*	Powesheik Skipper	S1
Interlake Plain	Insect	*Wallengrenia egeremet*	Northern Broken-dash	S1
Interlake Plain	Mammal	*Geomys bursarius*	Plains Pocket Gopher	S3
Interlake Plain	Mammal	*Myotis lucifugus*	Little Brown Myotis	S2N,S5B
Interlake Plain	Mammal	*Myotis septentrionalis*	Northern Myotis	S3S4N,S4B
Interlake Plain	Mammal	*Rangifer tarandus caribou*	Woodland Caribou	S2S3

Interlake Plain	Mussel	*Amblema plicata*	Threeridge	S3
Interlake Plain	Mussel	*Fusconaia flava*	Wabash Pigtoe	S3
Interlake Plain	Mussel	*Lasmigona complanata*	White Heelsplitter	S3
Interlake Plain	Mussel	*Lasmigona costata*	Flutedshell	S2
Interlake Plain	Mussel	*Ligumia recta*	Black Sandshell	S3
Interlake Plain	Mussel	*Quadrula quadrula*	Mapleleaf Mussel	S1
Interlake Plain	Other	*Orconectes immunis*	Calico Crayfish	S3
Interlake Plain	Plant	*Achnatherum richardsonii*	Richardson Needle Grass	S1S2
Interlake Plain	Plant	*Agalinis aspera*	Rough Agalinis	S2
Interlake Plain	Plant	*Agalinis tenuifolia*	Narrow-leaved Agalinis	S2S3
Interlake Plain	Plant	*Agrimonia gryposepala*	Common Agrimony	S1S2
Interlake Plain	Plant	*Alisma gramineum*	Narrow-leaved Water-plantain	S1
Interlake Plain	Plant	*Amorpha fruticosa*	False Indigo	S1S2
Interlake Plain	Plant	*Arabidopsis lyrata*	Lyre-leaved Rock Cress	S1S2
Interlake Plain	Plant	*Aralia racemosa*	Spikenard	S2
Interlake Plain	Plant	*Arethusa bulbosa*	Dragon's-mouth	S2
Interlake Plain	Plant	*Asclepias verticillata*	Whorled Milkweed	S3
Interlake Plain	Plant	*Astragalus australis*	Indian milkvetch	S1S2

Interlake Plain	Plant	*Astragalus neglectus*	Neglected Milkvetch	S1
Interlake Plain	Plant	*Astragalus pectinatus*	Narrow-leaved Milkvetch	S2
Interlake Plain	Plant	*Boltonia asteroides var. recognita*	White Boltonia	S2S3
Interlake Plain	Plant	*Botrychium campestre*	Prairie Moonwort	S1
Interlake Plain	Plant	*Botrychium matricariifolium*	Daisy-leaf Moonwort	S1
Interlake Plain	Plant	*Bouteloua curtipendula*	Side-oats Grama	S2
Interlake Plain	Plant	*Bromus kalmii*	Wild Chess	S2S3
Interlake Plain	Plant	*Bromus porteri*	Porter's Chess	S2S3
Interlake Plain	Plant	*Calamagrostis montanensis*	Plains Reed Grass	S3
Interlake Plain	Plant	*Calopogon tuberosus*	Swamp-pink	S2
Interlake Plain	Plant	*Canadanthus modestus*	Large Northern Aster	S2
Interlake Plain	Plant	*Cardamine bulbosa*	Spring Cress	SH
Interlake Plain	Plant	*Carex conoidea*	Field Sedge	S1
Interlake Plain	Plant	*Carex cryptolepis*	Northeastern Sedge	S1
Interlake Plain	Plant	*Carex douglasii*	Douglas Sedge	S2
Interlake Plain	Plant	*Carex flava*	Yellow Sedge	S2
Interlake Plain	Plant	*Carex hystericina*	Porcupine Sedge	S3
Interlake Plain	Plant	*Carex livida*	Livid Sedge	S3

Interlake Plain	Plant	*Carex parryana*	Parry's Sedge	S3
Interlake Plain	Plant	*Carex pedunculata*	Stalked Sedge	S3
Interlake Plain	Plant	*Carex sterilis*	Dioecious Sedge	S2
Interlake Plain	Plant	*Carex stricta*	Tussock Sedge	S1
Interlake Plain	Plant	*Carex supina ssp. spaniocarpa*	Weak Sedge	S2S3
Interlake Plain	Plant	*Carex tetanica*	Rigid Sedge	S3
Interlake Plain	Plant	*Carex vulpinoidea*	Fox Sedge	S3
Interlake Plain	Plant	*Caulophyllum thalictroides*	Papoose-root	S2
Interlake Plain	Plant	*Ceanothus herbaceus*	New Jersey Tea	S2S3
Interlake Plain	Plant	*Chrysosplenium iowense*	Iowa Golden-saxifrage	S1
Interlake Plain	Plant	*Cladium mariscoides*	Twig Rush	S2S3
Interlake Plain	Plant	*Clematis ligusticifolia*	Western Virgin's-bower	S1
Interlake Plain	Plant	*Clematis virginiana*	Virgin's-bower	S2?
Interlake Plain	Plant	*Corispermum villosum*	Hairy Bugseed	S1S2
Interlake Plain	Plant	*Cyperus erythrorhizos*	Red-root Flatsedge	S1
Interlake Plain	Plant	*Cyperus houghtonii*	Houghton's Umbrella-sedge	S2S3
Interlake Plain	Plant	*Cypripedium arietinum*	Ram's Head Lady's-slipper	S2S3
Interlake Plain	Plant	*Cypripedium candidum*	Small White Lady's-slipper	S1

Interlake Plain	Plant	*Desmodium canadense*	Beggar's-lice	S2
Interlake Plain	Plant	*Elymus lanceolatus*	Northern Wheat Grass	S3
Interlake Plain	Plant	*Elymus lanceolatus ssp. lanceolatus*	Thickspike Wheatgrass	S3
Interlake Plain	Plant	*Festuca hallii*	Plains Rough Fescue	S3
Interlake Plain	Plant	*Fraxinus nigra*	Black Ash	S2S3
Interlake Plain	Plant	*Gentiana rubricaulis*	Closed Gentian	S3
Interlake Plain	Plant	*Geranium maculatum*	Wild Crane's-bill	S1
Interlake Plain	Plant	*Goodyera tesselata*	Tesselated Rattlesnake Plantain	S2
Interlake Plain	Plant	*Hesperostipa curtiseta*	Western Porcupine Grass	S3
Interlake Plain	Plant	*Hudsonia tomentosa*	False Heather	S3
Interlake Plain	Plant	*Krigia biflora*	Two-flowered Dwarf-dandelion	S2S3
Interlake Plain	Plant	*Lactuca canadensis*	Tall Yellow Lettuce	S3
Interlake Plain	Plant	*Lactuca floridana*	Woodland Lettuce	SH
Interlake Plain	Plant	*Lechea intermedia*	Pinweed	S1?
Interlake Plain	Plant	*Linum sulcatum*	Grooved Yellow Flax	S3
Interlake Plain	Plant	*Lomatium foeniculaceum*	Hairy-fruited Parsley	S3
Interlake Plain	Plant	*Lomatium macrocarpum*	Long-fruited Parsley	S2S3
Interlake Plain	Plant	*Lysimachia quadriflora*	Whorled Loosestrife	S2

Interlake Plain	Plant	*Maianthemum racemosum*	False Spikenard	S1
Interlake Plain	Plant	*Malaxis monophyllos*	White Adder's-mouth	S2?
Interlake Plain	Plant	*Malaxis paludosa*	Bog Adder's-mouth	S1?
Interlake Plain	Plant	*Malaxis unifolia*	Green Adder's-mouth	S2?
Interlake Plain	Plant	*Muhlenbergia andina*	Foxtail Muhly	S1
Interlake Plain	Plant	*Oenothera perennis*	Sundrops	S1
Interlake Plain	Plant	*Onoclea sensibilis*	Sensitive Fern	S3?
Interlake Plain	Plant	*Ophioglossum pusillum*	Northern Adder's-tongue	S1
Interlake Plain	Plant	*Orobanche fasciculata*	Clustered Broom-rape	S3
Interlake Plain	Plant	*Orobanche ludoviciana*	Louisiana Broom-rape	S2
Interlake Plain	Plant	*Osmunda claytoniana*	Interrupted Fern	S2S3
Interlake Plain	Plant	*Oxytropis lambertii*	Purple Locoweed	S3
Interlake Plain	Plant	*Parnassia parviflora*	Small Grass-of-parnassus	S1
Interlake Plain	Plant	*Pellaea gastonyi*	Gastony's Cliffbrake	S1
Interlake Plain	Plant	*Pellaea glabella*	Smooth Cliffbrake	S2
Interlake Plain	Plant	*Pellaea glabella ssp. occidentalis*	Western Dwarf Cliffbrake	S2
Interlake Plain	Plant	*Penthorum sedoides*	Ditch-stonecrop	S1S2
Interlake Plain	Plant	*Phryma leptostachya*	Lopseed	S3

Interlake Plain	Plant	*Platanthera praeclara*	Western Prairie Fringed Orchid	S1
Interlake Plain	Plant	*Polygala verticillata*	Whorled Milkwort	S2
Interlake Plain	Plant	*Pyrola americana*	Round-leaved Pyrola	S2?
Interlake Plain	Plant	*Ranunculus hispidus var. caricetorum*	Bristly Buttercup	S2
Interlake Plain	Plant	*Rhynchospora alba*	White Beakrush	S3
Interlake Plain	Plant	*Rhynchospora capillacea*	Horned Beakrush	S2S3
Interlake Plain	Plant	*Sceptridium multifidum*	Leathery Grape-fern	S3
Interlake Plain	Plant	*Selaginella densa*	Prairie Spike-moss	S3
Interlake Plain	Plant	*Sisyrinchium campestre*	White-eyed Grass	S3
Interlake Plain	Plant	*Solidago mollis*	Velvety Goldenrod	S3
Interlake Plain	Plant	*Solidago riddellii*	Riddell's Goldenrod	S2S3
Interlake Plain	Plant	*Spiranthes magnicamporum*	Great Plains Ladies'-tresses	S1S2
Interlake Plain	Plant	*Symphyotrichum sericeum*	Western Silvery Aster	S2S3
Interlake Plain	Plant	*Teucrium canadense*	American Germander	S3
Interlake Plain	Plant	*Thalictrum revolutum*	Waxleaf Meadow-rue	S1
Interlake Plain	Plant	*Utricularia minor*	Lesser Bladderwort	S3
Interlake Plain	Plant	*Vaccinium caespitosum*	Dwarf Bilberry	S3
Interlake Plain	Plant	*Veronicastrum virginicum*	Culver's-root	S1S2

Interlake Plain	Plant	*Viola labradorica*	Early Blue Violet	S3
Interlake Plain	Reptile	*Chelydra serpentina*	Snapping Turtle	S3
Interlake Plain	Reptile	*Thamnophis radix*	Western Plains Garter Snake	S4
Interlake Plain	Reptile	*Thamnophis sirtalis*	Red-sided Garter Snake	S4
Interlake Plain	Reptile	*Thamnophis sirtalis parietalis*	Red-sided Garter Snake	S4

Appendix C Birds

Atlas summary: Species list for square 14NB39			Ranking	Regulatory Protection	
Region	*Square*	*Species Name*	*Provincial (S)*	*MESEA*	*SARA*
6	14NB39	Canada Goose			
6	14NB39	Mallard			
6	14NB39	Blue-winged Teal			
6	14NB39	Ring-necked Duck			
6	14NB39	Lesser Scaup			
6	14NB39	Common Merganser			
6	14NB39	Least Bittern	S2B	Endangerd	Threatened, Schedule 1
6	14NB39	Great Blue Heron	S5B		
6	14NB39	Turkey Vulture			
6	14NB39	Northern Harrier			
6	14NB39	Broad-winged Hawk			
6	14NB39	Red-tailed Hawk			
6	14NB39	American Kestrel			
6	14NB39	Sora			
6	14NB39	Sandhill Crane			
6	14NB39	Killdeer			
6	14NB39	Marbled Godwit			
6	14NB39	Wilson's Snipe			
6	14NB39	American Woodcock			
6	14NB39	Mourning Dove			
6	14NB39	Black-billed Cuckoo			
6	14NB39	Eastern Whip-poor-will	S3B	Threatened	Threatened, Schedule 1
6	14NB39	Ruby-throated Hummingbird			
6	14NB39	Belted Kingfisher			
6	14NB39	Yellow-bellied Sapsucker			
6	14NB39	Northern Flicker			
6	14NB39	Pileated Woodpecker			
6	14NB39	Alder Flycatcher			
6	14NB39	Least Flycatcher			
6	14NB39	Eastern Phoebe			
6	14NB39	Great Crested Flycatcher			
6	14NB39	Eastern Kingbird			
6	14NB39	Blue-headed Vireo			
6	14NB39	Warbling Vireo			
6	14NB39	Red-eyed Vireo			
6	14NB39	Canada Jay			
6	14NB39	Blue Jay			
6	14NB39	Black-billed Magpie			
6	14NB39	American Crow			
6	14NB39	Common Raven			
6	14NB39	Purple Martin			
6	14NB39	Tree Swallow			
6	14NB39	Barn Swallow	S4B	N/A	Threatened, Schedule 1
6	14NB39	Black-capped Chickadee			
6	14NB39	Red-breasted Nuthatch			
6	14NB39	House Wren			
6	14NB39	Sedge Wren			
6	14NB39	Marsh Wren			
6	14NB39	Veery			
6	14NB39	Swainson's Thrush			

6	14NB39	Hermit Thrush			
6	14NB39	American Robin			
6	14NB39	Gray Catbird			
6	14NB39	Brown Thrasher			
6	14NB39	European Starling			
6	14NB39	Cedar Waxwing			
6	14NB39	Tennessee Warbler			
6	14NB39	Nashville Warbler			
6	14NB39	Yellow Warbler			
6	14NB39	Chestnut-sided Warbler			
6	14NB39	Yellow-rumped Warbler			
6	14NB39	Black-and-white Warbler			
6	14NB39	American Redstart			
6	14NB39	Ovenbird			
6	14NB39	Connecticut Warbler			
6	14NB39	Common Yellowthroat			
6	14NB39	Chipping Sparrow			
6	14NB39	Clay-colored Sparrow			
6	14NB39	Vesper Sparrow			
6	14NB39	Savannah Sparrow			
6	14NB39	Song Sparrow			
6	14NB39	Swamp Sparrow			
6	14NB39	White-throated Sparrow			
6	14NB39	Rose-breasted Grosbeak			
6	14NB39	Red-winged Blackbird			
6	14NB39	Western Meadowlark			
6	14NB39	Brewer's Blackbird			
6	14NB39	Common Grackle			
6	14NB39	Brown-headed Cowbird			
6	14NB39	Baltimore Oriole			
6	14NB39	American Goldfinch			

Appendix D: Heritage Resources

From: +WPG574 - HRB Archaeology (SCH)
To: +WPG969 - MIT Environmental Services Section (MI)
Cc: Foth, Michael (MI); Nesbitt, Christina (SCH)
Subject: RE: PTH 6 Grahamdale HRB Inquiry
Date: September-06-19 1:50:43 PM
Attachments: image001.png

Dear MI,

The Branch has no heritage concerns at this time for the proposed PTH 6 realignment by Grahamdale.

If at any time, however, heritage resources are encountered in association with these lands during testing and development, the Historic Resources Branch may require that an acceptable heritage resource management strategy be implemented by the developer to mitigate the effects of development on the heritage resources.

Sincerely,

Suyoko

Suyoko Anne Tsukamoto
Impact Assessment Archaeologist
Historic Resources Branch
Manitoba Sport, Culture and Heritage
213 Notre Dame Avenue, Main Flr
Winnipeg, MB R3B 1N3
T: 204-945-3893
F: 204-945-2384
Suyoko.tsukamoto@gov.mb.ca

From: Beck, Ashley (MI) **On Behalf Of** +WPG969 - MIT Environmental Services Section (MI)
Sent: August 20, 2019 11:46 AM
To: +WPG574 - HRB Archaeology (SCH)
Cc: Foth, Michael (MI)
Subject: FW: PTH 6 Grahamdale HRB Inquiry

Good Morning,

Manitoba Infrastructure is planning to realign a portion of PTH 6 and PR 239 near the Community of Grahamdale.

Please review the attached and provide us with any comments/concerns related to you program areas on or before **September 4th, 2019.** If you have any concerns please indicate so in your reply. If you require further information please let us know. A non response will be interpreted as having no concerns.

Thanks,

Ashley

Appendix E: General Environmental Requirements

General Environmental Requirements

Manitoba Infrastructure

General Environmental Requirements

All construction shall be governed by the *Standard Construction Specification* set out in the contract and as modified in the Special Provisions.

Erosion and Sediment Control

1. Effective sediment and erosion control measures shall be installed before starting work near water to prevent the entry of sediment into any water course or wetland. Final erosion protection measures shall be installed progressively during the project.
2. Erosion and sediment control measures shall be inspected daily during the course of the work. Repairs or adjustments shall be made immediately if any damage is discovered or if these measures are not effective in controlling erosion and sedimentation.
3. Erosion and sediment control measures shall be maintained until complete revegetation of all disturbed areas is achieved. This period may extend beyond the duration of the construction contract, after which the monitoring of revegetation will be the responsibility of MI.
4. The duration of soil exposure shall be minimized and run-off shall be diverted away from the exposed soil.
5. Construction shall be halted during heavy rains with the exception of those works pertaining to erosion and sediment control.
6. Spoil piles shall not be placed within 30m of the ordinary high-water mark or as directed by the Engineer. Spoil piles shall be positioned and maintained in a manner not to increase sediment into the watercourse.

In-Water Work

7. No in-water work shall occur within fish bearing streams from April 1st to June 15th in Southern Manitoba or April 15th to June 30th in Northern Manitoba of any year to accommodate spawning and nursery periods, unless otherwise noted in the Special Provisions. Boundaries for Northern and Southern Manitoba are identified in the Manitoba Restricted Timing Activity Windows for the Protection of Fish and Fish Habitat (http://www.dfo-mpo.gc.ca/pnw-ppe/timing-periodes/mb-eng.html).
8. Duration of in-water work shall be minimized.
9. Where possible in-water works shall be conducted under low flow, frozen, or dry conditions to reduce impacts to fish and fish habitat.
10. If work must proceed under flowing water conditions, then the work site shall be isolated from the water while maintaining downstream flow around the isolated site unless otherwise directed by the engineer. Placement of clean rip rap does not need to be isolated.
11. Disturbance to the bed and banks of the watercourse or wetland shall be minimized and confined to the immediate work site. Unnecessary removal of riparian vegetation shall be avoided. The bed and banks of the watercourse or wetland shall be

restored to pre-disturbance conditions in accordance with the contract documents or as directed by the Engineer.

12. Unless otherwise specified in the contract documents site isolation methods shall be approved by the Engineer based on an accepted plan or design submittal.
13. Where a cofferdam shall be installed:
    - Cofferdams shall be designed to accommodate any expected high flows during the construction period.
    - Cofferdams shall be constructed using clean, non-erodible materials. Silts and clays are not acceptable materials for the surficial zone of the cofferdam.
    - Materials shall not be taken from below the ordinary high-water mark of any water body.
    - All spoil material and debris shall be removed from the isolated area prior to the removal of the cofferdam.
    - Exposed soil on the banks of the isolated area shall be stabilized before the cofferdam or sediment barrier is removed.
    - All cofferdam materials shall be removed and the watercourse shall be restored to its original shape and profile.
14. Any isolated site shall be de-watered using an appropriately sized screened pipe or other suitable method to ensure fish do not become entrained in the pipe. Pump intakes shall be sized and adequately screened to prevent debris blockage and fish mortality in accordance with the Freshwater Intake End-of-Pipe Fish Screen Guideline (http://www.dfo-mpo.gc.ca/Library/223669.pdf).
15. Sediment laden dewatering discharge shall be pumped to a stilling basin, filtering system or through dense terrestrial vegetation a minimum of 30 metres away from the watercourse before re-entry downstream of the construction area, or as noted in the Special Provisions. All pump discharge points shall be lined with clean rock or other acceptable flow dissipating applications in order to prevent erosion and the release of suspended sediments.

Rip Rap

16. Where rock is required for rock armouring or stabilization:
    - Rock rip rap placement shall not damage the bed and/or banks of the watercourse
    - Clean rocks shall be placed by machinery operating from outside of the water.
    - No rocks shall be obtained from below the ordinary high-water mark of any water body.

Revegetation

17. Immediately following construction and decommissioning, all disturbed areas shall be covered with local top soil and seeded. If local topsoil is not available, other organic based covers may be used to allow seed germination.
18. Do not plant the following undesirable/invasive species:
    - Smooth Brome (*Bromus inermis*)
    - Downy Brome (*Bromus tectorum*)

- Crested Wheatgrass (*Agropyron cristatum*)
- Reed Canary Grass (*Phalaris arundinacea*)
- Creeping Red Fescue (*Festuca rubra*)
- Kentucky Bluegrass (*Poa pratensis*)
- Birdsfoot Trefoil (*Lotus corniculatis*)
- Yellow Sweet Clover (Melilotus officinalis)
- White Sweet Clover (Melilotus alba)
- Dutch Clover (Trifolium repens)
- Alsike Clover (Trifolium hybridum)
- Alfalfa (Medicago sativa)
- Meadow Foxtail (Alopecurus pratensis)
- Tufted/Cow/Bird Vetch (Vicia cracca)
- Tall Fescue (Festuca arundinacea

Clearing, Grubbing and Brushing

19. Clearing and grubbing shall NOT be undertaken between April 1st and August 30th of any year unless otherwise specified in order to avoid disturbance to nesting birds and other wildlife species.
20. Where possible, grubbing shall not occur within 2 m (2.5 yards) of standing timber in order to prevent damage to root systems of adjacent standing trees and reduce the occurrence of blow down.
21. Timber stockpile sites shall be located within existing clearings or areas of non-merchantable timber. Stockpile sites shall not be located within 30 meters of a waterbody unless otherwise directed by the Engineer. All stockpiled material shall be removed by April 30 following clearing activities.
22. There shall be no bulldozing of woody debris into standing timber.
23. Existing trails, portages and other travel ways shall not be permanently blocked as a result of clearing and grubbing activities so as not to interfere with other users.
24. All cleared vegetation and debris shall be piled and/or compacted in windrows as close to the ground as possible in preparation for disposal. Windrows shall be no closer than 1 meter to the bush line.

Temporary Water Crossings/Access and Pads

25. Temporary in-water crossings, site access, and pads shall be completely removed prior to April 1st of any given year.
26. Temporary water crossings shall be constructed out of clean stone, rock or crushed rock in accordance with the contract documents or as accepted by the Engineer.
27. Culverts shall be hydraulically sized to accommodate expected flows and fish passage requirements for the duration of the installation. The culvert design must be signed and sealed by a qualified engineer.
28. The temporary crossings, site access and pads shall be removed in their entirety upon completion of the work.
29. Upon removal of the temporary crossings, site access or pads, the site shall be rehabilitated to pre-disturbance conditions.

Blasting Near a Watercourse

30. Use of explosives in or near fish habitat shall follow DFO's Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (Wright and Hopky 1998) to avoid causing serious harm to fish. This guideline in available online at http://www.dfo-mpo.gc.ca/Library/232046.pdf.
31. The use of ammonium nitrate-fuel oil mixtures in or near water frequented by fish shall be avoided to prevent the deposit of toxic by-products (ammonia) in water frequented by fish.

Table 1. Setback distance (m) from centre of detonation of a confined explosive to fish habitat to achieve 100 kPa guideline criteria for various substrates.

Substrate Type	Weight of Explosive Charge (kg)							
	0.5	1	2	5	10	25	50	100
	Setback Distance (m)							
Rock	3.6	5.0	7.1	11.0	15.9	25.0	35.6	50.3
Frozen Soil	3.3	4.7	6.5	10.4	14.7	23.2	32.9	46.5
Ice	3.0	4.2	5.9	9.3	13.2	20.9	29.5	41.8
Saturated Soil	3.0	4.2	5.9	9.3	13.2	20.9	29.5	41.8
Unsaturated Soil	2.0	2.9	4.1	6.5	9.2	14.5	20.5	29.0

Machinery, Fuel Storage and Handling

32. All fuel handling and storage shall comply with Storage and Handling of Petroleum Products and Allied Products Regulation 188/2001 under The Dangerous Goods Handling and Transportation Act C.C.S.M. c. D12.
33. Storage of fuel stored in drums or containers of 230 L or less shall comply with the requirements of Manitoba Fire Code.
34. Designated Area(s) shall be established for fuel storage and handling, equipment cleaning, refueling and servicing. Any Designated Area shall be located at least 100m away from any waterbody or wetland and shall be kept clear of snow and/or miscellaneous materials to allow clear access, routine inspection and leak detection.
    - Machinery and equipment shall be washed, refueled and serviced in such a manner that washwater shall not contaminate surface water or be discharged into a surface water body.
    - In the event that a piece of equipment must be refueled or serviced outside a Designated Area, the fuel shall be transported in approved containers. Absorbent pads or other precautions, such as drip trays or a high density polyethylene (HDPE) groundsheet, shall be used to contain the fuel in the event of spillage.

- All mobile equipment that is not in use shall be parked within a Designated Area(s) where possible.

35. Tank vehicles used to deliver fuel to the work site and/or used to move fuel around the work site shall meet the requirements for highway tanks for the shipment of dangerous goods by road set out in CSA Standard B620-14, Highway Tanks and TC Portable Tanks for the Transportation of Dangerous Goods.
36. All fuel storage containers and tank vehicles shall be inspected daily for leaks and spillage. Damaged or leaking fuel storage containers shall be promptly removed from site. All used petroleum products and other regulated hazardous wastes shall be collected and disposed of at a licensed facility in accordance with applicable legislative requirements.
37. As refueling, fuel storage and equipment servicing sites are taken out of service, any required remediation shall be conducted, including the disposal of the contaminated material at an appropriate licensed facility to the satisfaction of the Department.
38. Machinery shall arrive on site in a clean condition and shall be maintained free of fluid leaks.

Emergency Response Plan for Spills

39. Due care and caution shall be taken to prevent spills, at all times.
40. An updated list of key contacts and telephone numbers for reporting spills, problems, etc., shall be kept on-site at all times.
41. A Workplace Hazardous Materials Information System (WHMIS) file shall be maintained on-site for all hazardous materials at the work area. Prior to commencement of the Work, Material Safety Data Sheets (MSDS) shall be available on-site for all hazardous materials to be used. An updated spill response and containment plan for each dangerous good/hazardous waste shall be maintained in the work area at all times.
42. A spill kit or sufficient supply of materials for clean-up or spill containment, for example absorbent material, high density HDPE groundsheets and absorbent oil booms when working near water, shall always be available on site. If necessary, additional material shall be made available on short notice.
43. All personnel responsible for the handling of dangerous goods and hazardous wastes shall be familiar with the on-site response and containment plan.
44. Any reportable spills shall be reported to the Accident Reporting Line at (204) 944-4888 pursuant to Manitoba Regulation 439/87.
45. All spills shall be reported to the Engineer within 24 hours whether it was necessary to report the spill to Manitoba Sustainable Development or not. The spill report shall include the following:
    - personnel responding to the spill
    - material spilled
    - cause of spill
    - estimated amount of material spilled
    - estimated area and volume of soil affected by the spill

- cleanup action undertaken
- means used to contain, transport and dispose of the materials involved

46. In the event that there is a spill onto the ground surface from any piece of equipment, such as a broken hydraulic hose, the entire affected area shall be cleaned up and all contaminated soil shall be appropriately disposed of offsite at an appropriate licensed facility. Such events shall be reported immediately to the Engineer and proof of appropriate disposal provided. Contractor field staff trained in spill containment and management shall always be on site.

Disposal

47. Dispose of all used petroleum products and other regulated hazardous wastes in accordance with the Manitoba "Dangerous Goods Handling and Transportation Act".
48. Dispose of non-reusable demolition and construction debris at a waste disposal ground operating under the authority of a permit pursuant to Manitoba Regulation 150/91 respecting Waste Disposal Grounds. Provide proof of appropriate disposal.
49. Any waste and non-salvageable demolition materials removed from the work site shall be stabilized above the Ordinary High-Water Mark to prevent them from entering any watercourse and/or transported to a designated disposal site.
50. Dispose of all sewage and septage from on-site sanitary facilities in accordance with Manitoba Regulation 83/2003, respecting Onsite Wastewater Management Systems Regulation. Provide proof of appropriate disposal.

Dust and Particulate Control

51. All work shall be conducted in a manner that minimizes the raising of dust from construction operations.
52. Only water or approved dust suppressants shall be used for dust control. The use of waste petroleum or petroleum by-products is not allowed.
53. All vehicles used to haul materials to or from the work site shall have the load covered with a tarpaulin cover during transport to prevent material from falling out and creating dust.
54. All material stock piles or spoil piles shall be maintained as to minimize release of particulate matters. This may include, but is not limited to, covering or stabilization of material stockpiled at the work site as required.

Noise and Noise Limitations

55. All plant and equipment supplied for use on the Project shall be effectively "sound-reduced" by means of proper silencers, mufflers, acoustic linings, acoustic shields or acoustic sheds.
56. Noise By-laws of the adjacent communities and municipal authorities shall be complied with.

57. Any operation of plant or equipment outside the hours as regulated by local government shall require an exemption in writing.

Wildlife

58. Construction camps and worksites shall be kept clean and tidy. All food and garbage waste shall be stored in a secure manner to prevent access and exposure to local wildlife. All food and garbage waste shall be disposed of at an area which has been designated as an appropriate waste disposal site.
59. Nuisance wildlife shall be immediately reported to Manitoba Sustainable Developments local District Office and the Engineer.

Heritage Resources

60. Work shall immediately cease and be suspended at the location where archaeological or historic artifacts are encountered during construction activities. The discovery shall be reported to the Engineer and work at this location shall not resume unless otherwise authorized by the Engineer.

    Work at the location shall be suspended until a Historic Resource Consultant can assess archaeological or historic artifacts that are encountered, and mitigation measures are confirmed with the Manitoba Historic Resources Branch.

Other

61. The disturbed area shall be minimized to the greatest extent possible and limited to the Department's right-of-way unless otherwise permitted by the Department.
62. Utilization of ditches as a heavy-machinery transportation corridor shall be minimized to the greatest extent possible.
63. Existing drainage patterns shall not be altered.
64. Should there be a need for a water source for compaction or dust suppression or related activity, a temporary authorization for any withdrawal greater than 25,000 litres or 550 gdp shall be required from the Manitoba Sustainable Development Water Use Licensing Section. Contact the Manager of Water Use Licensing Section, at (204) 945-3983 prior to the commencement of the work.
65. Any asphalt plant and temporary asphalt plant sites shall have the necessary licence/permit and shall be operated in accordance with the terms and conditions on their licence/permit.