Appendix 9-2

Vegetation Characterization and Effects Assessment Report

VEGETATION CHARACTERIZATION AND EFFECTS ASSESSMENT OF THE PROPOSED BERENS RIVER TO POPLAR RIVER FIRST NATION ALL-SEASON ROAD PROJECT 4

INTERIM REPORT

Prepared for:

Manitoba East Side Road Authority

Prepared by:

Szwaluk Environmental Consulting Ltd.

Karin Newman

and

Calyx Consulting

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SUMMARY

This report provides a characterization of vegetation and an assessment of effects for the proposed P4 Berens River to Poplar River First Nation All-Season Road Project. The characterization of vegetation included a description of ecological land classification, physical environment, landscape level vegetation, local flora, and Aboriginal traditional knowledge. The proposed project is located in the Lac Seul Upland Ecoregion, and Berens River and Wrong Lake Ecodistricts. The landscape consists of coniferous, deciduous and mixedwood forests with wetlands interspersed. Fifty-six species of conservation concern are expected to range in the ecoregion, and 40 of these may potentially occur within the regional assessment area of the Project. Several plant species are identified as being important for sustenance and cultural practices, and blueberry picking is important to the people in the region.

Valued Components for the study included species of special interest, and botanical resource areas and culturally important plants. Consideration was given to potential environmental effects of the proposed project on vegetation and soils:

- Disturbance to or removal of native vegetation.
- Disturbance to or removal of bog/fen species.
- Disturbance to or removal of medicinally and culturally important species.
- Fragmentation of the local and regional vegetation communities.
- Modification of vegetation composition and structure adjacent to the disturbance zone.
- Loss of species of special interest.
- Introduction and spread of invasive and non-native species.
- Loss/impairment of vegetation from accidental releases of fuels or hazardous substances.
- Loss/impairment of desirable plant species from herbicide application.
- Impairment of vegetation in the project assessment area from dust.
- Increased risk of forest fire from clearing and construction.
- Loss of soils stripped during construction.
- Compaction of soils during construction.
- Loss of soil through erosion.
- Impaired soil quality from accidental releases of hydrocarbon and hazardous substances, and herbicides.

Measures to address potential effects are discussed. The assessment found no likely significant effects to valued vegetation components in this study.

A native vegetation survey will be conducted in the spring of 2015, to gather additional data and record baseline information on the vegetation and soils in the assessment area.

TABLE OF CONTENTS

Page. No.

TABLES

MAPS

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1.0 INTRODUCTION

1.1 Background

On the east side of Lake Winnipeg, Berens River First Nation and Northern Affairs Community, and Poplar River First Nation have relied primarily on winter road and air travel to transport people and goods. In 2008, the Government of Manitoba announced a strategic initiative to provide improved, safer and more reliable transportation services to connect the remote communities on the east side of Lake Winnipeg with the rest of Manitoba. Manitoba East Side Road Authority (ESRA), formerly Manitoba Floodway and East Side Road Authority (MFESRA), was established as a provincial Crown Agency to manage the East Side Transportation Initiative with the intent of increasing transportation opportunities for communities on the east side of Lake Winnipeg.

As part of the East Side Transportation Initiative, ESRA is proposing the construction of an all-season road along the east side of Lake Winnipeg from Berens River to Poplar River First Nation, Project 4 (P4). The proposed P4 All-Season Road will extend north from the first segment of the Transportation Initiative network; an all-season road from Provincial Road 304 (near Hollow Water First Nation) to Berens River First Nation and Northern Affairs Community along the east side of Lake Winnipeg (Project 1), already under construction.

1.2 Project Overview

The proposed All-Season Road will consist of 94.1 km of two-lane gravel highway on new Right-of-Way (RoW) on provincial Crown land, from the English Rapids Road south of the Berens River to the southern boundary of Poplar River First Nation (Map 1), where it will connect with a 410 m community access road on the reserve.

The All-Season Road will be a gravel-surface public highway, with a design width of 10 m. The All-Season Road will intersect four major water crossing and require bridges over the Berens, Etomami, North Etomami, and Leaf Rivers.

The components of the Project include the following:

- All-season road on new RoW
- Four bridges at river crossings
- Culverts for stream crossings and drainage
- Rock quarries and granular borrow areas
- Temporary access trails, staging areas and camps

The portion of the project located on Provincial Crown Land requires an Environmental Impact Assessment under the Manitoba Environment Act as a Class II development and under the Canadian Environmental Assessment Act. Additionally, the proposed project requires a separate federal environmental assessment for the portion of the project located on federal land (Poplar River community access road).

The specific objectives established for this study (based on the Request for Proposal, Reference # P4-EL-61) were as follows: i) provide an understanding of the baseline vegetation conditions in the Project assessment area; ii) provide an understanding of the potential environmental effects of road development on vegetation species and communities; and iii) contribute to the identification and implementation of environmental protection measures to avoid or minimize effects to vegetation, particularly protected species and plant species of interest.

2.0 STUDY AREA

The proposed All-Season Road Project is located on the east side of Lake Winnipeg, near Berens River First Nation, approximately 270 km north of Winnipeg (by air). The P4 All-Season Road begins approximately 500 m east of the boundary of the Berens River First Nation reserve, and extends north approximately 94.1 km from English Rapids Road on the south side of the Berens River to the Poplar River First Nation reserve boundary, approximately 400 km north of Winnipeg (by air).

2.1 Spatial Boundaries

The spatial boundaries for the assessment consist of project, local and regional assessment areas are described below, and illustrated in Map 1.

Project Assessment Area (PAA) – Footprint of the proposed All-Season Road Project, including rock quarries, borrow areas and access roads. The proposed All-Season Road will be centered on a 100 m RoW with a typical clearing width of 60 m and additional clearing as required at horizontal curves to maintain sight distances.

Local Assessment Area (LAA) – One km on either side of the proposed All-Season Road Project, including rock quarries, borrow areas and access roads.

Regional Assessment Area (RAA) – Five km on either side of the proposed All-Season Road Project.

3.0 METHODS

3.1 Desktop Methods

Existing biophysical information (e.g. Geology of Manitoba 2015; Matile and Keller 2004; Smith et al. 1998) was used to describe the environment, regionally and across all areas of assessment for the P4 All-Season Road, including available information provided by ESRA (e.g., project imagery and shapefiles). Literature searches for relevant studies in the vicinity of the Project (e.g., Asatiwisipe Aki Management Plan 2011) and environmental assessments (e.g., MFESRA 2010 and 2011) were also completed.

Data Sources

Within the P4 assessment areas (project, local, regional), the Land Cover Classification (LCC) was used to determine vegetation cover classes (Natural Resources Canada 2000). The LCC is a national vector database mapping layer that has been harmonized across the major federal departments involved in land management or land change detection (Agriculture and Agri-Foods Canada, Canadian Forest Service, and Canadian Centre for Remote Sensing). The LCC consists of remotely sensed imagery (Landsat data) as part of the Earth Observation for Sustainable Development of Forests Program.

An enhanced LCC includes a further harmonization/integration of the ecological stratification of Manitoba's landscapes (Smith et al. 1998) and the addition of wetland features, fire history (Manitoba Conservation 2013), soils (Agriculture and Agri-Food Canada 2013), water crossings (Natural Resources Canada 1999 to 2008) and Aboriginal Traditional Knowledge (ESRA 2015).

The available datasets were clipped to the three assessment areas, and for each resulting shapefile, the area of polygons was calculated. Intersecting stream and river crossings were buffered at 10 m.

Species of Conservation Concern

Plant species of conservation concern include species that are rare, disjunct, or at risk throughout their range or in Manitoba. Species of conservation concern encompasses plants ranked very rare to uncommon by the Manitoba Conservation Data Centre (MBCDC), and those listed under the Manitoba Endangered Species and Ecosystems Act (ESEA), the federal Species at Risk Act (SARA) and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). A database search of the MBCDC provincial records for known locations of species of conservation concern in the vicinity of the Project was requested in March 2015.

Plant species of special interest, according to ESRA, include those species listed under Schedule 1 of SARA, species listed under ESEA, and species ranked very rare to rare by the MBCDC.

The global (G) and sub-national (S) rarity ranking of species used by the MBCDC, according to a standardized procedure used by all Conservation Data Centres and Natural Heritage Programs is as follows:

1: Very rare throughout its range or in the province (5 or fewer occurrences, or very few remaining individuals). May be especially vulnerable to extirpation.

2: Rare throughout its range or in the province (6 to 20 occurrences). May be vulnerable to extirpation.

3: Uncommon throughout its range or in the province (21 to 100 occurrences).

4: Widespread, abundant, and apparently secure throughout its range or in the province, with many occurrences, but the element is of long-term concern (> 100 occurrences).

5: Demonstrably widespread, abundant, and secure throughout its range or in the province, and essentially impossible to eradicate under present conditions.

The conservation status categories for ESEA, SARA and COSEWIC are as follows:

Special Concern: A species that may become threatened or endangered because of a combination of biological characteristics and identified threats.

Threatened: A species likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.

Endangered: A species facing imminent extirpation or extinction.

Extirpated: A species no longer existing in the wild in Canada but exists elsewhere.

Extinct: A species that no longer exists.

Culturally Important Species

Other plant species of importance, such as those traditionally used for medicine, subsistence and cultural purposes were discussed based on available information from ESRA and literature searches.

Plant nomenclature for species discussed in this report will follow the MBCDC provincial species list.

4.0 EXISTING ENVIRONMENT

4.1 Ecological Land Classification

Ecological classification in Canada is a hierarchical designation describing ecologically distinct areas based on interrelationships of geology, landform, soil, water, vegetation, and human factors, with the Ecozone at the coarsest level. The Boreal Shield Ecozone, the largest in Canada, stretches from northern Saskatchewan to Newfoundland, and also covers much of Manitoba (Smith et al. 1998). Within this Ecozone, the Lac Seul Upland Ecoregion extends from the shoreline of Lake Winnipeg into western Ontario, and from the Winnipeg River north to Norway House. The traditional territories of the Anishinaabe communities of Poplar River, and Berens River are encompassed in the northern end of the Lac Seul Uplands (Asatiwisipe Aki Management Plan 2011). The proposed All-Season Road Project between the communities of Poplar River and Berens River, occurs entirely within both the Berens River Ecodistrict adjacent to the shoreline of Lake Winnipeg, and the Wrong Lake Ecodistrict, which lies to the east, see Map 2. In absence of specific and detailed vegetation and soil studies for the P4 study area, the Ecodistrict is used here as a detailed level of ecological reference, to describe the existing environment.

Among the assessment areas, there is generally an even division between the two Ecodistricts, identified in Table 4.1. The Wrong Lake Ecodistrict occupies a slightly greater area over the project and local assessment areas, except at the regional level.

Table 4.1. Area and proportion within ecodistricts among assessment areas.

	Project		Local		Regional	
Ecodistrict	**Area (ha)**	**Proportion**	**Area (ha)**	**Proportion**	**Area (ha)**	**Proportion**
Berens River	438.0	0.46	8,920.0	0.47	49,844.0	0.53
Wrong Lake	507.0	0.54	9,987.0	0.53	44,264.0	0.47

Source: Joro Consultants Inc. *from* Ecological Stratification Working Group, Agriculture and Agri-food Canada 1991-1999.

4.2 Physical Environment

4.2.1 Geology and Surficial Geology

The geology of the area consists of Precambrian rock from the Archean era (Geology of Manitoba 2015). In the vicinity of Poplar River and Berens River, the lithotec consists of metamorphosed early intrusive rocks, gneiss and migmatites. The unit consist of tonalite, minor granodiorite, granite, related gneiss, and magmatic gneiss containing tonalite and amphibolites. Late intrusive rocks occur approximately midway between Poplar River and Berens River, which consist of granite, granodiorite and gneiss (Geology of Manitoba 2015).

The surficial geology of the area is characterized by both organic and glaciolacustrine deposits, interspersed with local Precambrian bedrock ridge and knoll outcrops (Smith et

al. 1998). Level to gently undulating organic deposits are from 1 – 5 m thick and accumulate in fen, bog, swamp and marsh settings. The glaciolacustrine sediments are very low relief, massive and laminated deposits of clay, silt and minor sand, deposited by glacial Lake Agassiz. Deposits were commonly scoured and homogenized by icebergs. The rock outcrops are generally unweathered intrusive, metasedimentary and metavolcanic rocks with a glacially scoured irregular surface with high local relief (Matile and Keller 2004).

4.2.2 Soils

Soils are similar across both Ecodistricts, with wetter, lower lying soils closer to the shore of Lake Winnipeg. In the Berens River Ecodistrict, the dominant soils are poorly-drained, deep or shallow organic Mesisols developed from moderately decomposed peat, which overlie finer glaciolacustrine sediments. Well- to imperfectly-drained Gray Luvisols occur in localized areas, and are associated with calcareous glacial sediments glaciolacustrine loamy and clay textured soils. Poorly-drained peaty Gleysols occur to the north of the study area. To the east within the Wrong Lake Ecodistrict, imperfectly-drained Gray Luvisols are the dominant soils, while organic Mesisols are slightly less widespread (Smith et al. 1998). Acidic bedrock outcrops intersperse the extensively peat-covered lowland, increasingly more widespread to the east, with thin organic soils occurring in shallow depressions. Although permafrost is absent, thin, seasonal frost layers can last into late summer (Halsey et al. 1997). Relic permafrost that has historically degraded, is very sporadically distributed in the northern most peatlands of the Lac Seul Uplands Ecoregion (Smith et al. 1998).

The general distribution of the main soil classification types for the greater region of the P4 study area is shown in Map 3. The area (ha) and proportion of soil types within all assessment areas is shown in Table 4.2.2.

Table 4.2.2. Area and proportion of soil classes among assessment areas.

Soil Classification	Project		Local		Regional	
	Area (ha)	Proportion	Area (ha)	Proportion	Area (ha)	Proportion
Acidic Bedrock	278.0	0.29	5,266.0	0.28	21,875.0	0.23
Luvisolic	217.0	0.23	4,311.0	0.23	18,562.0	0.20
Mesisolic	450.0	0.48	9,329.0	0.49	53,671.0	0.57

Source: Joro Consultants Inc. *from* National Soils Database, Agriculture and Agri-food Canada 2013.

4.2.3 Topography and Drainage

Topography of the area is generally level, or gently undulating peat-covered lowland, occasionally interspersed by rock outcrops, with thin mantles of finer glacial sediments. Elevation is between 222 metres above sea level (masl), near the shore of Lake Winnipeg, and 245 masl for the next contour to the east (Smith et al. 1998). The Lake Winnipeg Watershed drains from Ontario to the west into Lake Winnipeg, and then to the Nelson

River Watershed to the north. Drainage is generally poor, due to low relief and the widespread occurrence of many deep and shallow peatlands.

The major rivers of the area include the Berens, Etomami, North Etomami, Leaf, and Poplar Rivers. The Bloodvein and Pigeon Rivers lie to the south of the project area, while the Mukutawa River lies to the north. The P4 alignment is intersected at 18 locations by rivers and streams, and 13 times by other waterbodies (e.g. small lakes and ponds), shown in Map 4. The four major rivers crossed are the Berens, Etomami, North Etomami, and Leaf rivers. The thirty-one water crossings account for roughly 2.1% of the total project assessment area, of which rivers and stream crossings (buffered by 10 m) account for 7.1 ha, or 0.8%, while other waterbodies (e.g. small lakes) account for 12.0 ha, or 1.3%, shown in Table 4.2.3.

Table 4.2.3. Water crossings in the project assessment area.

Category	Crossings	Area (ha)	Proportion
Rivers and streams	18	7.1	0.008
Waterbody	13	12.0	0.013
No water crossing activity	-	923.8	0.980

Source: Joro Consultants Inc. *from* Natural Resources Canada 1999-2008.

4.2.4 Climate

This area falls within the Mid Boreal Ecoclimatic Region, which extends from NW Ontario to the foothills of the Rocky Mountains (Smith et al. 1998). Four distinct seasons occur, with a relatively short spring and fall, a warm, moderately wet summer, and long cold winters. Local climate normals recorded from Berens River (1981-2010) show a mean annual temperature of 0.6˚C, with a July mean of 17.7˚C and a January mean of -18.9˚C. The average annual precipitation is 470 mm, one third of which falls as snow (Environment Canada 2015).

4.2.5 Fire and the Boreal Forest

In the boreal forest, fire is an important natural disturbance that drives vegetation dynamics at the landscape, stand and species levels. Forest diversity is a result of the variation of fires in frequency, intensity, severity, size shape and season of burn (Natural Resources Canada 2014). The area burned varies greatly, and fire activity is influenced by weather and climate, fuels, ignition agents, and humans (Brandt et al. 2013). High intensity fire rejuvenates boreal ecosystems, and is the major stand renewing agent, affecting stand life cycles, patchiness and regeneration (Stocks et al. 2003). Fires improve soil conditions for germination, by releasing nutrients and minerals into soils, removing live vegetation and litter matter, and increasing availability of sunlight at the forest floor (Brandt et al. 2013; Stocks et al. 2003). A mosaic of vegetation at different stages of succession from fire

in the ecosystem results in greater landscape diversity and provides an array of habitats for flora and fauna (Perry 1994).

Seasons play a role in fire frequency and intensity and can affect re-growth of the ecosystem, while temperature changes and soil moisture content also effect fire intensity (Weber and Flannigan 1997). The boreal forest fire season is April through October. Lightning fires occur generally in late spring/ summer, while human caused fires tend to occur in early spring and fall (Stocks et al. 2003). In the boreal forest, lightning strikes account for about 35% of fires, although are responsible for about 85% of the total area burned (Brandt et al. 2013).

4.2.6 Fire History

The boreal forest tends to burn at different intervals. The fire cycle for jack pine is approximately 15 to 35 years, while spruce stands cycle every 50 to 100 years (Natural Resources Canada 2014). Stand-destroying crown fires occur at approximately 50 to 200 year intervals, and can reach 500 years on very moist sites. Coniferous forests (e.g., pine and spruce) experience more frequent crown fires than deciduous dominated forests (Perry 1994).

The provincial fire history data available for the region dates back to 1920. Fire history is calculated by decade, for the area (ha) and percent of land within all levels of assessment, in Table 4.2.6.

Table 4.2.6. Area and percent of fires among assessment areas.

Fires by Decade	Project		Local		Regional	
	Area (ha)	Proportion	Area (ha)	Proportion	Area (ha)	Proportion
1920-1929	718.0	0.76	14,140.0	0.75	66,687.0	0.71
1960-1969	39.0	0.04	837.0	0.04	1,844.0	0.02
1970-1979	0	0.00	0	0.00	247.0	0.003
1980-1989	0	0.00	1.0	0.0000	38.0	0.0004
1990-1999	0	0.00	23.0	0.001	1,642.0	0.02
2000-2009	0	0.00	2.0	0.0001	36.0	0.0004
2010-2013	0	0.00	142.0	0.01	198.0	0.002
No Fire Activity	188.0	0.20	3762.0	0.20	23,417.0	0.25

Source: Joro Consultants Inc. *from* Manitoba Conservation and Water Stewardship 2013.

The majority of fires occurred prior to 1930, with approximately three quarters of the regional assessment area having burned between 1920 and 1929. Over both the project and local assessment areas, 20% of the land has seen no fire activity from 1920 to the present, whereas the regional proportion of unburned land is slightly higher, at 25%. From 1970 to the present, there has been little to no fire activity documented over the project and local assessment areas. The distribution of fire history by decade is shown in Map 5.

Limited fire suppression by Manitoba Conservation and local fire officials due to remoteness of the area and the absence of commercial forestry interests, have led to near natural landscape-level fire dynamics (Asatiwisipe Aki Management Plan 2011). Fires do not burn evenly over an area, but will favour vegetation on drier sites (e.g. jack pine dominated uplands). Treed wetlands with deep water tables may be partially burned, and wetter sites (e.g. black spruce/ tamarack bog) are generally skipped over by fire (Asatiwisipe Aki Management Plan 2011). This naturally occurring fire pattern results in large burned areas, broken by unburned patches of intact forest.

4.3. Landscape Level Vegetation

The vegetation across this region of Manitoba is primarily coniferous forest, with black spruce occurring widespread on imperfectly drained mineral and organic soils. Upland sites support black spruce, with willow and alder shrubs. The understory herb and shrub vegetation is sparse to absent, and ground cover is made up of feather mosses. Occasional mixed wood stands with balsam fir, white spruce, trembling aspen and balsam poplar form along warmer river valleys and south facing slopes, in the southern portion of the Ecoregion. Mixed wood stands have generally more diverse shrub and herbaceous vegetation layers. Areas of rocky outcrops may have patchy tree growth, often dominated by jack pine, with an understory of ericaceous shrubs, herbs and mosses and lichens (Smith et al. 1998).

4.3.1 Land Cover Classification

The Land Cover Classification, generated from Landsat satellite data, details twenty-one vegetation classes, as they occurred in 2000 (Natural Resources Canada 2000). Eleven vegetation classes occur within the project, local and regional assessment areas, including tall shrub, wetlands, and coniferous, broadleaf and mixedwood forests. The water class includes lakes and rivers, while the exposed land class occurs primarily around the Berens River community. Map 6 illustrates the distribution of the land cover classes for the region surrounding the P4 study area. The area (ha) and proportion of land cover classes among all assessment areas is shown in Table 4.3.1a.

The anticipated percent of vegetation removal from the local and regional assessment areas, through clearing in the RoW for each vegetation class, is shown in Table 4.3.1b.

Table 4.3.1a. Area and proportion of vegetation cover classes among assessment areas.						
Land Cover Classification	**Project**		**Local**		**Regional**	
	Area (ha)	**Proportion**	**Area (ha)**	**Proportion**	**Area (ha)**	**Proportion**
Water	8.0	0.01	425.0	0.02	4,054.0	0.04
Exposed Land	4.0	0.00	72.0	0.00	189.0	0.00
Shrub Tall	0	0.00	0	0.00	1,798.0	0.02
Wetland Treed*	18.0	0.02	351.0	0.02	1,490.0	0.02
Wetland Shrub*	273.0	0.29	7,468.0	0.40	35,984.0	0.38
Wetland Herb*	26.0	0.03	868.0	0.05	6,246.0	0.07
Coniferous Dense	341.0	0.36	5,346.0	0.28	22,346.0	0.24
Coniferous Open	27.0	0.03	401.0	0.02	1,886.0	0.02
Coniferous Sparse	30.0	0.03	603.0	0.03	2,196.0	0.02
Broadleaf Dense	30.0	0.03	560.0	0.03	4,814.0	0.05
Mixedwood Dense	187.0	0.20	2,813.0	0.15	13,107.0	0.14

Source: Joro Consultants Inc., *from* Natural Resources Canada, Earth and Sciences Sector 2000.
*Dominantly bog and fen wetlands.

Table 4.3.1b. Percent (%) of vegetation removal from local and regional assessment areas, by clearing on the RoW.		
Land Cover Classification	**Local removal (%)**	**Regional removal (%)**
Wetland Treed*	5.17	1.22
Wetland Shrub*	3.66	0.76
Wetland Herb*	2.94	0.41
Coniferous Forest Dense	6.39	1.53
Coniferous Forest Open	6.76	1.44
Coniferous Forest Sparse	5.02	1.38
Broadleaf Forest Dense	5.42	0.63
Mixedwood Forest Dense	6.63	1.42

*Dominantly bog and fen wetlands.

When only the local assessment area is considered, tree and shrub removal for RoW clearing will affect 8.8% of local treed and or shrubby wetlands, while 2.9% of the locally affected wetlands are herbaceous. Locally, 18.6% of the coniferous forests (dense, open and sparse cover), 5.4% of dense broadleaf forests, and 6.6% of dense mixedwood forests at the local scale, occur on the project RoW.

On the regional scale, 2.0% of regional wetlands that are treed and/or shrubby will have tree and shrub vegetation removed in the RoW. Regionally, 0.4% of the wetlands affected are herbaceous. Of the regional forest types, 4.3% of the coniferous forests (dense, open and sparse cover), 0.6% of dense broadleaf forests, and 1.4% of dense mixedwood forests on the regional scale will be affected by project clearing of the RoW. The tall shrub vegetation cover class is not found on the RoW, or at the local assessment area scale, although this vegetation type does occur regionally.

4.3.2 Quarry and Borrow Areas

Due to the widespread presence of wetlands throughout the project area, extensive aggregate for construction of the road will be pulled from other sites, and thirty-five potential rock quarries have been identified along the alignment (ESRA 2015). Potential quarries identified range in size from 1.1 ha to 53.4 ha, with the majority (68.6%) of potential quarry sites less than 10 ha. The area and proportion of land cover classes that occur within the thirty-five potential quarries are shown for all levels of assessment, in Table 4.3.2a.

Table 4.3.2a. Area and proportion of land cover classes for potential quarry sites, within all assessment areas.

Land Cover Classes	Project		Local		Regional	
	Area (ha)	Proportion	Area (ha)	Proportion	Area (ha)	Proportion
Water	0.51	0.020	1.02	0.003	1.02	0.003
Wetland Treed*	0.00	0.000	6.18	0.019	6.19	0.017
Wetland Shrub*	0.97	0.039	30.48	0.093	34.49	0.096
Wetland Herb*	0.04	0.002	0.37	0.001	0.37	0.001
Coniferous Dense	9.93	0.400	98.45	0.300	111.14	0.309
Coniferous Open	4.10	0.165	41.45	0.126	46.84	0.130
Coniferous Sparse	8.62	0.348	120.57	0.368	130.21	0.362
Broadleaf Dense	0.00	0.000	0.20	0.001	0.20	0.001
Mixedwood Dense	0.64	0.026	29.25	0.089	29.25	0.081

Source: Joro Consultants Inc, *from* ESRA 2015.
*Dominantly bog and fen wetlands.

The development of potential quarry sites will require the removal of vegetation. The anticipated percent of vegetation removal by land cover class for all potential quarries is shown in Table 4.3.2b, for local and regional assessment areas.

Table 4.3.2b. Percent (%) of vegetation removal from local and regional assessment areas for potential quarries.

Land Cover Classification	Local removal (%)	Regional removal (%)
Wetland Treed*	1.759	0.415
Wetland Shrub*	0.408	0.096
Wetland Herb*	0.043	0.006
Coniferous Forest Dense	1.842	0.497
Coniferous Forest Open	10.341	2.484
Coniferous Forest Sparse	19.994	5.931
Broadleaf Forest Dense	0.036	0.004
Mixedwood Forest Dense	1.040	0.223

*Dominantly bog and fen wetlands.

Within the local assessment area, 2.21% of wetlands (primarily treed wetlands) occur within potential quarry sites. Of the local area forest types, 32.18% of the coniferous forests (dense, open and sparse cover), 0.04% of dense broadleaf forests, and 1.04% of dense mixedwood forests occur within potential quarry sites.

Within the regional assessment area, 0.52% of wetlands occur within potential quarry sites. Regionally, 8.91% of the coniferous forests (dense, open and sparse cover), 0.004% of dense broadleaf forests, and 0.22% of dense mixedwood forests occur within potential quarry areas.

The majority of potential quarries identified are proximally situated, either on the project RoW (37.1%), or within 100 m (25.7%). Access to approximately one third of potential quarries is between 130 and 400 m off the RoW, while access to two potential quarries identified occurs greater than 650 m from the alignment. For all potential quarries located off the alignment, access roads will be required. Straight line access was assumed for access roads, with a width of 30 m. As access to all potential quarries falls within one km of the RoW (e.g. within the local assessment area), figures are provided for the project and local assessment areas only. The area and proportion of land cover classes for potential access roads, is shown in Table 4.3.2c, by level of assessment.

Table 4.3.2c. Area and proportion of land cover classes for potential access roads, and percent vegetation removed over project and local assessment areas.

	Project		Local	
Land Cover Classes	**Area (ha)**	**Proportion**	**Area (ha)**	**Proportion**
Exposed Land	0.15	0.047	0.19	0.014
Wetland Treed*	0.15	0.047	0.73	0.053
Wetland Shrub*	0.56	0.177	4.36	0.318
Wetland Herb*	0.00	0.000	0.06	0.004
Coniferous Dense	1.48	0.465	6.02	0.440
Coniferous Open	0.00	0.001	0.07	0.005
Coniferous Sparse	0.06	0.020	0.24	0.017
Broadleaf Dense	0.53	0.168	1.10	0.080
Mixedwood Dense	0.24	0.075	0.92	0.067

Source: Joro Consultants Inc, *from* ESRA 2015.
*Dominantly bog and fen wetlands.

While certain potential access road areas occur on exposed land, others will require the removal of vegetation. All potential access roads occur within the local assessment area. The anticipated percent of vegetation removal by land cover class and for all potential access roads, is shown in Table 4.3.2d, for local and regional assessment areas.

Within the local assessment area, 0.272% of wetlands occur within potential access road areas. Of the local area forest types, 0.170% of the coniferous forests (dense, open and sparse cover), 0.196% of the dense broadleaf forests, and 0.033% of dense mixedwood forests occur within potential access road areas.

Over the regional assessment area, 0.062% of wetlands occur within potential access road areas. Of the regional area forest types, 0.042% of the coniferous forests (dense, open and sparse cover), 0.023% of the dense broadleaf forests, and 0.007% of dense mixedwood forests all fall within potential access road areas.

Table 4.3.2d. Percent (%) of vegetation removal from local and regional assessment areas for potential access roads.

Land Cover Classification	Local removal (%)	Regional removal (%)
Wetland Treed*	0.207	0.049
Wetland Shrub*	0.058	0.012
Wetland Herb*	0.007	0.001
Coniferous Forest Dense	0.113	0.027
Coniferous Forest Open	0.019	0.004
Coniferous Forest Sparse	0.039	0.011
Broadleaf Forest Dense	0.196	0.023
Mixedwood Forest Dense	0.033	0.007

*Dominantly bog and fen wetlands.

4.3.3 Wetlands

In Canada, approximately 85% of wetlands are located in the boreal forest (Ducks Unlimited Canada 2015). In Manitoba, Halsey et al. (1997) estimates that wetlands cover 233,340 km^2 or 43% of the terrestrial landscape, with peatlands representing 90% of all wetlands. It is well documented that wetlands are ecologically important (Bond et al. 1992, Locky et al. 2005, Ducks Unlimited Canada 2015, Goldsborough 2015). Foster et al. (2004) noted the importance of calcareous wetlands (e.g. fens) and their potential to support species of conservation concern. Threats to wetlands include agricultural runoff, drainage, forestry activities, off-road vehicles, peat extraction, and right-of-way activities (Foster et al. 2004).

According to the Canadian Wetland Classification System, there are five wetland classes that include bog, fen, marsh, swamp and shallow water (National Wetlands Working Group 1997). Ducks Unlimited Canada (2015) further identifies nineteen minor wetland classes based on an enhanced wetland classification system of the five major wetland classes, which considers moisture, water movement and nutrients, as well as plant structure and

cover (e.g. trees, shrubs, grasses, sedges, and mosses) to differentiate wetland sites using field-collected data.

The vegetation around the eastern shore of Lake Winnipeg reflects the nature of the dominant poorly-drained organic soils, and the distribution of wetlands in the P4 study area, see Map 7. Within the regional assessment area, wetland types present include bog and fen complexes, mineral wetlands, fens, and bogs. Marshes, and other wetland complexes (peat and non-peat forming) are also present over the greater area, although not generally found within the P4 regional assessment area.

The distribution of wetlands across the region (shown in Map 7 and Table 4.3.3.), is based on digitized data from a larger study on wetland types and their distribution in Manitoba (Halsey et al. 1997). Here, wetlands are distinguished by wetland class (bog, fen, marsh, swamp, shallow water), the presence/absence of a tree canopy (open, wooded, forested), and a landform modifier (e.g. patterned, non-patterned). For the sake of mapping at this scale, in many cases wetland complexes, rather than individual wetlands were identified.

This roughly corresponds to the wetland cover classes of the Land Cover Classification (LCC) described earlier in Section 4.3.1, which are differentiated solely on the basis of vegetation structure (height). 'Treed wetlands' encompass treed bog and fen complexes; 'tall shrub wetlands' include shrubby bogs and fens; and 'herbaceous wetlands' include open fens (both patterned and non-patterned). Because both data sets were originally compiled differently and at different scales, the area calculations of classes are not necessarily directly comparable.

Bogs are characterized by an accumulation of peat, with a surface that is raised or level with the surrounding terrain. Precipitation and snowmelt are primary water sources, resulting in acidic bog waters low in dissolved minerals, enhanced by the decomposition of acidic *Sphagnum* moss leaves. Vegetation largely consists of *Sphagnum*-dominated peat mosses, ericaceous shrubs (Labrador tea, leather leaf and bog cranberry) and where present, black spruce in sparse to closed stands (National Wetlands Working Group 1997).

Fens are defined as peatlands with a fluctuating water table, rich in dissolved minerals due to ground and surface water movement. The greater nutrient availability in fens supports unique vegetation, related to the depth of the water table. The vegetation of nutrient poor fens, with waters low in dissolved minerals, is characterized by *Sphagnum* mosses and ericaceous shrubs, black spruce are occasionally present. Moderately rich fens are dominated by graminoids (e.g. sedges) and brown mosses. Drier, rich fens support shrubs (birch, willow and tamarack), and trees (black spruce, tamarack) can be found on moss hummocks up to 20cm above the water table (National Wetlands Working Group 1997).

The fens present in the P4 study area are classed as shrubby, or with an open (<10%) or treed (>10%) canopy. Fens are further distinguished based on the presence of landforms of linear hummocky ridges and hollow depressions, oriented perpendicular to surface-water-flow direction with a parallel or reticulated pattern. Treed bogs are wooded to forested, with a tree canopy of 10% to 70% cover (Halsey et al. 1997), Table 4.3.3.

Table 4.3.3. Area and proportion of wetland types among assessment areas.

Wetland Types	Project		Local		Regional	
	Area (ha)	Prop-ortion	Area (ha)	Prop-ortion	Area (ha)	Prop-ortion
Bog and fen complex	569.0	0.67	10,617.0	0.56	49,621.0	0.60
Fen- non-patterned, shrubby, open	237.0	0.28	5,269.0	0.31	25,702.0	0.31
Fen- non-patterned, treed	24.0	0.03	597.0	0.04	3,057.0	0.04
Fen- patterned, open	0.00	0.00	0.00	0.00	1,742.0	0.02
Bog- treed	20.0	0.02	398.0	0.02	2,317.0	0.03

Source: Joro Consultants Inc., adapted from Halsey et al 1997.
Note: In the regional assessment area, wetlands are dominantly bogs and fens.

The proportion of wetland types are similar across all assessment area scales. Within the project assessment area, 67% of the RoW is characterized as fen and bog wetland complex, while 28.0% is classed as open or shrubby fen with no surface peat ridge pattern. The remaining 5.0% of the project assessment area wetland is divided between treed non-patterned fens and treed bogs. There are no patterned open fens within the project or local assessment areas. Within the regional assessment area, 60% of the land area is characterized as fen and bog wetland complex, in which elements of both fen and bog are present in a mosaic of vegetation. Open or shrubby fens with no surface peat ridge patterning account for 31% of the regional area. The remaining 9.0% of regional wetlands is divided among non-patterned treed fens, open patterned fens and treed bogs.

Non-patterned open fens are characterized by the presence of a continuous sedge cover and sparse to no trees. Fens can be poor, or moderately to extremely rich in dissolved nutrients. Birch and willow shrubs may be present, the ground cover in wet poor fens is *Sphagnum* mosses. Non-patterned open fens can occur as collapse scars in association with peat plateaus, as laggs associated with bog islands, or as small isolated basins (Halsey et al. 1997).

Non-patterned treed fens have a variable range in tree cover (i.e. wooded >10% to forested <70%) in some combination of black spruce/ tamarack, with a common shrub understory of birch and willow, ground mosses are *Sphagnum* or brown mosses. These fens can be poor, or moderately to extremely rich in dissolved minerals.

Patterned open fens have tree cover (<10%) in any combination of tamarack, black spruce, birch and willow, with potential ground cover of sphagnum or brown mosses.

Treed bogs are forested exclusively by black spruce and may be characterized by the presence of open wet Sphagnum/ sedge dominated associations. These internal lawns represent areas of permafrost that have historically degraded, and which may still contain relict permafrost. Treed bogs can occur as uniformly wooded islands within large complex fens or as peninsulas protruding into large fens. Bogs can also be found confined to small basins associated with hummocky terrain or in broad, poorly defined depressions as well as along drainage divides. Ground cover is dominated by lichens and *Sphagnum* mosses (Halsey et al. 1997).

4.3.4 Vegetation Communities

The management plan created for the traditional territories of Poplar River First Nation (Asatiwisipe Aki Management Plan 2011), is one outcome of a series of initiatives to study traditional knowledge and land use within Poplar River First Nations. This plan highlights the desire of Poplar River First Nation to secure protection for their traditional lands and resources, while recognizing interrelationships with neighbouring First Nations, and the need to cooperate in the protection and management in the wider territory of ancestral lands.

The management plan recognizes a diversity of vegetation and habitats that characterize these traditional lands, and further that the distinctive vegetation community associations reflect variation in soils, topography, water and drainage (Asatiwisipe Aki Management Plan 2011). Towards this end the digital Forest Resource Inventory (FRI) dataset was used to determine the vegetation communities that occur throughout Poplar River First Nation traditional territories. The FRI digital dataset was produced by the Manitoba Forest Resource Management Branch, for management of commercial forestry in the province, by digitizing 1:15,840 aerial photography taken during the mid-1980s, and classifying the resulting polygons based on vegetative characteristics (Manitoba Land Initiative 2015). As such, seven Forest Ecosystem Site Types (after Zoladeski et al. 1995) are identified by Ecodistrict, across the Poplar River First Nation traditional lands. Five of these vegetation community types occur in the Berens River and the Wrong Lake Ecodistricts, and fall within the northern portion of the P4 regional vegetation assessment area, Table 4.3.4.

The Poplar River/ Nanowin Park Reserve covers approximately 862,000 ha of the Poplar River traditional territory. It had received interim protection under the Manitoba Provincial Parks Act, since 1999 and through subsequent five-year extensions, while being considered for designation as a protected area. As of 2011, with the establishment of

Asatiwisipe Aki, this traditional territory is currently one of the largest protected areas in the province (Asatiwisipe Aki Management Plan 2011).

Table 4.3.4. Forest ecosystem site type description of vegetation communities within ecodistricts of the P4 study area.		
Community Type	**Soils**	**Vegetation**
Berens River Ecodistrict		
Lowland Black Spruce	Wet, poorly drained organic soils.	Black spruce, with developed shrub layer, sparse herb layer, and a continuous ground layer of *Sphagnum* and feather mosses.
Aspen Hardwood Mixedwood	Deep moist fine textured upland mineral soils.	Aspen with birch, balsam poplar, jack pine, balsam fir, white and black spruce. Rich shrub and herb layer, sparse ground mosses.
Wrong Lake Ecodistrict		
Black Spruce Mixedwood	Moist, fine-textured mineral soils.	Black spruce, with aspen, birch, jack pine and balsam poplar. Rich shrub and herb layer, and well developed feather moss ground cover.
Jack Pine Mixedwood	Upland, fresh to moist mineral soils.	Jack pine with black spruce, aspen and birch. Shrub and herb layer range from poor to rich, with well-developed feather moss ground layer.
White Spruce/ Balsam Fir Mixedwood	Moist well-drained mineral soil.	White spruce, with diverse canopy of balsam fir, black spruce, birch, aspen, balsam poplar and jack pine. Shrub and herb layer range from rich to poor, with a feather moss ground layer.

Source: Asatiwisipe Aki Management Plan 2011, *after* Zoladeski et al. 1995.

4.4 Local Flora

4.4.1 Native Species

A list of potential plant species expected to occur within the P4 study area and throughout the region was compiled from available data sources including provincial data (MB Conservation Data Center), herbarium records (The Manitoba Museum), regional flora (e.g. Ames et al. 2005; Cody 1989; Flora of North America 2015; Scoggan 1957), and existing literature (e.g. Asatiwisipe Aki Management Plan 2011; Davidson-Hunt et al. 2012; Wilson and Aykroyd 2004). This preliminary flora list contains all species with a potential to range in the P4 study area. This flora includes over 450 vascular and non-vascular species from over 80 families, occurring in terrestrial, wetland and aquatic habitats. A species list from the field component of this study (to occur in June 2015) is expected to include species identified in the preliminary species list, see Appendix II.

4.4.2 Introduced Species

A number of non-native and invasive species are expected to occur across the greater P4 study area. Generally not naturally found in undisturbed boreal forest habitats, many species are introduced along roads, rivers and streams, and generally follow human

activities. Introduced species grow outside of their region of origin and generally thrive on disturbed sites, are often prolific seed producers, and can tolerate poor or disturbed soils (Langor et al. 2014). Where established, non-native and invasive plants can impact ecosystem diversity, structure, and function. Invasive species compete with native species, forming dense populations that may subsequently spread to other areas. Displacement of native species can change the floristic composition of an ecosystem, potentially endangering species of concern. Invasive species have been cited as risk factors for species of conservation concern (Canadian Food and Inspection Agency 2008).

Within the preliminary list of species expected to occur in the greater P4 study area are 26 introduced species, evenly divided between non-native and invasive species (Invasive Species Council of Manitoba 2015; MBCDC 2015), Table 4.4.2. The boreal shield has a relatively high number of invasive plants, compared to other ecozones in Canada (CFIA 2008). Non-native and invasive plants in the boreal are commonly perennial herbs and grasses, particularly from among the Asteraceae (composites), Fabaceae (legumes), and Poaceae (grasses) families, (Langor et al. 2014).

Table 4.4.2. Potential introduced species, Lac Seul Upland Ecoregion.

Family	Scientific Name	Common Name	S Rank	Invasive
Poaceae	*Agrostis stolonifera*	Creeping Bent Grass	SNA	
Poaceae	*Bromus inermis*	Smooth Brome	SNA	
Poaceae	*Elymus repens*	Quack-grass	SNA	
Poaceae	*Phalaris arundinacea*	Reed Canary Grass	S5	X
Poaceae	*Phleum pratense*	Timothy	SNA	
Typhaceae	*Typha angustifolia*	Narrow-leaved Cat-tail	S4	X
Polygonaceae	*Rumex crispus*	Curly Dock	SNA	
Chenopodiaceae	*Chenopodium album*	Lamb's-quarters	SNA	
Ranunculaceae	*Ranunculus acris*	Common Buttercup	SNA	X
Fabaceae	*Medicago lupulina*	Black Medic	SNA	
Fabaceae	*Medicago sativa*	Alfalfa	SNA	X
Fabaceae	*Melilotus alba*	White Sweetclover	SNA	X
Fabaceae	*Melilotus officinalis*	Yellow Sweetclover	SNA	X
Fabaceae	*Trifolium hybridum*	Alsike Clover	SNA	
Fabaceae	*Trifolium pratense*	Red Clover	SNA	
Fabaceae	*Trifolium repens*	White Clover	SNA	
Fabaceae	*Vicia cracca*	Tufted Vetch	SNA	X
Euphorbiaceae	*Euphorbia esula*	Leafy Spurge	SNA	X
Plantaginaceae	*Plantago major*	Common Plantain	SNA	
Asteraceae	*Arctium* sp.	Burdock	SNA	X
Asteraceae	*Artemisia absinthimum*	Wormwood	SNA	
Asteraceae	*Cirsium arvense*	Canada Thistle	SNA	X
Asteraceae	*Leucanthemum vulgare*	Ox-eye Daisy	SNA	X
Asteraceae	*Sonchus arvensis*	Field Sow-thistle	SNA	X
Asteraceae	*Tanacetum vulgare*	Common Tansy	SNA	X
Asteraceae	*Taraxacum officinale*	Common Dandelion	SNA	

With two exceptions, all introduced species are exotic, and currently ranked as SNA, e.g. a conservation status rank not is applicable (MBCDC 2015). Narrow-leaved cat-tail (*Typha angustifolia*), S4, is considered to be an invasive species due to its rapid spreading range, and tendency to form monospecific stands, which replace native plants. *Typha angustifolia* will hybridize with the native species *Typha latifolia* (*Typha* x *glauca*). Though thought to be sterile, the hybrid may also threaten biodiversity due to its invasive potential (Selbo and Snow 2004). Reed canary grass (*Phalaris arundinaceae*, S5) is native to north eastern North America, its spread facilitated by introduction of Eurasian commercial cultivars for forage. While the native species and its introduced cultivars are indistinguishable in field conditions, *Phalaris* remains an aggressive invasive species in wetlands (ISCM 2015), which can outcompete and eliminate the native genotypes, and other native species (White et al. 1993).

4.4.3 Species of Conservation Concern and Special Interest

According to provincial sources, there are 56 species of conservation concern that can be expected to range within the Lac Seul Uplands Ecoregion (MBCDC 2015). There are currently no species at risk listed in the Lac Seul Uplands Ecoregion, with either the Manitoba Endangered Species and Ecosystems Act (ESEA), the federal Species at Risk Act (SARA), or the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Based on records at the Manitoba Conservation Data Centre, collected specimens from Manitoba Museum herbarium, and literature data available, there are an estimated 40 species of conservation concern that may potentially occur within the P4 regional assessment area and surroundings, Table 4.4.3. Of these, four are ranked very rare (S1) and 15 are ranked rare (S2) by the MBCDC. No species are listed under Schedule 1 of SARA.

Table 4.4.3. Potential species of conservation concern, Lac Seul Upland Ecoregion.

Family	Scientific Name	Common Name	S Rank	G Rank
Lycopodiaceae	*Diphasiastrum tristachyum*	Ground-cedar	S3	G5
Lycopodiaceae	*Huperzia lucidula*	Shining Club-moss	S1	G5
Lycopodiaceae	*Huperzia selago*	Mountain Club-moss	S2S3	G5
Lycopodiaceae	*Lycopodiella inundata*	Bog Club-moss	S1	G5
Lycopodiaceae	*Lycopodium clavatum* var. *clavatum*	Running-pine	S2	G5TNR
Dryopteridaceae	*Dryopteris fragrans*	Fragrant Shield Fern	S3S4	G5
Dryopteridaceae	*Gymnocarpium jessoense*	Northern Oak Fern	S3S4	G5
Dryopteridaceae	*Onoclea sensibilis*	Sensitive Fern	S3S4	G5
Taxaceae	*Taxus canadensis*	Canada Yew	S3	G5
Potamogetonaceae	*Potamogeton amplifolius*	Large-leaved Pondweed	S2?	G5
Eriocaulaceae	*Eriocaulon aquaticum*	White-buttons	S1	G5
Poaceae	*Glyceria pulchella*	Graceful Manna Grass	S2	G5
Poaceae	*Torreyochloa pallida* var. *fernaldii*	Pale Manna Grass	S2	G5T4Q

Table 4.4.3. Potential species of conservation concern, Lac Seul Upland Ecoregion.				
Family	**Scientific Name**	**Common Name**	**S Rank**	**G Rank**
Cyperaceae	*Carex castanea*	Chestnut Sedge	S3	G5
Cyperaceae	*Carex livida*	Livid Sedge	S3	G5
Cyperaceae	*Carex projecta*	Necklace Sedge	S2?	G5
Cyperaceae	*Carex vesicaria*	Blister Sedge	SU	G5
Cyperaceae	*Dulichium arundinaceum*	Three-way Sedge	S2	G5
Cyperaceae	*Rhynchospora alba*	White Beakrush	S3?	G5
Cyperaceae	*Schoenoplectus subterminalis*	Water Bulrush	SU	G4G5
Juncaceae	*Juncus vaseyi*	Big-head Rush	S4?	G5?
Alismataceae	*Sagittaria rigida*	Sessile-fruited Arrowhead	S2	G5
Orchidaceae	*Arethusa bulbosa*	Arethusa	S2	G4
Orchidaceae	*Cypripedium arietinum*	Ram's Head Lady's-slipper	S2S3	G3
Orchidaceae	*Goodyera tesselata*	Tesselated Rattlesnake Plantain	S2	G5
Orchidaceae	*Platanthera hookeri*	Hooker's Orchid	S2	G4
Orchidaceae	*Platanthera orbiculata*	Round-leaved Bog Orchid	S3	G5
Aristolochiaceae	*Asarum canadense*	Wild Ginger	S3S4	G5
Cistaceae	*Hudsonia tomentosa*	False Heather	S3	G5
Nymphaeaceae	*Nymphaea odorata* ssp. *odorata*	Fragrant Water-lily	S2	G5T5
Violaceae	*Viola selkirkii*	Long-spurred Violet	S2	G5?
Haloragaceae	*Myriophyllum alterniflorum*	Water-milfoil	S2?	G5
Haloragaceae	*Myriophyllum farwellii*	Farwell's Water-milfoil	S1	G5
Pyrolaceae	*Pyrola americana*	Round-leaved Pyrola	S2	G5
Ericaceae	*Vaccinium caespitosum*	Dwarf Bilberry	S3	G5
Gentianaceae	*Gentiana rubricaulis*	Closed Gentian	S2S3	G4?
Solanaceae	*Leucophysalis grandiflora*	Large White-flowered Ground-cherry	S3	G4?
Rubiaceae	*Galium aparine*	Cleavers	SU	G5
Campanulaceae	*Lobelia dortmanna*	Water Lobelia	S2	G4G5
Asteraceae	*Megalodonta beckii*	Water-marigold	S3	G4G5

Due to the lack of detailed botanical field studies in this area, only four species of conservation concern have been previously collected from the region, i.e. blister sedge (*Carex vesicaria*, SU), tessellated rattlesnake plantain (*Goodyera tesselata*, S3), big-head rush (*Juncus vaseyi*, S4?), and dwarf bilberry (*Vaccinium caespitosum*, S3), as listed with The Manitoba Museum and the MBCDC.

4.5 Aboriginal Traditional Knowledge

Aboriginal traditional knowledge can be considered a dynamic process of learning from elders and observing from nature, while adapting this knowledge to enhance the quality of life (Marles et al. 2000). Primarily preserved by oral traditions passed down through generations, the documentation of aboriginal traditional knowledge, particularly when led

by individual Aboriginal communities, can help preserve local knowledge and culture for generations to come. A great deal of aboriginal traditional knowledge concerns plants and their use as food, medicines, for handicrafts, and technology. Aboriginal people have been sustainably gathering and harvesting plants from the boreal forest in Canada for thousands of years (Marles et al. 2000).

4.5.1 Pimachiowin Aki

Pimachiowin Aki (Ojibwe: *the land that gives life*) is a non-profit corporation seeking international recognition for an Anishinabe cultural landscape as a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site (Province of Manitoba 2007). Straddling the boundary of Manitoba and Ontario and covering 33,400 km^2, Pimachiowin Aki is made up of five isolated Anishinaabe settlements, including Poplar River First Nation. While Berens River First Nation is directly adjacent to Pimachiowin Aki lands, community-led documentation of its traditional knowledge is still in early stages.

A variety of vegetation including trees, shrubs, flowers, mosses and lichens have historically been both an important food source and medicinal source for the Pimachiowin Aki (Davidson-Hunt et al. 2012). Plant species identified as being important for sustenance and cultural practices include the following: balsam poplar, white spruce and birch trees, red-osier dogwood, Labrador tea, lichens, *Sphagnum* mosses, and cinder cork fungus. Common food plants among communities of Pimachiowin Aki include cloudberry, small cranberry, pin cherry, blueberry and water parsnip. Blueberry picking is important to the people and depended on for nutrition. Medicinal plants include poplar, sweet flag, dewberry, wild mint, and prickly and smooth rose (Davidson-Hunt et al. 2012).

Wild rice seeding, harvesting, processing and marketing of rice have long been part of the Anishinaabe culture. The importance of rice was noted by some of the earliest visitors, such as George Sutherland, a fur trade explorer of the Hudson Bay Company to the lands of Pimachiowin Aki in the an 18^{th} century (Davidson-Hunt et al. 2012). Wild rice is still an integral component of feasts held today by Anishinaabe people.

Carrots and potatoes were commonly grown by the Anishinaabe people. The introduction of the potato is not well documented but could have occurred through contact with southern tribes, or from the Hudson Bay and the Northwest Companies, through their gardens established at posts (Davidson-Hunt et al. 2012).

Trees meet many needs of the Anishnaabe of Pimachiowin, providing building and craft materials, fuel supply, and a source of food and medicine. Jack pine is one of the favoured fire woods as a result of its high heat content, while black spruce is useful for medicines and their roots gathered for cordage. Poplar wood is used for smoking meat, fish and curing hides (Davidson-Hunt et al. 2012). Birch trees are useful for wood working, starting fires,

supply sap in the spring, while birch bark is used for baskets and birch scrolls were once used to make maps (Davidson-Hunt et al. 2012).

The economic value of ecosystem services and benefits provided by the Pimachiowin Aki landscape were highlighted in a recent report published for Pimachiowin Aki by the International Institute for Sustainable Development (Voora and Barg 2008). Ecosystem services have direct relevance to local communities, and have value at regional and global scales. Many specific benefits concern plant species or vegetation communities, such as the ability to harvest berries and medicinal plants; carbon storage, flood and erosion control, air and water filtration by peatlands and forests; wildlife habitat refuges, soil formation and pollination (Voora and Barg 2008).

4.5.2 Poplar River First Nation

Recent efforts to document aboriginal traditional knowledge of the Poplar River First Nation are apparent through the creation of the Asatiwisipe Aki Management Plan (2011), and through the establishment of Pimachiowin Aki. During research for the East Side of Lake Winnipeg Large Area Transportation Network Study (LATNS; SNC-Lavalin Inc. 2010, Appendix 9) surveys and interviews were conducted with elders and trappers in a number of local communities, including Poplar River and Berens River. This work resulted in mapping of broad areas used for traditional purposes, such as berry picking, hunting, trapping and fishing activities, burial and spiritual areas, and special gathering places. For example within the P4 study area, areas where berry picking occurs are concentrated around the community of Poplar River, and extend along the Poplar River waterway, and around nearby Weaver Lake. Other isolated areas to the north of the P4 study area were also identified as important areas for berry picking for the community of Poplar River (SNC-Lavalin Inc. 2010, Appendix C: Map PR 9).

Areas used in Aboriginal traditional knowledge and traditional purposes within the Poplar River territory are shown in Map 8. Within Poplar River, certain areas are used for traditional purposes based on specific vegetation present, for example birch areas occur within the regional assessment area, and areas where berry picking occurs in all P4 levels of assessment. Areas included in traditional knowledge concerning vegetation among the Poplar River First Nation are shown in Table 4.5.2.

Table 4.5.2. Area (ha) concerning vegetation and Aboriginal Traditional Knowledge of Poplar River First Nation, among assessment areas.

Vegetation	Project	Local	Regional
Birch area	-	-	372.0
Area where berry picking occurs	71.0	1,097.0	8,102.0

Source: Joro Consultants Inc. *from* ESRA 2015.

4.5.3 Berens River First Nation

Community-led documentation of traditional knowledge related to the Berens River First Nation is on-going. In the course of research on traditional ecological knowledge (LATNS; SNC-Lavalin Inc. 2010, Appendix 9), maps were produced to provide details on broad areas used by the community of Berens River for traditional purposes. Initial documentation for areas where berry picking by Berens River First Nation occurs primarily along the Berens River (SNC-Lavalin Inc. 2010, Appendix C: Map BR 9), which passes through the southern tip of the P4 project assessment area.

A recent workshop on traditional knowledge held at Berens River (April 22, 2015) discussed specific plant species that have been and continue to be considered important by members of the community. Important berries cited for the Berens River community include blueberries, saskatoons, strawberries, raspberries, moss berries/cranberries and pin cherries, while other important local food sources in Berens River include hazelnuts (Neegan Burnside 2015). Wild rice, produced in the past, is still valued by the community and may once again become an important locally harvested wild food around Berens River. Gardening is also currently practiced in Berens River, as members of the community raise tomatoes, pumpkins, carrots, rhubarb and cucumbers (Neegan Burnside 2015).

Berens River community members identified certain plants as useful for medicinal purposes, such as wild ginger (*Asarum canadense*), sweet flag (*Acorus americanus*), and a yellow flowered water lily (possibly *Nuphar* sp.). Notably, dry creek beds are considered important places for the collection of medicinal plants (Neegan Burnside 2015). Berens River community members have in recent years observed certain invasive plant species that have not traditionally been a part of the local environment, such as purple loosestrife and common dandelion.

Within the Berens River area, jack pine wood is particularly prized for heating and fires, while birch wood is preferred for crafting (e.g. showshoe construction). Local forest tent caterpillar outbreaks have been observed over the last two seasons (Neegan Burnside 2015).

Through the course of these past studies and discussions (e.g. Asatiwisipe Aki Management Plan 2011; Davidson-Hunt et al. 2012; SNC-Lavalin Inc. 2010; Neegan Burnside 2015), it is clear that all local Aboriginal community members place a high value on the land, and on their relationship to the land. The concern for the protection of habitat quality is shared among all communities. There is a deep understanding that both traditional aboriginal knowledge along with proven management practices will help protect natural ecological processes of these lands, but also preserve community cultural values, and Aboriginal people's place within the boreal ecosystem.

4.5.4 Plants of Cultural Importance

As an outcome of a study on indigenous plants, the Poplar River Anishinabek Plant Guide (Bruce et al. *compilers* 2002: *In* Asatiwisipe Aki Management Plan 2011) was produced to describe Aboriginal values and uses for local plants. The plant guide lists fifty different trees, shrubs, herbs grasses, mosses and lichens that have been used for sustenance and in traditional cultural practices. An adapted excerpt from the plant guide (Asatiwisipe Aki Management Plan 2011) includes the Anishinabek names for the species mentioned, and is reproduced in Table 4.5.4, below.

Table 4.5.4. Plants of cultural importance listed by habitat, with Anishanaabe, scientific and common names.

Form	Anishinabek Name	Scientific Name	Common Name
Poplar Woods Habitat- Azaadi Noopiming			
Tree	Azaadi	*Populus tremuloides*	Trembling Aspen/Poplar
Tree	Maanazaadi	*Populus balsamifera*	Balsam Poplar
Tree	Mina'ig	*Picea glauca*	White Spruce
Tree	Nipigandag	*Abies balsamea*	Balsam Fir
Shrub	Ininiminan	*Vaccinium caespitosum*	Dwarf Blueberry
Shrub	Miishinchiiminag	*Ribes triste*	Swamp Red Currant
Shrub	Miskopiimag, Omagaakiiminan	*Cornus seracea*	Red-osier Dogwood, Red Willow
Shrub	Moozominan	*Viburnum edule*	Mooseberry/Low-bush Cranberry
Shrub	Pagaanag	*Corylus cornuta*	Beaked Hazelnut
Vine	Waapiizhishooatig	*Lonicera dioica*	Twining Honeysuckle
Herb	Ginebigominan	*Actaea rubra*	Baneberry
Herb	Nishkiinzhigominan	*Rubus pubescens*	Dewberry
Herb	Oteiminan, oteiminatigoon	*Fragaria virginiana*	Wild Strawberry
Herb	Ozhaashaagominan	*Cornus canadensis*	Bunchberry
Herb	Waaboozojiibik	*Sanicula marilandica*	Snakeroot
Riverside Habitat - Chigoziibig			
Shrub	Wiigopiin, wiisagopiimag	*Salix spp.*	Willows
Herb	Omikawingushk	*Mentha arvensis*	Wild Mint
Herb	Pozaagan, zhigaagomish	*Typha latifolia*	Cattail
Herb	Wiike, wiikens	*Acorus americanus*	Ratroot/Sweet Flag
Herb	Gichimashkosiin	*Phragmites australis*	Giant Reed grass
Herb	Mashkosiiminan	*Zizania palustris*	Wild Rice
Muskeg Habitat - Mashkiig			
Tree	Mashkiigoatig	*Larix laricina*	Tamarack/Larch
Tree	Zhigob	*Picea mariana*	Black Spruce
Shrub	Gaagigebag,	*Rhododendron*	Labrador Tea

Table 4.5.4. Plants of cultural importance listed by habitat, with Anishanaabe, scientific and common names.			
Form	**Anishinabek Name**	**Scientific Name**	**Common Name**
	mashkiigobagoon	*groenlandicum*	
Shrub	Mashkiigominan	*Vaccinium oxycoccus*	Bog Cranberry
Shrub	Waapigoshiminan	*Gaultheria hispidula*	Creeping Snowberry/Wintergreen
Moss	Aagi, mashkiig, miskokamig	*Sphagnum spp.*	Sphagnum/Peatmoss
Rocky Highland Habitat - Pangodinang			
Tree	Ogik	*Pinus banksiana*	Jack Pine
Tree	Wiigwas	*Betula papyrifera*	Paper Birch/White Birch
Shrub	Gaagaagiwanatig	*Juniperus communis*	Common Juniper
Shrub	Ininiminan/	*Vaccinium myrtilloides*	Velvet-leaved blueberry
Shrub	Makominan/	*Arctostapylos uva-ursi*	Bearberry
Shrub	Makominatig	*Sorbus decora*	Mountain Ash
Shrub	Miskominag	*Prunus pennsylvanica*	Pin Cherry
Shrub	Miskominan	*Rubus idaeus*	Wild Red Raspberry
Shrub	Mizaakotoominag	*Amelanchier spp.*	Saskatoon/Serviceberry
Shrub	Nikiminan	*Ribes oxyacanthoides*	Gooseberry
Shrub	Wiisagiminan	*Vaccinium vitis-idaea*	Cranberry
Herb	Majimashkoos	*Toxicodendron rydbergii*	Poison Ivy
Herb	Oshkiitebagoon	*Maianthemum canadense*	Wild lily-of-the-valley
Herb	Pizhiigojiibik	*Heuchera richardsonii*	Alumroot
Lichen	Aasaakamig	*Cladina spp.*	Reindeer Lichen
Fungus	Asiniiwakwanag	*Umbilicaria spp.*	Brown Rock Tripe
Fungus	Kabaashkaanasewa, Pozaaganag	*Lycoperdon spp*	Puffball
Roadside Habitat - Opimekanang			
Shrub	Oginiik	*Rosa acicularis*	Prickly Rose
Herb	Choochooshaaboojiibik	*Taraxacum officinale*	Common Dandelion
Herb	Kawaapanakiig	*Heracleum lanatum*	Cow Parsnip
Herb	Ozagaanjiigesiiwag	*Arctium minus*	Burdock
Herb	Pizhikiwingushk	*Artemisia absinthium*	Sagewort/Wormwood
Herb	Mazaanowashkoon	*Hordeum jubatum*	Foxtail Barley

5.0 POTENTIAL EFFECTS ASSESSMENT

The identification of potential effects of the proposed P4 All-Season Road Project was carried out based on information provided by ESRA, information from the MBCDC, literature and internet searches. Environmental assessments conducted on other recent all-season road projects in Manitoba were also reviewed. Requirements of *The Environment Act* (Manitoba) and the *Canadian Environmental Assessment Act* (2012) and regulations and guidelines were considered in the preparation of the effects assessment for the Road Project. This assessment report conforms to Manitoba Conservation and Water Stewardship's guideline for preparing an Environment Act Proposal Report (Manitoba Conservation and Water Stewardship 2015).

The environmental effects of the proposed P4 All-Season Road Project were identified from environmental assessment reports conducted on other all-season road proposals, east of Lake Winnipeg, and by using professional judgement. Community concerns were considered in the effects assessment. Environmental effects are a predicted change in the environment caused by the project, while mitigation are measures to avoid, prevent, and minimize adverse environmental effects. Residual effects are environmental effects predicted to remain after the application of mitigation measures.

The significance of the residual environmental effects for the proposed P4 All-Season Road Project was evaluated using criteria provided by the Manitoba East Side Road Authority (Table 5.0.).

Table 5.0. Description of significance criteria used for the residual effects assessment.		
Assessment Criteria	**Range of Criteria**	**Level of Effect and Definition**
Direction of Change (type of effect)	Negative	Net loss (adverse or undesirable change) to the environmental component.
	Positive	Net benefit (or desirable change) to the environmental component.
Ecological Context (degree of adverse influence on the ecosystem)	Low	**Level I** – No meaningful adverse ecosystem effects; potential effects are within the range of natural variation and result in minimal disruption of ecological functions and relationships in the area affected.
	Moderate	**Level II** – Potential adverse effects are outside the range of natural variation and result in some disruption of non-critical ecological functions and relationships.
	High	**Level III** – Potential adverse effects are outside the range of natural variation and result in disruption of critical ecological functions and relationships.
Duration (period of time the effect occurs)	Short-Term	**Level I** - The potential effect results from short-term events or activities such as the time required to complete discrete component (e.g., culvert installation), seasonal or annual construction, maintenance or rehabilitation activities (i.e., a timeframe of several months).
	Medium-Term	**Level II** - The potential effect is likely to persist until the completion of construction and rehabilitation activities (i.e., a timeframe of 8 to 10 years).
	Long-Term	**Level III** -The potential effect is likely to persist beyond the completion of construction and rehabilitation activities into the operations and maintenance phase of the Project (i.e., a timeframe of greater than 10 years).
Magnitude (degree or intensity of the change)	Low	**Level I** - A change of low magnitude is not likely to have a definable, detectable or measurable potential effect above baseline (i.e., potential effect is within a normal range of variation) or is below established thresholds of acceptable change (e.g., water quality guideline).
	Moderate	**Level II** – A change of moderate magnitude will have a measurable potential effect that can be detected with a well-designed monitoring program; but is only marginally beyond standards/guidelines or established thresholds of acceptable change.
	High	**Level III** – A change of high magnitude will have potential effects that are easily observed, measured and described (i.e., readily detectable without a monitoring program) and are well beyond guidelines or established thresholds of acceptable change.
Extent (Spatial	Project	**Level I** - The physical space or directly affected area on which

Table 5.0. Description of significance criteria used for the residual effects assessment.		
Assessment Criteria	**Range of Criteria**	**Level of Effect and Definition**
Boundary)	Footprint	Project components or activities are located and/or immediately adjacent area which is the defined limits of the P4 All-season road right-of-way (i.e., 100 m) and permanent and temporary facilities (e.g., temporary access roads and quarries) within which potential effects are likely to be measurable.
	Local Assessment Area	**Level II** - Area within which potential project effects are measurable and extending beyond the Project Footprint to, but not beyond, the Local Assessment Area.
	Regional Assessment Area	**Level III** - Area beyond the Local Assessment Area within which most potential indirect and cumulative effects would occur.
Frequency (how often the effect occurs)	Once	**Level I** - The potential effect occurs once over the duration of the disturbance (e.g., initial clearing of the right-of-way).
	Intermittent	**Level II** - The potential effect occurs at sporadic or intermittent intervals during the Project phase in which they occur or life of the Project (e.g., blasting at quarries; site-specific construction equipment noise; potential wildlife-vehicle collisions).
	Continuous	**Level III** – Potential effect occurs at regular and frequent intervals during the Project phase in which they occur or during the life of the Project (e.g., construction traffic; operations traffic).
Reversibility (the degree of permanence)	Reversible (short-term)	**Level I** – Potential effect is readily reversible over a relatively short period of time (i.e., ≤ to the Project construction phase of approximately 8 years).
	Reversible (long-term)	**Level II** - Potential effect is potentially reversible but over a long period of time (i.e., many years into the Project operations phase).
	Irreversible	**Level III** - Project-specific potential effects are permanent.

5.1 Environmental Issues

Regional issues of concern for the assessment of the proposed P4 All-Season Road Project were determined from professional experience, literature and a traditional knowledge workshop held at Berens River (April 22, 2015) to include:

Spread of Invasive Plant Species

Invasive plant species are plants that out-compete native species when introduced outside of their natural setting. Invasive species may establish and proliferate as a result of the Project. These species are problematic because they are capable of growing under a wide range of climatic and soil conditions, produce abundant seeds, and often have vigorous growth.

5.2 Valued Components

Valued Components (VCs) refer to environmental biophysical or human features that may be impacted by a project. The value of a component not only relates to its role in the ecosystem, but also to the value people place on it. The value of a component may be determined on the basis of scientific, social, cultural, economic, historical, archaeological or aesthetic importance.

Information on environmental indicators and measurable parameters are provided on the VCs. Environmental indicators are aspects of VCs or the environment that are subject to change by a project activity, while measurable parameters are variables used to express changes in the environmental indicators. VCs that have the potential to be adversely affected by project activities receive special consideration in the assessment of cumulative environmental effects. VCs identified for the proposed P4 All-Season Road Project assessment include the following:

Species of Special Interest

Species of special interest are valued because these are plants that exist in low numbers, play a role in helping to preserve species diversity, their distribution is often restricted, and some species are protected. Protected species are listed by The Endangered Species and Ecosystems Act – Manitoba (ESEA) and the federal Species at Risk Act (SARA), under Schedule 1. Federal species designated as endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) are also included as are species listed by the Manitoba Conservation Data Centre (MBCDC) ranked very rare to rare.

Botanical Resource Areas and Culturally Important Plants

Botanical resource areas are valued locations where Aboriginal people have gathered plants and collected berries for subsistence, and medicinal, cultural and spiritual uses. Plant species of cultural importance may include blueberry, cranberry, raspberry, strawberry, saskatoon, cloudberry and wild rice, and many other medicinal plants and herbs (Northern Lights Heritage Services 2000).

5.3 Effects Analysis

The following identifies the effects on vegetation and soils for the proposed P4 All-Season Road Project.

5.3.1 Vegetation

Effects of roads on vegetation and terrestrial ecosystems have been well documented (Angold 1997; Forman and Alexander 1998; Trombulak and Frissell 1999; Hui et al. 2003; Noss 2002; and Watkins et al. 2003). Effects include habitat loss, altering interior forest conditions, destroying natural vegetation along sides of the road, reduction in biomass, introduction of non-native plant species, increased erosion potential, and increased abundance of grass species near roads. Road dust affects vegetation by covering plant surfaces, affecting photosynthesis, respiration and transpiration, resulting in decreased productivity (Farmer, 1993).

Environmental effects of the proposed PR 304 to Berens River All-Season Road on the east side of Lake Winnipeg have been reported on in environmental assessments by the Manitoba Floodway and East Side Road Authority (2010, 2011) and the Canadian Environmental Assessment Agency (2011). Environmental effects included the loss of forest and wetland vegetation through clearing (Canadian Environmental Assessment Agency 2011) and the spread of non-native and invasive plant species during construction activities (Manitoba Floodway and East Side Road Authority 2010).

Effects from other linear development projects in Manitoba's boreal forest have been reported on by Calyx Consulting (2012) and Szwaluk Environmental Consulting et al. (2011) and include loss of native forest vegetation, introduction of invasive plant species, potential loss of habitat and plants used by Aboriginal people, disruption of riparian areas and wetlands, increased fragmentation, and increased risk of wildfire.

The proposed P4 All-Season Road Project was determined to affect vegetation and terrestrial ecosystems during construction, operation and maintenance stages. Potential environmental effects include the following:

1. Disturbance to or removal of native vegetation in the project assessment area due to clearing during construction. The P4 All-Season Road Project will result in the disturbance of approximately 1,309.4 ha of native vegetation; 937 ha from road construction and 223.4 ha from quarries and access roads.

2. Disturbance to or removal of bog/fen species in the project assessment area due to clearing during construction. The Project will result in the loss of approximately 363.3 ha of wetlands; 317 ha from road construction and 27.8 ha from quarries and access roads. Wetlands in the boreal forest are highly connected systems that transport water and nutrients across the landscape. Road development has the potential to impede water flow resulting in long-term vegetation changes (Ducks Unlimited Canada et al. 2014).

3. Disturbance to or removal of medicinally and culturally important species in the project assessment area due to clearing during construction. The Project will result in removal of approximately 71 ha of vegetation that is locally valued. A potential beneficial effect from the P4 All-Season Road Project will be increased access to new botanical resource areas by local community members.

4. Fragmentation of the local and regional vegetation communities due to clearing during construction. The P4 All-Season road, quarries and access roads will result in discontinuity in the spatial distribution of native vegetation.

5. Modification of vegetation composition and structure adjacent to the disturbance zone due to clearing during construction. The removal of native vegetation and the creation of new forest edges along a disturbance zone may result in changes to the vegetation. Increased solar radiation exposure and a change in microclimate along these edges may cause changes in structure and species composition (Ecological Land Surveys Ltd. 1999). Along newly created forest edges, windfall may result due to extreme weather events (e.g. high winds).

6. Loss of species of special interest in the project assessment area due to clearing during construction. These plants include species listed by the MBCDC as very rare to rare. Protected vascular plant species listed by ESEA and SARA are not expected to occur as the study area is beyond the geographic range of the listed species.

7. Introduction and spread of invasive and non-native species in the local assessment area during construction, operation and maintenance. Construction equipment and granular material used for construction can be a source of non-native and invasive plant species which can become problematic for the native plant species in the area.

8. Loss/impairment of vegetation in the project assessment area from accidental releases of fuels or hazardous substances during road construction and operation and maintenance. In a past study that examined the effects of oil spills and vegetation, non-vascular plants and most dicot plants showed no recovery after oil was spilled on selected plant communities (Walker et al. 1978).

9. Loss/impairment of desirable plant species in the project assessment area from herbicide application during road operation and maintenance. Unfortunately, herbicides not only inhibit the growth of undesirable species but can also negatively affect desirable species by causing undue stress and possible mortality of vegetation that may be considered important for wildlife, traditional uses, or botanical value.

10. Impairment of vegetation in the project assessment area from dust during road construction, operation and maintenance. Dust can have a potential negative effect on the environment causing stress to adjacent vegetation. A covering of dust on leaf surfaces increases solar heat absorption and decreases transpiration rates resulting in a reduction of carbon uptake (Succarieh 1992).

11. Increased risk of forest fire in the local and regional assessment area during construction and operation and maintenance. Wildfire has the potential to develop from the accumulation of slash during clearing and construction activities, and from human related causes as a result of new access during road operation.

Mitigation measures for vegetation effects have been reported by Forman and Alexander (1998), Daigle (2010), and Ducks Unlimited Canada et al. (2014). Best practices and environmental protection measures identified to mitigate adverse environmental effects on vegetation as a result of the proposed P4 All-Season Road Project include: limit clearing to designated area within the RoW, undertake construction activities during winter months to the extent possible, identify and flag plant species of interest prior to clearing, adjust the road alignment, where possible, to avoid loss of plant species of interest and important harvest areas; design road and construction practices to avoid adversely affecting the functionality of bogs and fens; implement design measures to maintain existing moisture conditions that support localized vegetative communities as per the Operational Guide to Forest Road Wetland Crossings (Ducks Unlimited Canada et al. 2014), wash construction equipment and vehicles prior to bringing them into the construction area, adhere to permit terms and conditions for herbicide use, undertake burning of slash piles during the winter months to the extent possible, and restore ground cover vegetation using natural means augmented with planting and seeding as required.

The range of evaluation criteria for potential residual effects on vegetation were determined to be adverse in direction of change, low to moderate ecological context, medium to long-term duration, low to moderate magnitude, extent ranging from the project footprint to the regional assessment area, frequency of once to continuous, and long-term reversibility of effects.

Follow-up actions identified include inspections to ensure that mitigation is implemented and effective. The residual effects on VCs (i.e., species of special interest, and botanical resource areas and culturally important plants) were determined to have minimal risk of loss/mortality in the project assessment area. The environmental effects analysis for vegetation is summarized in Table 5.3.1a.

Table 5.3.1a. Vegetation effects analysis.

Nature of Potential Effects	Mitigation Measures	Residual Effects	Evaluation
Disturbance to or removal of native vegetation in the project assessment area due to clearing during construction	• Limit clearing to designated areas within the RoW • Prohibit equipment and vehicle use outside the designated cleared area • Restore ground cover vegetation along road shoulders using natural means augmented with planting and seeding of native species as required	Removal of native vegetation confined to the RoW	Direction – negative; ecological context – low; duration – long-term; magnitude – moderate; extent – project footprint; frequency – once; reversibility – long-term
Disturbance to or removal of bog/fen species in the project assessment area due to clearing during construction	• Design road and construction practices to avoid adversely affecting the functionality of bogs and fens (i.e., equalization culverts to maintain wetland hydraulics) • Undertake construction activities during winter months to extent possible • Implement design measures to maintain existing moisture conditions that support localized vegetative communities as per the Operational Guide to Forest Road Wetland Crossings (Ducks Unlimited Canada et al. 2014)	Removal of bog/fen species confined to the RoW	Direction – negative; ecological context – low; duration – long-term; magnitude – moderate; extent – project footprint; frequency – once; reversibility – long-term

Table 5.3.1a. Vegetation effects analysis.			
Nature of Potential Effects	**Mitigation Measures**	**Residual Effects**	**Evaluation**
Disturbance to or removal of medicinally and culturally important species in the project assessment area due to clearing during construction	• Identify areas of cultural importance prior to clearing • Identify important medicinal and cultural plants and harvesting areas • Adjust road where possible to avoid to the loss of important harvesting area • Limit clearing to designated area within the RoW • Prohibit use of equipment and vehicles outside the designated cleared area	Minimal loss of vegetation and loss confined to the RoW	Direction – negative; ecological context – low; duration – long-term; magnitude – low; extent – project footprint; frequency – once; reversibility – long-term
Fragmentation of the local and regional vegetation communities due to clearing during construction	• Undertake construction activities during winter months to extent possible • Limit clearing to designated area within the RoW • Prohibit equipment and vehicle use outside the designated cleared area	Fragmentation confined to the RoW	Direction – negative; ecological context – low; duration – long-term; magnitude – moderate; extent – project footprint; frequency – once; reversibility – long-term
Modification of vegetation composition and structure adjacent to the disturbance zone due to clearing during construction	• Undertake construction activities during winter months to extent possible • Limit clearing to designated area within the RoW • Prohibit equipment and vehicle use outside the designated cleared area	Minimal modification of vegetation adjacent to disturbance zone	Direction – negative; ecological context – low; duration – medium-term; magnitude – low; extent – project footprint; frequency – once; reversibility – long-term
Loss of species of special interest in the project assessment area due to clearing during construction	• Identify and flag plant species of interest prior to clearing • Adjust road alignment where possible to avoid loss of plant species of interest and important harvesting areas • Prohibit equipment and vehicle use outside the	Minimal risk of loss of plant species of interest	Direction – negative; ecological context – low; duration – long-term; magnitude – low; extent – project footprint; frequency – once; reversibility –

Table 5.3.1a. Vegetation effects analysis.			
Nature of Potential Effects	**Mitigation Measures**	**Residual Effects**	**Evaluation**
	designated cleared area		long-term
Introduction and spread of invasive and non-native species in the local assessment area during construction, operation and maintenance	• Wash construction equipment and vehicles prior to bringing them into the construction site • Undertake construction activities during winter months to the extent possible	Minimal risk of invasive and non-native species introduction	Direction – negative; ecological context – moderate; duration – long-term; magnitude – moderate; extent – project footprint; frequency – continuous; reversibility – long-term
Loss/impairment of vegetation in the project assessment area from accidental releases of fuels or hazardous substances during road construction and operation and maintenance	• Construction sites to have an approved emergency response plan that includes fuel spills	Minimal risk of vegetation mortality	Direction – negative; ecological context – moderate; duration – long-term; magnitude – moderate; extent – project footprint; frequency – intermittent; reversibility – long-term
Loss/impairment of desirable plant species in the project assessment area from herbicide application during road operation and maintenance	• Apply herbicides in accordance with manufacturers guidelines and adhere to permit terms and conditions • Avoid herbicide application beyond road shoulder	Minimal risk of vegetation mortality	Direction – negative; ecological context – low; duration – long-term; magnitude – low; extent – project footprint; frequency – intermittent; reversibility – long-term
Impairment of vegetation in the project assessment area from dust during road construction,	• Undertake construction activities during winter months to extent possible • Use water or approved dust suppression agents that will	Minimal risk of vegetation mortality	Direction – negative; ecological context – low; duration – long-term;

Table 5.3.1a. Vegetation effects analysis.			
Nature of Potential Effects	**Mitigation Measures**	**Residual Effects**	**Evaluation**
operation and maintenance	not negatively affect plants		magnitude – low; extent – project footprint; frequency – intermittent; reversibility – short-term
Increased risk of forest fire in the local and regional assessment area during construction and operation and maintenance	• Undertake construction and burning during the winter months to the extent possible • Prohibit burning of slash piles during high forest fire conditions	Minimal risk of forest fires	Direction – negative; ecological context – moderate; duration – long-term; magnitude – moderate; extent – regional assessment area; frequency – intermittent; reversibility – long-term

Environmental indicators and measureable parameters for VCs are provided in Table 5.3.1b.

Table 5.3.1b. VC environmental indicators and measurable parameters.				
Valued Component	**Environmental Indicator**	**Measurable Parameter**	**Residual Effect**	**Comment**
Species of special interest	Species occurrence	Presence and abundance	Minimal risk of loss	Effects primarily restricted to project assessment area
Botanical resource areas and culturally important plants	Area of resource use	Hectares	Minimal loss of vegetation	Effects primarily restricted to project assessment area

5.3.2 Soils

The relationship between soils and vegetation growth has been researched by several authors (e.g., Twardy and Corns 1980; Strong and La Roi 1983; Klinka et al. 1994; Szwaluk and Strong 2003). Soils are important to vegetation for several reasons including the storing nutrients and providing a medium for growth. According to Hironaka et al. (1990), soils and vegetation are mutually associated with each other when reviewing basic concepts of development, both influenced by the same environmental variables.

Effects of road construction on the soil environment has been well documented (Bilby 1989; Daigle 2010; Noss 2002; Senes Consultants Ltd. 2005; Swift 1988; and Trombulak and Frissell 1999). Effects of road construction on soils include erosion, compaction, contamination, and loss of productivity.

Environment effects of the proposed PR 304 to Berens River All-Season Road on the east side of Lake Winnipeg have been reported on in environmental assessments by the Manitoba Floodway and East Side Road Authority (2010) and the Canadian Environmental Assessment Agency (2011). Environmental effects include contamination of soils from accidental spills and fuel releases, soil compaction, loss of soils, soil erosion and the modification of terrain and local drainage condition.

The proposed P4 All-Season Road Project was determined to affect soils during construction, operation and maintenance stages. Potential environmental effects include the following:

1. Loss of soils stripped in the project assessment area during construction.
2. Compaction of soils in the project assessment area during construction.
3. Loss of soil in the project assessment area through erosion during construction.
4. Impaired soil quality in the project assessment area from accidental releases of hydrocarbon and hazardous substances during construction, operation and maintenance.
5. Impaired soil quality in the project assessment area from herbicide application during construction, operation and maintenance.

Measures identified to mitigate adverse environmental effects on soils include stockpiling soils that are stripped for use in re-vegetation, minimize the amount of soil stripped in construction sites, minimize compaction of soils by heavy equipment in construction areas, provide erosion protection and sediment control around soil stockpiles and construction areas, store fuels and other hydrocarbon containing substances in approved containers, use drip trays when fuelling construction equipment and vehicles, construction sites to have an approved emergency response plan that includes fuel spills, and adhere to herbicide permit terms and conditions.

The range of evaluation criteria for potential residual effects on soils were determined to be adverse in direction of change, with low to moderate ecological context. Other evaluation criteria include duration of medium to long-term, magnitude ranging from low to moderate, an extent restricted to the project footprint, frequency of once to intermittent, and short to long-term reversibility of effects. Follow-up actions identified include inspections to ensure that mitigation is implemented and effective. The environmental effects analysis for soils is summarized in Table 5.3.2.

Table 5.3.2. Soils effects analysis.			
Nature of Potential Effects	**Mitigation Measures**	**Residual Effects**	**Evaluation**
Loss of soils stripped in the project assessment area during construction	• Stockpile soil stripped from the proposed road bed for re-vegetation purposes • Minimize amount of soil stripped in construction sites	Loss of soils	Direction – negative; ecological context – low; duration – long-term; magnitude – moderate; extent – project footprint; frequency – once; reversibility – long-term
Compaction of soils in the project assessment area during construction	• Minimize compaction of soils by heavy equipment in construction areas	Minimal compaction of soils	Direction – negative; ecological context – low; duration – medium-term; magnitude – low; extent – project footprint; frequency – once; reversibility – short-term
Loss of soil in the project assessment area through erosion during construction	• Provide erosion protection and sediment control around soil stockpiles as required	Minimal risk of soil erosion	Direction – negative; ecological context – low; duration – medium-term; magnitude – low; extent – project footprint; frequency – once; reversibility – short-term
Impaired soil quality in the project assessment area from accidental releases of hydrocarbon and hazardous substances during construction, operation and maintenance	• Store fuels and other hydrocarbon containing substances in approved containers • Use drip trays, pads or sheets when fuelling construction equipment and vehicles • Construction sites to have an approved emergency response plan that includes fuel spills	Minimal risk of impaired soil quality	Direction – negative; ecological context – moderate; duration – long-term; magnitude – moderate; extent – project footprint; frequency – intermittent; reversibility –

Table 5.3.2. Soils effects analysis.			
Nature of Potential Effects	**Mitigation Measures**	**Residual Effects**	**Evaluation**
			long-term
Impaired soil quality in the project assessment area from herbicide application during construction, operation and maintenance	• Apply herbicide in accordance with manufacturers guidelines • Adhere to herbicide permit terms and conditions	Minimal risk of impaired soil quality	Direction – negative; ecological context – low; duration – long-term; magnitude – low; extent – project footprint; frequency – intermittent; reversibility – long-term

6.0 CUMULATIVE EFFECTS

Cumulative effects are the environmental effects that are likely to result from a project in combination with the environmental effects of other past, existing and future projects or activities. The environmental assessment process for cumulative environmental effects includes: scoping, analysis of effects, identification of mitigation, evaluation of significance, and follow-up.

6.1 Scoping

Regional Issues: Regional vegetation issues of concern for the assessment of cumulative effects for the P4 Berens River to Poplar River First Nation All-Season Road Project were determined to include:

- Spread of invasive plant species

Regional issues are discussed in Section 5.1 of the vegetation report.

Regional Valued Components: Regional VCs relevant to the cumulative effects assessment for the P4 Berens River to Poplar River First Nation All-Season Road Project were determined to be:

- Species of special interest
- Botanical resource areas and culturally important plants

VCs are discussed in Section 5.2 of the vegetation report.

Spatial and Temporal Boundaries: Spatial and temporal boundaries for a cumulative effects assessment generally occur over a wide area and extend before and after the project boundaries. The spatial boundary identified for the cumulative effects assessment includes the regional assessment area, while the temporal boundary was determined to be long-term (beyond 10 years of operation).

Other Actions: Other actions that may affect the VCs were determined to include:

Past:

- Community Development
- Resource Use

Existing:

- Winter Roads
- Transmission Maintenance

- Resource Use
- Off-road Vehicles

Future:

- Transmission Maintenance
- Transmission Projects
- Road Projects
- Resource Use
- Off-road Vehicles
- Community Development
- Mining

Potential Effects: The potential environmental effects on VCs due to the proposed P4 All-Season Road Project and other projects and activities in the cumulative effects assessment area for the foreseeable future are shown as interactions in Table 6.1.

Table 6.1. Potential cumulative effects identification.

Projects and Activities	Regional VCs	
	Species of Special Interest	**Botanical Resource Areas and Culturally Important Plants**
Proposed Project		
Project construction	X	X
Project operation	X	X
Past Projects and Activities		
Community development projects	X	X
Resource use	X	X
Existing Projects and Activities		
Winter roads	X	X
Transmission maintenance	X	X
Resource use	X	X
Off-road vehicles	X	X
Future Projects and Activities		
Transmission projects	X	X
Road projects	X	X
Mining projects	X	X
Community development projects	X	X

6.2 Effects Analysis

Eleven different cover types were recognized in the regional assessment area. Wetland shrub is the dominant cover type and accounts for 35,984.0 ha. The second most abundant cover type in regional assessment area is dense coniferous forest (22,346.0 ha), followed by dense mixedwood forest (13,107.0 ha). The remaining cover types are divided among coniferous and broadleaf forests, shrub lands, wetlands and exposed land. Open water occupies an area of 4,054 ha.

In the regional assessment area, known areas where berry picking occurs represent 8,102.0 ha, and up to 56 species of conservation concern may occur, of which four are very rare (S1) and 15 are rare (S2), as ranked by the MBCDC.

The potential cumulative effects of the proposed P4 All-Season Road Project in combination with the effects of other Projects and activities in the assessment area are summarized below:

Species of Special Interest, and Botanical Resource Areas and Culturally Important Plants: The effects of construction and operation of the proposed P4 All-Season Road Project may act cumulatively with the effects of the existing winter roads, transmission maintenance, resource use, and off-road vehicles. Future activities such as transmission projects, road projects, mining projects, and community development may adversely affect the VCs identified. Past activities have included community development projects and resource use, but past effects on VC's are anticipated to be small.

The potential cumulative effects of the proposed P4 All-Season Road Project in combination with the effects of other projects and activities in the assessment area are evaluated in Table 6.2. The range of evaluation criteria (see Table 5.0.) for the potential cumulative effect categories include an adverse direction of change, low ecological context, long-term duration, low magnitude, a project footprint extent or spatial boundary, frequency of once to intermittent, and reversible over the long-term. Any potential cumulative environmental effects for the Project would be very small.

Table 6.2. Potential cumulative environmental effects analysis.							
Potential Cumulative Effect Categories	**Evaluation Criteria and Rating**						
	Direction o f Change	**Ecological Context**	**Duration**	**Magnitude**	**Extent**	**Frequency**	**Reversibility**
Loss of Species of Special Interest	Negative	Low	Long-term	Low	Project	Once	Long-term
Loss of Botanical Resource Areas and Culturally Important Plants	Negative	Low	Long-term	Low	Project	Intermit tent	Long-term

6.3 Identification of Mitigation

No additional mitigation measures are required for any potential cumulative environmental effects.

6.4 Evaluation of Significance

No significant cumulative environmental effects were identified for the proposed P4 Berens River to Poplar River First Nation All-Season Road Project, in combination with the environmental effects of other projects and activities in the assessment area currently, or for the reasonably foreseeable future.

6.5 Follow-up

No additional follow-up is required for any potential cumulative environmental effects.

7.0 ENVIRONMENTAL PROTECTION

7.1 Environmental Protection Measures

Environmental protection measures identified in this assessment report include specific mitigation measures to avoid or minimize potential adverse effects on vegetation and soils arising from the Project. The environmental protection measures are based on best practices and guidance materials from other development projects, and are summarized from the Effects Assessment (Section 5.0).

Vegetation Mitigation Measures

- Limit clearing to designated areas within the RoW.
- Prohibit equipment and vehicle use outside the designated cleared area.
- Restore ground cover vegetation along road shoulders using natural means augmented with planting and seeding of native species as required.
- Design road and construction practices to avoid adversely affecting the functionality of bogs and fens.
- Implement design measures to maintain existing moisture conditions that support localized vegetative communities as per the Operational Guide to Forest Road Wetland Crossings (Ducks Unlimited Canada et al. 2014).
- Undertake construction activities during winter months to extent possible.
- Identify areas of cultural importance prior to clearing.
- Identify important medicinal and cultural plants and harvesting areas.
- Identify and flag plant species of interest prior to clearing.
- Adjust road alignment where possible to avoid loss of plant species of interest and important harvesting areas.
- Wash construction equipment and vehicles prior to bringing them into the construction site.
- Construction sites to have an approved emergency response plan that includes fuel spills.
- Apply herbicides in accordance with manufacturer's guidelines and adhere to permit terms and conditions.
- Avoid herbicide application beyond road shoulder.
- Use water or approved dust suppression agents that will not negatively affect plants.
- Undertake construction and burning during the winter months to the extent possible.
- Prohibit burning of slash piles during high forest fire conditions.

Soil Mitigation Measures

- Stockpile soil stripped from the proposed road bed for revegetation purposes.
- Minimize amount of soil stripped in construction sites.
- Minimize compaction of soils by heavy equipment in construction areas.
- Provide erosion protection and sediment control around soil stockpiles as required.
- Store fuels and other hydrocarbon containing substances in approved containers.
- Use drip trays, pads or sheets when fuelling construction equipment and vehicles.
- Construction sites to have an approved emergency response plan that includes fuel spills.
- Apply herbicides in accordance with manufacturer's guidelines and adhere to permit terms and conditions.
- Avoid herbicide application beyond road shoulder.

7.2 Future Field Investigations

For this assessment, a native vegetation survey will be conducted in the spring of 2015 to ground truth desktop findings. The survey will be conducted to gather additional data and record baseline information on the vegetation and soils in the Project assessment area. Field studies will include investigations for species of conservation concern and species of special interest, species of that have botanical value to local communities and invasive plant species distribution.

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APPENDIX I. Definitions of Selected Technical Terms[1].

Bog – Ombrotrophic peatlands generally unaffected by nutrient-rich groundwater that are acidic and often dominated by heath shrubs and Sphagnum mosses and that may include open-growing, stunted trees.

Boreal – Pertaining to the north; a climatic and ecological zone that occurs south of the subarctic, but north of the temperate hardwood forests of eastern North America, the parkland of the Great Plains region, and the montane forests of the Canadian cordillera.

Canopy – The more or less continuous cover of branches and foliage formed by the crowns of trees.

Canopy Closure – The degree of canopy cover relative to openings.

Classification – The systematic grouping and organization of objects, usually in a hierarchical manner.

Community-Type – A group of vegetation stands that share common characteristics, an abstract plant community.

Coniferous – A cone-bearing plant belonging to the taxonomic group Gymnospermae.

Cover – The area of ground covered with plants of one or more species, usually expressed as a percentage.

Deciduous – Refers to perennial plants from which the leaves abscise and fall off at the end of the growing season.

Ecoregion – An area characterized by a distinctive regional climate as expressed by vegetation.

Family – Taxonomic grouping of plants that are related at a particular hierarchical level.

Fen – Wetland with a peat substrate, nutrient-rich waters, and primarily vegetated by shrubs and graminoids.

Flora – A list of the plant species present in an area.

Forest – A relatively large assemblage of tree-dominated stands.

Graminoid – A plant that is grass-like; the term refers to grasses and plant that look like grasses, i.e., only narrow-leaved herbs; in the strictest sense, it includes plants belonging only to the family Graminaceae.

Habitat – The place in which an animal or plant lives; the sum of environmental circumstances in the place inhabited by an organism, population or community.

Invasive – Invasive species are plants that are growing outside of their country or region of origin and are out-competing or even replacing native plants (Invasive Species Council of Manitoba).

Mitigation – Often the process or act of minimizing the negative effects of a proposed action.

Mixedwood – Forest stands composed of conifers and angiosperms each representing between 25 and 75% of the cover.

Riparian – Refers to terrain, vegetation or simply a position adjacent to or associated with a stream, flood plain, or standing body of water.

Shrub – A perennial plant usually with a woody stem, shorter than a tree, often with a multi-stemmed base.

Species – A group of organisms having a common ancestry that are able to reproduce only among themselves; a general definition that does not account for hybridization.

Stand – A collection of plants having a relatively uniform composition and structure, and age in the case of forests.

Terrestrial – Pertaining to land as opposed to water.

Understory – Vegetation growing beneath taller plants such as trees or tall shrubs.

Vascular – Having tissues that transport water, sap, nutrients; refers to plants that are not mosses, lichens and algae.

Vegetation – The general cover of plants growing on a landscape.

Vegetation Type – In phytosociology, the lowest possible level to be described.

Wetland – Land that is saturated with water long enough to promote hydric soils or aquatic processes as indicated by poorly drained soils, hydrophytic vegetation, and various kinds of biological activity that are adapted to wet environments.

[1]All references Cauboue et al. 1996, unless otherwise noted.

APPENDIX II. Preliminary Species List.

The following is a list of the preliminary plant species with potential range in the P4 study area and vicinity, including 458 vascular and non-vascular species from 81 families, occurring in terrestrial, wetland and aquatic habitats. Data is compiled from provincial data (MB Conservation Data Center), herbarium records (The Manitoba Museum), regional flora (e.g. Ames et al. 2005; Cody 1989; Flora of North America 2015; Scoggan 1979), and existing literature (e.g. Asatiwisipe Aki Management Plan 2011; Davidson-Hunt et al. 2012; MFESRA 2014; Wilson and Aykroyd 2004). A rank of SNA in this list generally denotes an introduced species, while an asterisk (*) in the Rank column denotes an invasive species.

FAMILY/Species	Common Name	Rank
Ferns and Allies		
EQUISETACEAE	HORSETAIL FAMILY	
Equisetum arvense	Common Horsetail	S5
Equisetum fluviatile	Swamp Horsetail	S5
Equisetum hyemale	Common Scouring-rush	S5
Equisetum pratense	Meadow Horsetail	S4S5
Equisetum sylvaticum	Wood Horsetail	S5
Equisetum scirpoides	Dwarf Scouring-rush	S5
LYCOPODIACEAE	CLUB-MOSS FAMILY	
Diphasium complanatum	Trailing Club-moss	S5
Lycopodium annotinum	Stiff Club-moss	S5
Lycopodium clavatum	Running Pine	S4
Lycopodium dendroideum	Ground Pine	S5
Lycopodium obscurum	Ground-pine	S5
OPHIOGLOSSACEAE	ADDER'S TONGUE FAMILY	
Botrychium virginianum	Common Grape-fern	S5
Botrychium spp.	Grape-fern	
POLYPODIACEAE	POLYPODY FAMILY	
Polypodium virginianum	Rock Polypody	S5
DRYOPTERIDACEAE	WOOD FERN FAMILY	
Athyrium felix-femina	Lady Fern	S5
Dryopteris carthusiana	Spinulose Wood Fern	S5
Gymnocarpium dryopteris	Common Oak Fern	S5
Matteucia struthiopteris	Ostrich Fern	S5
Woodsia ilvensis	Rusty Woodsia	S5
Gymnosperms		
TAXACEAE	YEW FAMILY	
Taxus canadensis	Canada Yew	S3
PINACEAE	PINE FAMILY	
Abies balsamea	Balsam Fir	S5
Larix laricina	Tamarack	S5
Picea glauca	White Spruce	S5
Picea mariana	Black Spruce	S5
Pinus banksiana	Jack Pine	S5
CUPRESSACEAE	CYPRESS FAMILY	
Juniperus communis	Common Juniper	S5

Juniperus horizontalis	Creeping Juniper	S5
Monocots		
JUNCAGINACEAE	ARROW-GRASS FAMILY	
Triglochin maritima	Seaside Arrow-grass	S5
POTAMOGETONACEAE	PONDWEED FAMILY	
Potamogeton sp	Pondweed	
ALISMATACEAE	ARROWHEAD FAMILY	
Alisma triviale	Common Water-plantain	S5
Sagittaria cuneata	Northern Arrowhead	S5
POACEAE	GRASS FAMILY	
Agropyron sp.	Wheat-grass	
Agrostis scabra	Tickle-grass	S5
Agrostis sp.	Bent Grass	
Agrostis stolonifera	Creeping Bent Grass	SNA
Alopecurus aequalis	Short-awned Foxtail	S5
Andropogon gerardii	Big Bluestem	S5
Beckmannia syzigachne	Slough Grass	S5
Bromus ciliatus	Fringed Brome	S5
Bromus inermis	Smooth Brome	SNA
Calamagrostis canadensis	Marsh Reed Grass	S5
Calamagrostis sp.	Reed Grass	
Calamagrostis stricta	Northern Reed Grass	S5
Cinna latifolia	Slender Woodreed	S5
Dathonia spicata	Poverty Oatgrass	S5
Deschampsia cespitosa	Tufted Hairgrass	S5
Dichanthelium acuminatum var. fasciculatum	Soft Millet	S4
Elymus canadensis	Canada Wild Rye	S5?
Elymus repens	Quack-grass	SNA
Elymus trachycaulus	Slender Wheat Grass	S5
Festuca rubra	Red Fescue	S5
Glyceria borealis	Northern Manna Grass	S5
Glyceria striata	Fowl Manna Grass	S5
Hesperostipa spartea	Porcupine Grass	S4
Hierochloe odorata	Sweet Grass	S5
Hordeum jubatum	Foxtail Barley	S5
Koeleria macrantha	June Grass	S5
Leymus innovatus	Hairy Wild Rye	S5
Oryzopsis asperifolia	Rice Grass	S5
Phalaris arundinacea	Reed Canary Grass	S5*
Phleum pratense	Timothy	SNA
Phragmites australis	Common Reed	S5
Piptatherum pungens	Northern Rice Grass	S5
Poa alpina	Alpine Bluegrass	S5
Poa palustris	Fowl Blue Grass	S5
Poa pratensis	Kentucky Bluegrass	S5
Poa sp.	Bluegrass	
Puccinellia sp.	Salt-meadow Grass	
Schizachne purpurascens	False Melic	S5

Spartina pectinata	Prairie Cord Grass	S5
Zizania palustris	Wild Rice	S4
CYPERACEAE	SEDGE FAMILY	
Carex aurea	Golden Sedge	S5
Carex aquatilis	Water Sedge	S5
Carex atherodes	Awned Sedge	S5
Carex bebbii	Bebb's Sedge	S5
Carex canescens	Hoary Sedge	S5
Carex capillaris	Hair-like Sedge	S5
Carex chordorrhiza	Prostrate Sedge	S5
Carex concinna	Beautiful Sedge	S4S5
Carex deflexa	Bent Sedge	S5
Carex dewyana	Dewey's Sedge	S5
Carex disperma	Two-seeded Sedge	S5
Carex eburnea	Bristle-leaved Sedge	S4S5
Carex foenea	Hay Sedge	S5
Carex granularis	Granular Sedge	S4
Carex gynocrates	Northern Bog Sedge	S5
Carex inops	Long-stolon Sedge	SU
Carex interior	Inland Sedge	S4?
Carex lasiocarpa	Hairy-fruited Sedge	S5
Carex leptalea	Bristle-stalked Sedge	S5
Carex magellanica	Bog Sedge	S5
Carex rariflora	Scant Sedge	S3
Carex retrorsa	Turned Sedge	S5
Carex sartwellii	Sartwell's sedge	S4
Carex scirpoidea	Rush-like Sedge	S4
Carex sp.	Sedge	
Carex stipata	Awl-fruited Sedge	S4
Carex trisperma	Three-seeded Sedge	
Carex utriculata	Beaked Sedge	S5
Carex vaginata	Sheathed Sedge	S5
Carex vesicaria	Blister Sedge	SU
Eleocharis quinqueflora	Few-flowered Spikerush	S4
Eriophorum angustifolium	Tall Cotton-grass	S5
Eriophorum sp.	Cotton-grass	
Eriophorum vaginatum	Sheathed Cotton-grass	S5
Eriophorum viridi-carinatum	Thin-leaved Cotton-grass	S4
Rhynchospora alba	White Beakrush	S3?
Schoenoplectus acutus	Hard-stemmed Bulrush	S4
Schoenoplectus tabernaemontani	Soft-stem Bulrush	S5
Scirpus cyperinus	Wool-grass	S5
Scirpus microcarpus	Small-fruited Bulrush	S5
Scirpus sp.	Rush	
Trichophorum alpinum	Alpine Cotton-grass	S5
Trichophorum caespitosum	Tufted Bulrush	S4
ARACEAE	ARUM FAMILY	
Calla palustris	Water-arum	S5
TYPHACEAE	CAT-TAIL FAMILY	
Typha angustifolia	Narrow-leaved Cat-tail	S4*

Typha latifolia	Common Cat-tail	S5
ACORACEAE	SWEET-FLAG FAMILY	
Acorus americanus	Sweet Flag	S5
LEMNACEAE	DUCKWEED FAMILY	
Lemna minor	Lesser Duckweed	SNA
JUNCACEAE	RUSH FAMILY	
Juncus arcticus	Arctic Rush	S5
Juncus arcticus var. balticus	Baltic Rush	S5
Juncus bufonius	Toad Rush	S5
Juncus sp.	Rush	
Juncus vaseyi	Big-head Rush	S4?
LILIACEAE	LILY FAMILY	
Clintonia borealis	Blue-bead Lily	S4?
Hypoxis hirsuta	Yellow Star Grass	S4
Lilium philadelphicum	Wood Lily	S4
Maianthemum canadense	Canada May Flower	S5
Maianthemum stellatum	Star-flowered Solomon's Seal	S5
Maianthemum trifolium	Three-leaved Solomon's Seal	S5
Prosartes trachycarpa	Fairybells	S4
Smilax lasioneura	Carrion Vine	S4
Streptopus amplexifolius	White Mandarin	S3?
Tofieldia pusilla	Bog Asphodel	S4
Triantha glutinosa	Sticky False Asphodel	S5
Trillium cernuum	Nodding Trillium	S4
Zigadenus elegans	Smooth Camas	S5
ORCHIDACEAE	ORCHID FAMILY	
Amerorchis rotundifolia	Round-leaved Orchis	S5
Cypripedium acaule	Stemless Lady's-slipper	S4
Cypripedium calceolus	Yellow Lady's-slipper	S4
Cypripedium reginae	Showy Lady's-slipper	S4
Cypripedium passerinum	Sparrow's-egg Lady's-slipper	S4
Goodyera repens	Lesser Rattlesnake Plantain	S5
Goodyera tesselata	Tesselated Rattlesnake Plantain	S3
Platanthera aquilonis	Northern Green Bog Orchid	S5
Platanthera hookeri	Hooker's Orchid	S2
Platanthera orbiculata	Round-leaved Bog Orchid	S3
Spiranthes lacera	Northern Slender Ladies'-tresses	S3S4
Spiranthes romanzoffiana	Hooded Ladies'-tresses	S5
Dicots		
SALICAEAE	WILLOW FAMILY	
Populus balsamifera	Balsam Poplar	S5
Populus deltoides	Cottonwood	S4
Populus tremuloides	Trembling Aspen	S5
Salix amygdaloides	Peach-leaved Willow	S4
Salix arbusculoides	Little-tree Willow	S3
Salix bebbiana	Bebb's Willow	S5
Salix candida	Hoary Willow	S5
Salix discolor	Pussy Willow	S5
Salix exigua	Sandbar Willow	S5

Salix glauca	Smooth Willow	S4?
Salix humilis	Gray Willow	S4
Salix maccalliana	Velvet-fruited Willow	S4
Salix myrtillifolia	Myrtle-leaved Willow	S5
Salix pedicellaris	Bog Willow	S5
Salix pellita	Satin Willow	S4
Salix petiolaris	Basket Willow	S4
Salix planifolia	Flat-leaved Willow	S5
Salix scouleriana	Scouler Willow	S4
Salix vestita	Rock Willow	S3
Salix sp.	Willow	S5
BETULACEAE	BIRCH FAMILY	
Alnus incana	Speckled Alder	S5
Alnus viridis	Green Alder	S5
Betula papyrifera	White Birch	S5
Betula pumila	Dwarf Birch	S5
Betula x winteri	Birch (hybrid)	
Corylus americana	American Hazelnut	S4
Corylus cornuta	Beaked Hazelnut	S5
FAGACEAE	BEECH FAMILY	
Quercus macrocarpa	Bur Oak	S5
ULMACEAE	ELM FAMILY	
Ulmus americana	American Elm	S4
CANNABACEAE	HEMP FAMILY	
Humulus lupulus	Common Hop	S4
URTICACEAE	NETTLE FAMILY	
Urtica dioica	Stinging Nettle	S5
SANTALACEAE	SANDALWOOD FAMILY	
Geocaulon lividum	Northern Comandra	S5
POLYGONACEAE	SMARTWEED FAMILY	
Fallopia cilinodes	Fringed Black Bindweed	S5
Polygonum amphibium	Water Smartweed	S5
Polygonum sp.	Smartweed	
Rumex crispus	Curly Dock	SNA
Rumex triangulivalvis	Narrow-leaved Dock	S5
CHENOPODIACEAE	GOOSEFOOT FAMILY	
Chenopodium album	Lamb's-quarters	SNA
Corispermum americanum	American Bugseed	S2S3
Suaeda calceoliformis	Horned Sea-blite	S5
CARYOPHYLLACEAE	PINK FAMILY	
Silene sp.	Catchfly	
Stellaria longipes	Long-leaved Starwort	S5
RANUNCULACEAE	CROWFOOT FAMILY	
Actaea rubra	Baneberry	S5
Anemone canadensis	Canada Anemone	S5
Anemone cylindrica	Thimbleweed	S5
Anemone multifida	Cut-leaved Anemone	S5
Anemone parviflora	Small Wood Anemone	S4
Anemone patens	Prairie Crocus	S4

Aquilegia brevistyla	Small-flowered Columbine	S4
Aquilegia canadensis	Wild Columbine	S5
Caltha palustris	Marsh Marigold	S5
Ranunculus abortivus	Kidneyleaf Buttercup	S5
Ranuculus cymbalaria	Seaside Buttercup	S5
Ranunculus acris	Common Buttercup	SNA*
Ranunculus lapponicus	Lapland Buttercup	S5
Ranunculus pallasii	Pallas Buttercup	S2
Ranunculus sceleratus	Celery-leaved Buttercup	S5
Ranunculus sp.	Buttercup	
Thalictrum dasycarpum	Hairy Meadowrue	S5
Thalictrum venulosum	Veiny Meadowrue	S5
PAPAVERACEAE	POPPY FAMILY	
Sanguinaria canadensis	Blood-root	S2
FUMARIACEAE	FUMITORY FAMILY	
Corydalis aurea	Golden Corydalis	S5
Corydalis sempervirens	Pink Corydalis	S5
BRASSICACEAE	MUSTARD FAMILY	
Arabis drummondii	Drummond's Rock Cress	S5
Arabis lyrata	Lyre-leaved Rock Cress	S2?
Rorippa palustris	Marsh Yellow Cress	S5
SARRACENIACEAE	PITCHER PLANT FAMILY	
Sarracenia purpurea	Pitcher Plant	S5
DROSERACEAE	SUNDEW FAMILY	
Drosera anglica	Oblong-leaved Sundew	S3
Drosera rotundifolia	Round-leaved Sundew	S5
GROSSULARIACEAE	CURRANT FAMILY	
Ribes americanum	Wild Black Currant	S5
Ribes glandulosum	Skunk Currant	S5
Ribes hudsonianum	Northern Black Currant	S5
Ribes lacustre	Swamp Gooseberry	S4
Ribes oxyacanthoides	Northern Gooseberry	S5
Ribes triste	Swamp Red Currant	S5
SAXIFRAGACEAE	SAXIFRAGE FAMILY	
Heuchera richardsonii	Alumroot	S5
Mitella nuda	Mitrewort	S5
Saxifraga tricuspidata	Three-toothed Saxifrage	S4
Sibbaldiopsis tridentata	Three-toothed Cinquefoil	S5
PARNASSIACEAE	GRASS OF PARNASSUS FAMILY	
Parnassia palustris	Northern Grass-of-Parnassus	S4
ROSACEAE	ROSE FAMILY	
Amelanchier alnifolia	Saskatoon	S5
Argentina anserina	Silverweed	S5
Comarum palustre	Marsh Cinquefoil	S5
Crataegus chrysocarpa	Round-leaved Hawthorn	S4
Dasiphora fruticosa	Shrubby cinquefoil	S5
Fragaria virginiana	Smooth Wild Strawberry	S5
Geum aleppicum	Yellow Avens	S5
Potentilla norvegica	Rough Cinquefoil	S5

Prunus pensylvanica	Pin Cherry	S5
Prunus pumila	Ground Cherry	S4
Prunus virginiana	Chokecherry	S5
Rosa acicularis	Prickly Rose	S5
Rosa arkansana	Low Prairie Rose	S4
Rosa sp.	Rose	
Rosa woodsii	Wood's Rose	S4
Rubus arcticus	Stemless Raspberry	S5
Rubus chamaemorus	Cloud Berry	S5
Rubus idaeus	Raspberry	S5
Rubus pubescens	Trailing Dewberry	S5
Sorbus decora	Mountain-ash	S4
Spiraea alba	Meadowsweet	S5
FABACEAE	PEA FAMILY	
Amphicarpaea bracteata	Hog-peanut	S4
Astragalus americanus	American Milkvetch	S3
Astragalus canadensis	Canada Milkvetch	S5
Desmodium canadense	Beggar's-lice	S2
Glycyrrhiza lepidota	Wild Licorice	S5
Lathyrus ochroleucus	Cream-coloured Vetchling	S4S5
Lathyrus venosus	Wild Peavine	S5
Lotus corniculatus	Bird's-foot Trefoil	SNA
Medicago lupulina	Black Medic	SNA
Medicago sativa	Alfalfa	SNA*
Melilotus alba	White Sweetclover	SNA*
Melilotus officinalis	Yellow Sweetclover	SNA*
Trifolium hybridum	Alsike Clover	SNA
Trifolium pratense	Red Clover	SNA
Trifolium repens	White Clover	SNA
Vicia americana	American Vetch	S5
Vicia cracca	Tufted Vetch	SNA*
OXALIDACEAE	WOOD-SORREL FAMILY	
Oxalis stricta	Yellow Wood-sorrel	S4S5
GERANIACEAE	GERANIUM FAMILY	
Geranium bicknellii	Bicknell's Geranium	S5
POLYGALACEAE	MILKWORT FAMILY	
Polygala senega	Seneca Root	S4
EUPHORBIACEAE	SPURGE FAMILY	
Euphorbia esula	Leafy Spurge	SNA*
ANACARDIACEAE	SUMAC FAMILY	
Rhus glabra	Smooth Sumac	S4
Toxicodendron rydbergii	Poison Ivy	S5
ACERACEAE	MAPLE FAMILY	
Acer negundo	Manitoba Maple	S5
Acer spicatum	Mountain Maple	S5
BALSAMINACEAE	TOUCH-ME-NOT FAMILY	
Impatiens capensis	Jewelweed	S5
RHAMNACEAE	BUCKTHORN FAMILY	
Rhamnus alnifolia	Alder-leaved Buckthorn	S5

VITACEAE	GRAPE FAMILY	
Vitis riparia	Riverbank Grape	S3S4
TILIACEAE	LINDEN FAMILY	
Tilia americana	Basswood	S4
IRIDACEAE	IRIS FAMILY	
Iris versicolor	Blue Flag	S4
Sisyrinchium montanum	Blue-eyed Grass	S5
CISTACEAE	ROCK ROSE FAMILY	
Hudsonia tomentosa	False Heather	S3
VIOLACEAE	VIOLET FAMILY	
Viola adunca	Early Blue Violet	S5
Viola canadensis	Canada Violet	S5
Viola nephrophylla	Bog Violet	S5
Viola pubescens	Downy Yellow Violet	S4
Viola renifolia	Kidney-leaved Violet	S5
Viola sp.	Violet	
ELAEAGNACEAE	OLEASTER FAMILY	
Elaeagnus commutata	Wolf-willow	S4
Shepherdia canadensis	Canada Buffaloberry	S5
ONAGRACEAE	EVENING PRIMROSE FAMILY	
Chamerion angustifolium	Fireweed	S5
Circaea alpina	Small Enchanter's-nightshade	S5
Circaea lutetiana	Large Enchanter's Nightshade	S2
Epilobium ciliatum ssp. glandulosum	Northern Willowherb	S5
Epilobium leptophyllum	Willowherb	S5
Epilobium palustre	Marsh Willowherb	S5
Oenothera biennis	Evening Primrose	S5
HALORAGACEAE	WATER-MILFOIL FAMILY	
Myriophyllum sibiricum	Spiked Water-milfoil	S5
ARALIACEAE	GINSENG FAMILY	
Aralia hispida	Bristly Sarsaparilla	S5
Aralia nudicaulis	Wild Sarsaparilla	S5
APIACEAE	CARROT FAMILY	
Cicuta maculata	Spotted Water Hemlock	S5
Heracleum maximum	Cow parsnip	S5
Osmorhiza claytonii	Wooly or Hairy Sweet Cicely	S2
Osmorhiza longistylis	Sweet Cicely	S5
Sanicula marilandica	Seneca Snakeroot	S5
Sium suave	Water Parsnip	S5
Zizia aptera	Heart-leaved Alexander	S5
Zizia aurea	Golden Alexanders	S5
CORNACEAE	DOGWOOD FAMILY	
Cornus canadensis	Bunchberry	S5
Cornus sericea	Red-osier Dogwood	S5
PYROLACEAE	WINTERGREEN FAMILY	
Chimaphila umbellata	Prince's Pine	S4S5
Orthilia secunda	One-sided Wintergreen	S5
Pyrola asarifolia	Pink Wintergreen	S5
Pyrola chlorantha	Greenish-flowered Wintergreen	S5

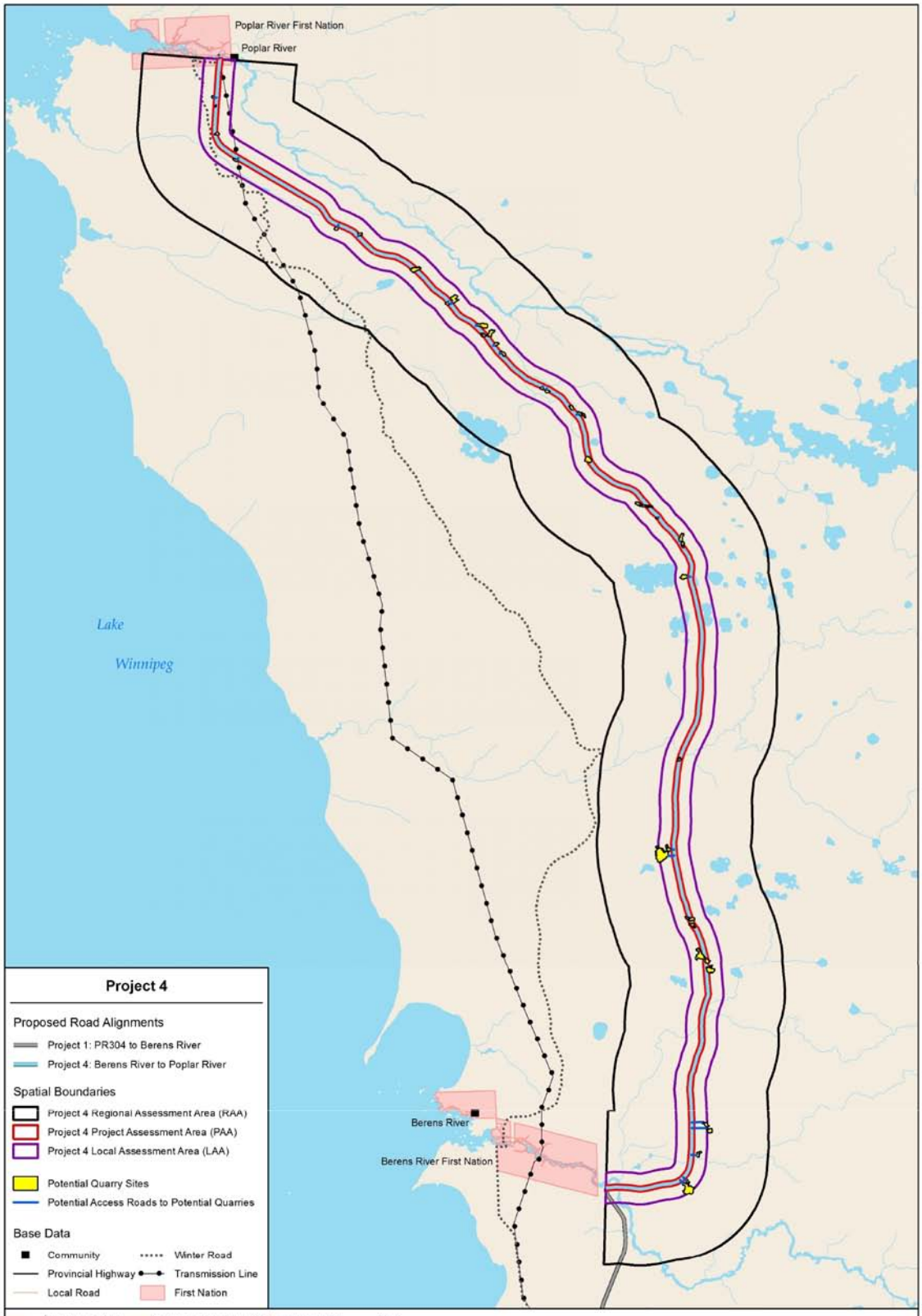
Pyrola elliptica	White Wintergreen	S5
Pyrola sp.	Wintergreen	
MONOTROPACEAE	INDIAN PIPE FAMILY	
Monotropa uniflora	Indian-pipe	S4
ERICACEAE	HEATH FAMILY	
Andromeda polifolia	Bog-rosemary	S5
Arctostaphylos uva-ursi	Bearberry	S5
Arctous alpina	Alpine Bearberry	S5
Chamaedaphne calyculata	Leatherleaf	S5
Gaultheria hispidula	Creeping Snowberry	S5
Gaultheria procumbens	Teaberry	S3S4
Kalmia polifolia	Pale Laurel	S5
Rhododendron groenlandicum	Labrador Tea	S5
Rhododendron tomentosum	Trapper's Tea	S4
Vaccinium angustifolium	Low Sweet Blueberry	S4
Vaccinium caespitosum	Dwarf Bilberry	S3
Vaccinium myrtilloides	Velvetleaf Blueberry	S5
Vaccinium oxycoccus	Bog Cranberry	S5
Vaccinium uliginosum	Tall Sweet Blueberry	S5
Vaccinium vitis-idaea	Dry-ground Cranberry	S5
MYRSINACEAE	MYRSINE FAMILY	
Lysimachia ciliata	Fringed Loosestrife	S5
Trientalis borealis	Northern Starflower	S5
OLEACEAE	OLIVE FAMILY	
Fraxinus nigra	Black Ash	S3
Fraxinus pennsylvanica	Green Ash	S5
GENTIANACEAE	GENTIAN FAMILY	
Gentiana andrewsii	Closed Gentian	S4
Menyanthes trifoliata	Bog Bean	S5
APOCYNACEAE	DOGBANE FAMILY	
Apocynum androsaemifolium	Spreading Dogbane	S5
Apocynum cannabinum	Indian-hemp	S4
Apocynum sp.	Dogbane	
ASCLEPIADACEAE	MILKWEED FAMILY	
Asclepias ovalifolia	Dwarf Milkweed	S4S5
CONVOLVULACEAE	CONVOLVULUS FAMILY	
Calystegia sepium	Hedge Bindweed	S4
CUSCUTACEAE	DODDER FAMILY	
Cuscuta grenovii	Common Dodder	S4
BORAGINACEAE	BORAGE FAMILY	
Hakelia deflexa var. *americana*	American Stickseed	S5
Lithospermum canescens	Hoary Puccoon	S5
Mertensia paniculata	Tall Lungwort	S5
Onosmodium molle	Marble-seed	S3S4
LAMIACEAE	MINT FAMILY	
Agastache foeniculum	Giant Hyssop	S5
Dracocephalum parviflorum	American Dragon-head	S5
Lycopus americanus	Water-horehound	S5
Lycopus asper	Western Water-horehound	S4

Lycopus sp.	Water-horehound	
Mentha arvensis	Common Mint	S5
Monarda fistulosa	Wild Bergamot	S4
Scutellaria galericulata	Hooded Skullcap	S5
Scutellaria lateriflora	Mad-dog Skullcap	S4
Stachys palustris	Marsh Hedge-nettle	S5
SOLANACEAE	POTATO FAMILY	
Hyoscamus niger	Black Henbane	SNA
SCROPHULARIACEAE	FIGWORT FAMILY	
Euphrasia frigida	Northern Eyebright	S4S5
Melampyrum lineare	Cow-wheat	S5
Pedicularis macrodonta	Muskeg Lousewort	S2
Veronica sp.	Speedwell	
LENTIBULARIACEAE	BLADDERWORT FAMILY	
Pinguicula villosa	Small Butterwort	S3S4
VERBENACEAE	VERVAIN FAMILY	
Phryma leptostachya	Lopseed	S3
PLANTAGINACEAE	PLANTAIN FAMILY	
Plantago major	Common Plantain	SNA
RUBIACEAE	MADDER FAMILY	
Galium boreale	Northern Bedstraw	S5
Galium labradoricum	Northern Bog Bedstraw	S5
Galium trifidum	Three-petal Bedstraw	S5
Galium triflorum	Sweet-scented Bedstraw	S5
Houstonia longifolia	Long-leaved Bluets	S4S5
CAPRIFOLIACEAE	HONEYSUCKLE FAMILY	
Diervilla lonicera	Bush-honeysuckle	S5
Linnaea borealis	Twinflower	S5
Lonicera dioica	Twining Honeysuckle	S5
Lonicera involucrata	Black Twinberry	S4
Lonicera oblongifolia	Swamp-fly-honeysuckle	S4
Lonicera villosa	Blue Fly Honeysuckle	S5
Sambucus racemosa	Elderberry	S4
Symphoricarpos albus	Snowberry	S5
Symphoricarpos occidentalis	Western Snowberry	S5
Viburnum edule	Low-bush Cranberry	S5
Viburnum lentago	Nannyberry	S4
Viburnum opulus	High-bush Cranberry	S5
Viburnum rafinesquianum	Downy Arrowwood	S4
CAMPANULACEAE	BELLFLOWER FAMILY	
Campanula aparinoides	Marsh Bellflower	S5
Campanula rotundifolia	Bluebell	S5
ASTERACEAE	ASTER FAMILY	
Achillea millefolium	Yarrow	S5
Achillea sibirica	Many-flowered Yarrow	S5
Ambrosia psilostachya	Perennial Ragweed	S5
Antennaria sp.	Pussytoes	
Arctium minus	Common Burdock	SNA
Arctium sp.	Burdock	*

Artemisia absinthimum	Wormwood	SNA
Artemisia campestris	Field Sagewort	S5
Bidens cernua	Smooth Begarticks	S5
Cirsium arvense	Canada Thistle	SNA*
Cirsium muticum	Swamp Thistle	S4
Dendrathema arcticum	Arctic Daisy	S3
Doellingeria umbellata	Flat-topped White Aster	S5
Erigeron hyssopifolius	Hyssop-leaved Fleabane	S4
Erigeron philadelphicus	Philadelphia Fleabane	S5
Erigeron sp.	Fleabane	
Eupatorium maculatum	Spotted Joe-pye-weed	S5
Euthamia graminifolia	Flat-topped Goldenrod	S5
Gaillardia aristata	Great-flowered Gaillardia	S4
Grindelia squarosa	Curly-cup Gumweed	S5
Helianthus sp.	Sunflower	
Hieracium umbellatum	Northern Hawkweed	S5
Leucanthemum vulgare	Ox-eye Daisy	SNA*
Liatris punctata	Dotted Blazing Star	S4
Packera paupercula	Balsam Groundsel	S5
Petasites frigidus var. *palmatus*	Palmate-leaved Coltsfoot	S5
Petasites frigidus var. *sagittatus*	Arrow-leaved Coltsfoot	S5
Petasites frigidus var. x vitifolius	Vine-leaved Coltsfoot	SNA
Prenanthes alba	White Rattlesnakeroot	S4S5
Rudbeckia hirta	Black-eyed Susan	S5
Rudbeckia laciniata	Tall Coneflower	S4
Senecio sp.	Groundsel	
Solidago canadensis	Canada Goldenrod	S5
Solidago gigantea	Tall Goldenrod	S5
Solidago hispida	Hairy Goldenrod	S5
Solidago mollis	Velvety Goldenrod	S5
Solidago multiradiata	Alpine Goldenrod	S5
Solidago rigida	Stiff Goldenrod	S5
Solidago simplex	Decumbent Goldenrod	SU
Solidago sp.	Goldenrod	
Sonchus arvensis	Field Sow-thistle	SNA*
Symphyotrichum boreale	Northern Bog Aster	S5
Symphyotrichum ciliolatum	Lindley's Aster	S5
Symphyotrichum ericoides	Many-flowered Aster	S4
Symphyotrichum laeve	Smooth Aster	S5
Symphyotrichum lanceolatum	Panicled Aster	S5
Symphyotrichum lateriflorum	Calico Aster	S4
Tanacetum vulgare	Common Tansy	SNA*
Taraxacum officinale	Common Dandelion	SNA
Bryophytes		
Brachythecium sp.	Brachythecium Moss	
Climacium dendroides	Tree Climacium Moss	
Dicranum undulatum	Dicranum Moss	
Dicranum sp.	Dicranum Moss	
Hylocomium splendens	Splendid Feather Moss	
Mnium sp.	Mnium Moss	

Pleurozium schreberi	Schreber's Moss
Polytrichum sp.	Polytrichum Moss
Ptilium crista-castrensis	Knights Plume Moss
Sphagnum spp.	Peat Moss
Lichens	
Cladina mitis	Green Reindeer Lichen
Cladina rangiferina	Grey Reindeer Lichen
Cladina stellaris	Northern Reindeer Lichen
Cladina sp.	Reindeer Lichen
Cladonia borealis	Red Pixie-cup Lichen
Cladonia sp.	Cladonia Lichen
Cladonia uncialis	Prickle Cladonia Lichen
Flavocetraria nivalis	Flattened Snow Lichen
Icmadophila ericetorum	Spraypaint Lichen
Peltigera sp.	Pelt Lichen
Stereocaulon tomentosum	Woolly Coral Lichen
Umbilicaria sp.	Rocktripe Lichen
Fungi	
Lycoperdon spp	Puffball Fungus

APPENDIX III. Report Figures.


Poplar River First Nation
Poplar River
Lake
Winnipeg
Berens River
Berens River First Nation
Project 4
Proposed Road Alignments
Project 1: PR304 to Berens River
Project 4: Berens River to Poplar River
Spatial Boundaries
Project 4 Regional Assessment Area (RAA)
Project 4 Project Assessment Area (PAA)
Project 4 Local Assessment Area (LAA)
Potential Quarry Sites
Potential Access Roads to Potential Quarries
Base Data
Community
Winter Road
Provincial Highway
Transmission Line
Local Road
First Nation
MANITOBA East Side Road AUTHORITY
Joro Consultants
Coordinate System: UTM Zone 14N NAD83
Data Source: ESRA, Joro, MCWS
Date Created: April 24, 2015
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0 2 4 Miles
1:225,000
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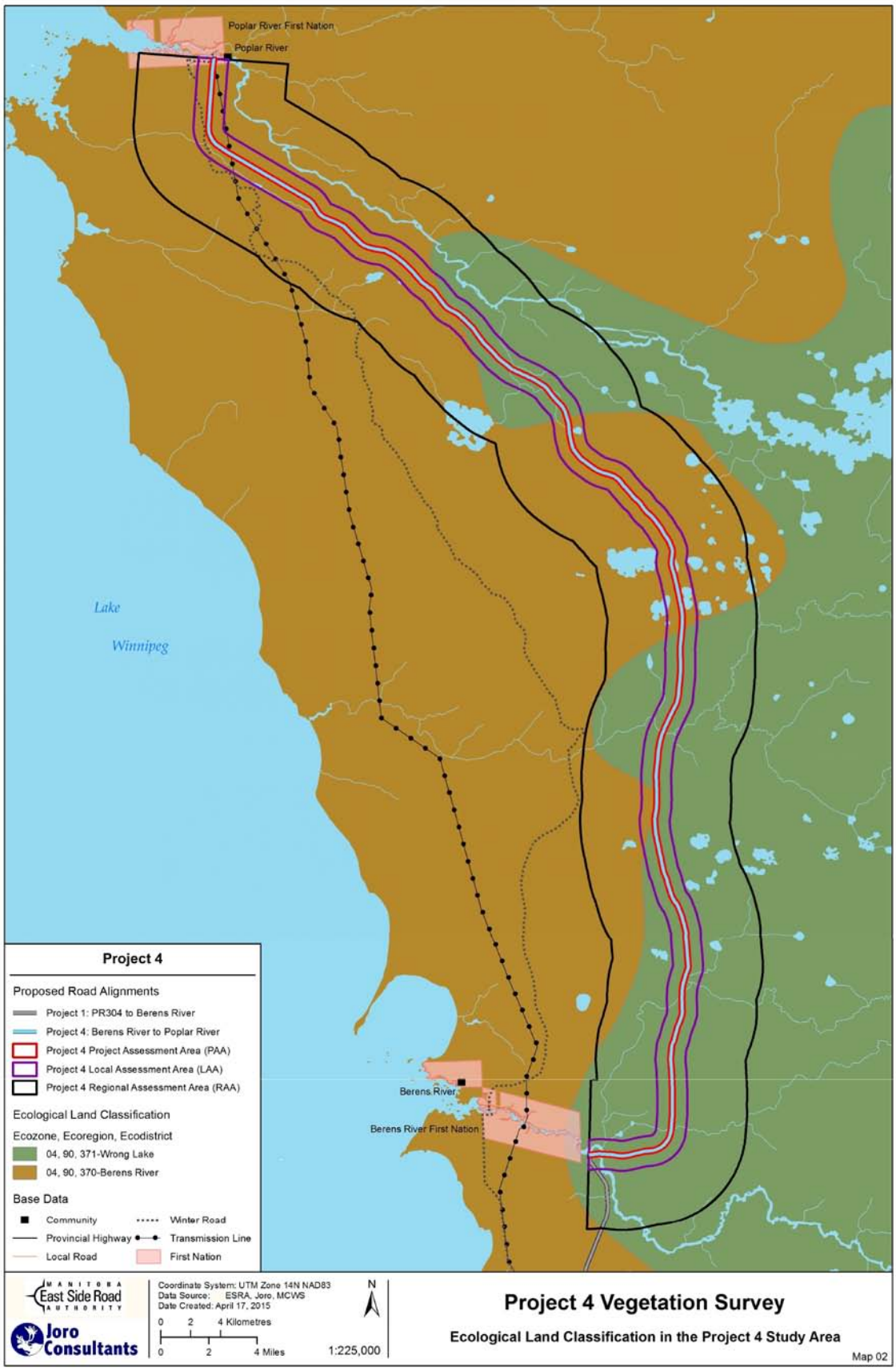
Project 4 Vegetation Survey
Spatial Boundaries of Assessment Areas in the Project 4 Study Area
Map 01


Poplar River First Nation
Poplar River
Lake
Winnipeg
Berens River
Berens River First Nation
Project 4
Proposed Road Alignments
Project 1: PR304 to Berens River
Project 4: Berens River to Poplar River
Project 4 Project Assessment Area (PAA)
Project 4 Local Assessment Area (LAA)
Project 4 Regional Assessment Area (RAA)
Ecological Land Classification
Ecozone, Ecoregion, Ecodistrict
04, 90, 371-Wrong Lake
04, 90, 370-Berens River
Base Data
Community
Winter Road
Provincial Highway
Transmission Line
Local Road
First Nation
MANITOBA East Side Road AUTHORITY
Joro Consultants
Coordinate System: UTM Zone 14N NAD83
Data Source: ESRA, Joro, MCWS
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0 2 4 Miles
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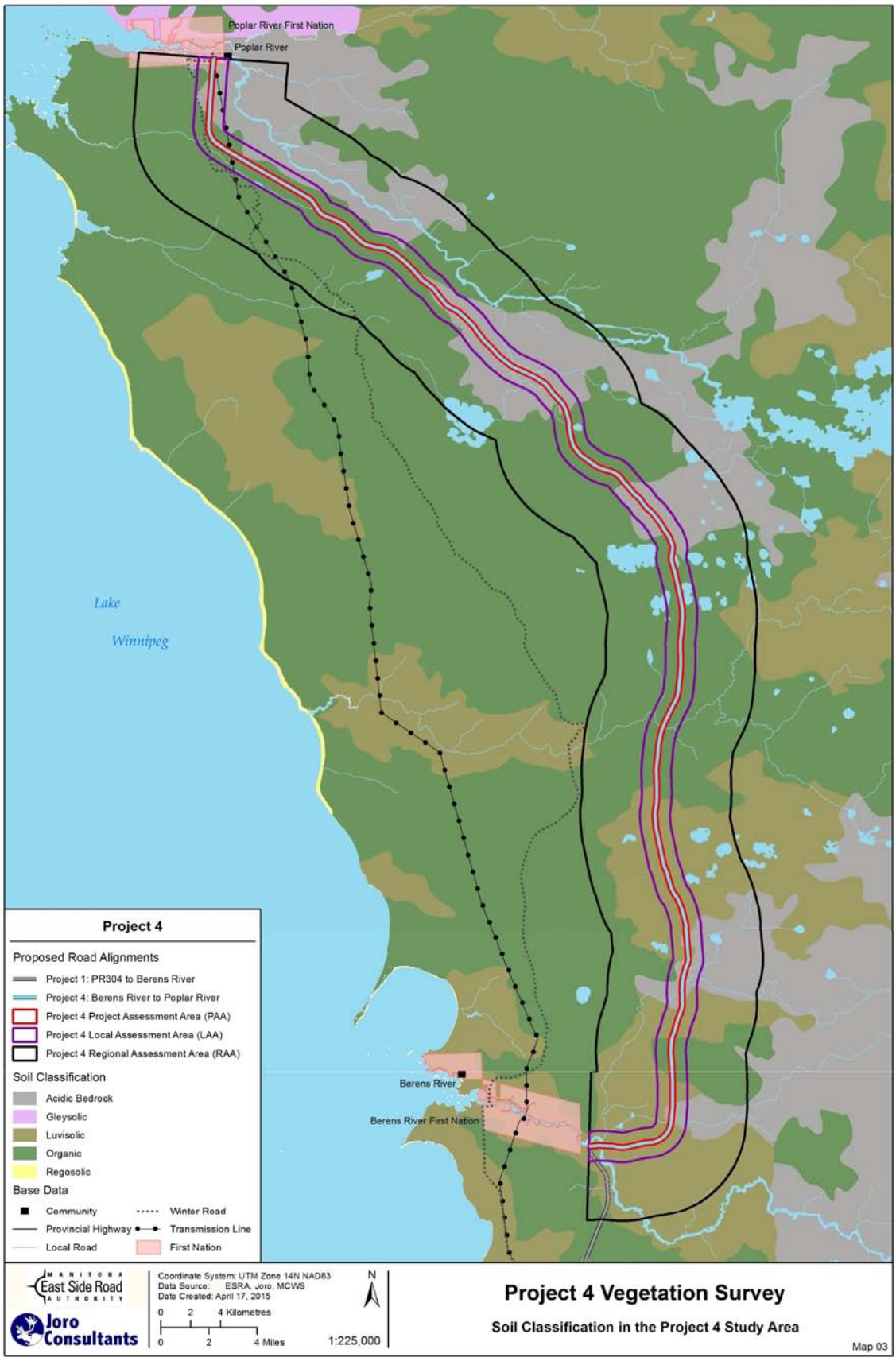
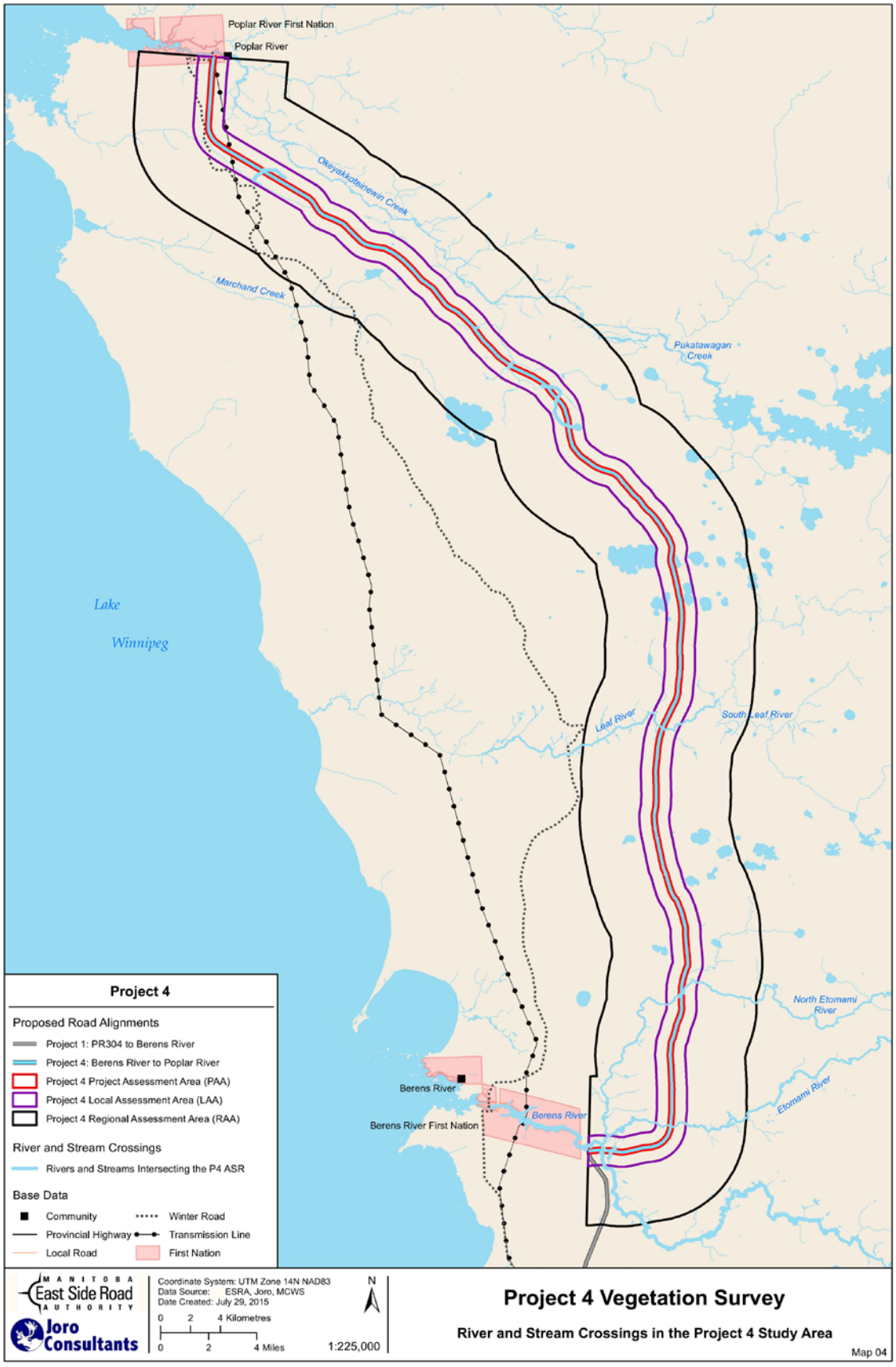
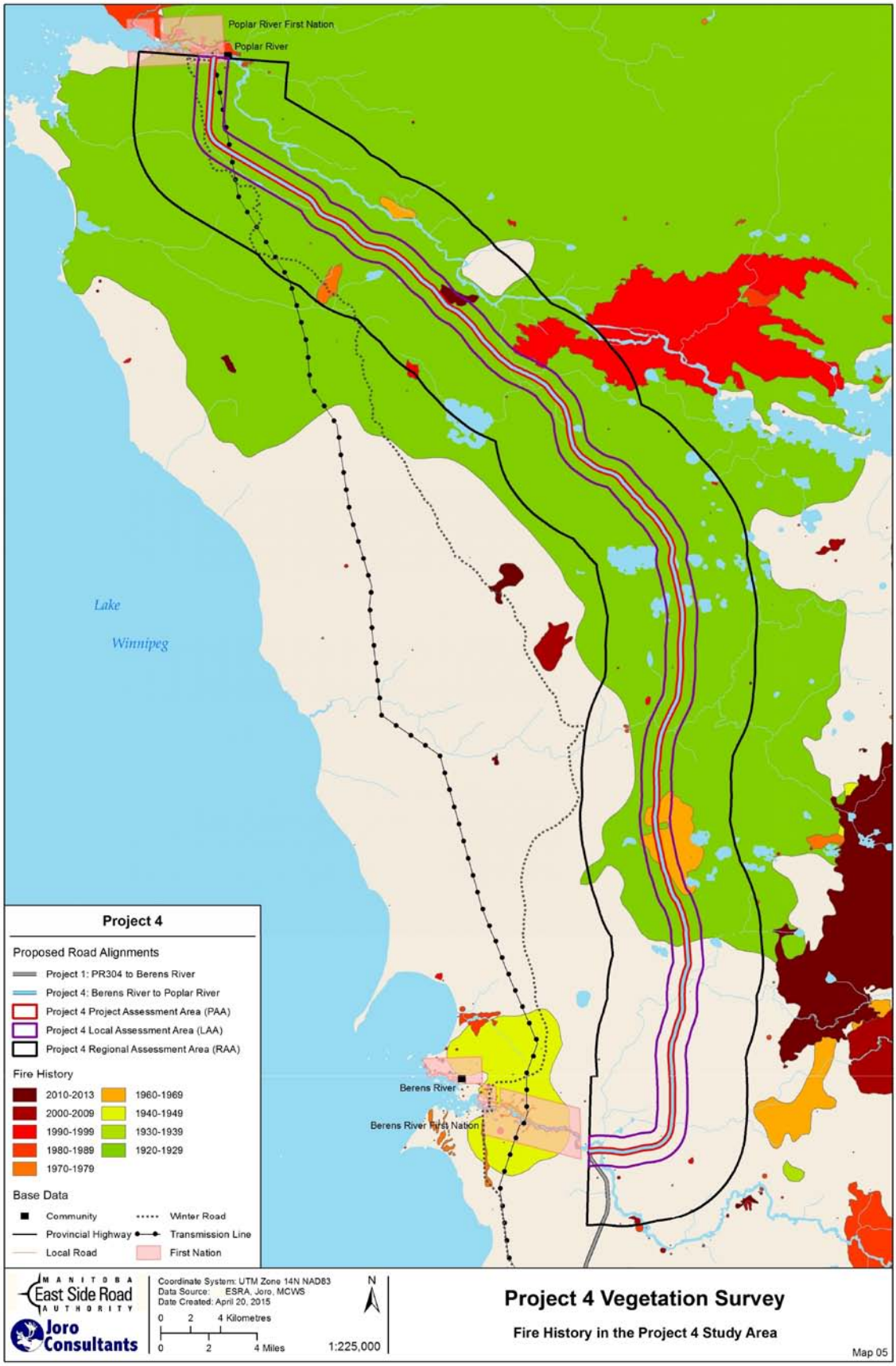
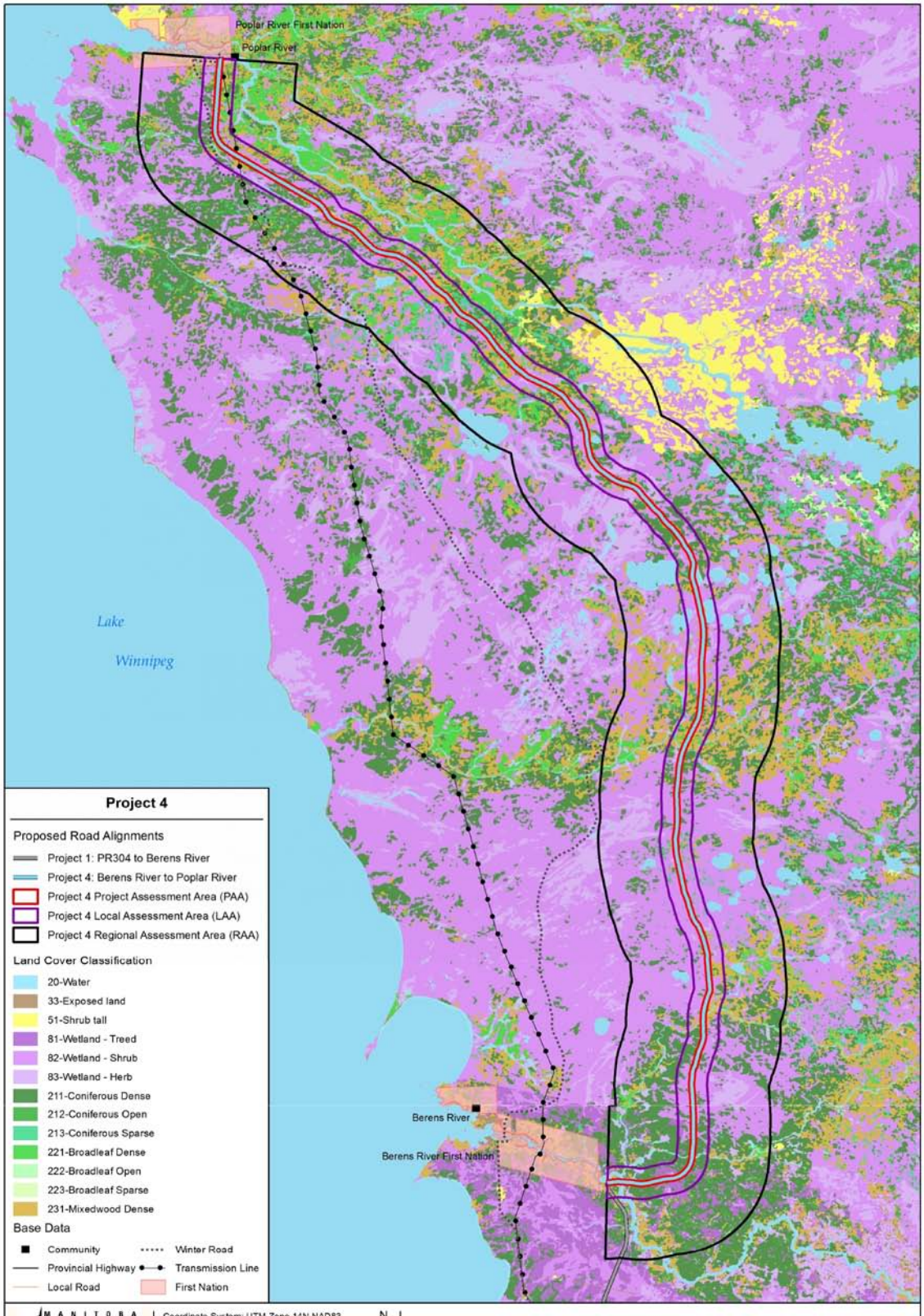
Project 4 Vegetation Survey
Ecological Land Classification in the Project 4 Study Area
Map 02


Poplar River First Nation
Poplar River
Lake
Winnipeg
Berens River
Berens River First Nation
Project 4
Proposed Road Alignments
Project 1: PR304 to Berens River
Project 4: Berens River to Poplar River
Project 4 Project Assessment Area (PAA)
Project 4 Local Assessment Area (LAA)
Project 4 Regional Assessment Area (RAA)
Soil Classification
Acidic Bedrock
Gleysolic
Luvisolic
Organic
Regosolic
Base Data
Community
Winter Road
Provincial Highway
Transmission Line
Local Road
First Nation
Manitoba East Side Road Authority
Joro Consultants
Coordinate System: UTM Zone 14N NAD83
Data Source: ESRA, Joro, MCWS
Date Created: April 17, 2015
0 2 4 Kilometres
0 2 4 Miles
1:225,000
N
Project 4 Vegetation Survey
Soil Classification in the Project 4 Study Area
Map 03


Poplar River First Nation
Poplar River
Okeyakkoburnewin Creek
Marchand Creek
Pukatawagan Creek
Lake Winnipeg
Leaf River
South Leaf River
North Etomami River
Etomami River
Berens River
Berens River First Nation
Berens River
Project 4
Proposed Road Alignments
Project 1: PR304 to Berens River
Project 4: Berens River to Poplar River
Project 4 Project Assessment Area (PAA)
Project 4 Local Assessment Area (LAA)
Project 4 Regional Assessment Area (RAA)
River and Stream Crossings
Rivers and Streams Intersecting the P4 ASR
Base Data
Community
Winter Road
Provincial Highway
Transmission Line
Local Road
First Nation
MANITOBA East Side Road AUTHORITY
Joro Consultants
Coordinate System: UTM Zone 14N NAD83
Data Source: ESRA, Joro, MCWS
Date Created: July 29, 2015
0 2 4 Kilometres
0 2 4 Miles
1:225,000
N
Project 4 Vegetation Survey
River and Stream Crossings in the Project 4 Study Area
Map 04


Poplar River First Nation
Poplar River
Lake
Winnipeg
Berens River
Berens River First Nation
Project 4
Proposed Road Alignments
Project 1: PR304 to Berens River
Project 4: Berens River to Poplar River
Project 4 Project Assessment Area (PAA)
Project 4 Local Assessment Area (LAA)
Project 4 Regional Assessment Area (RAA)
Fire History
2010-2013
2000-2009
1990-1999
1980-1989
1970-1979
1960-1969
1940-1949
1930-1939
1920-1929
Base Data
Community
Provincial Highway
Local Road
Winter Road
Transmission Line
First Nation
MANITOBA East Side Road AUTHORITY
Joro Consultants
Coordinate System: UTM Zone 14N NAD83
Data Source: ESRA, Joro, MCWS
Date Created: April 20, 2015
0 2 4 Kilometres
0 2 4 Miles
1:225,000
N
Project 4 Vegetation Survey
Fire History in the Project 4 Study Area
Map 05



MANITOBA East Side Road AUTHORITY

Joro Consultants

Coordinate System: UTM Zone 14N NAD83
Data Source: ESRA, Joro, MCWS
Date Created: April 20, 2015

0 2 4 Kilometres
0 2 4 Miles

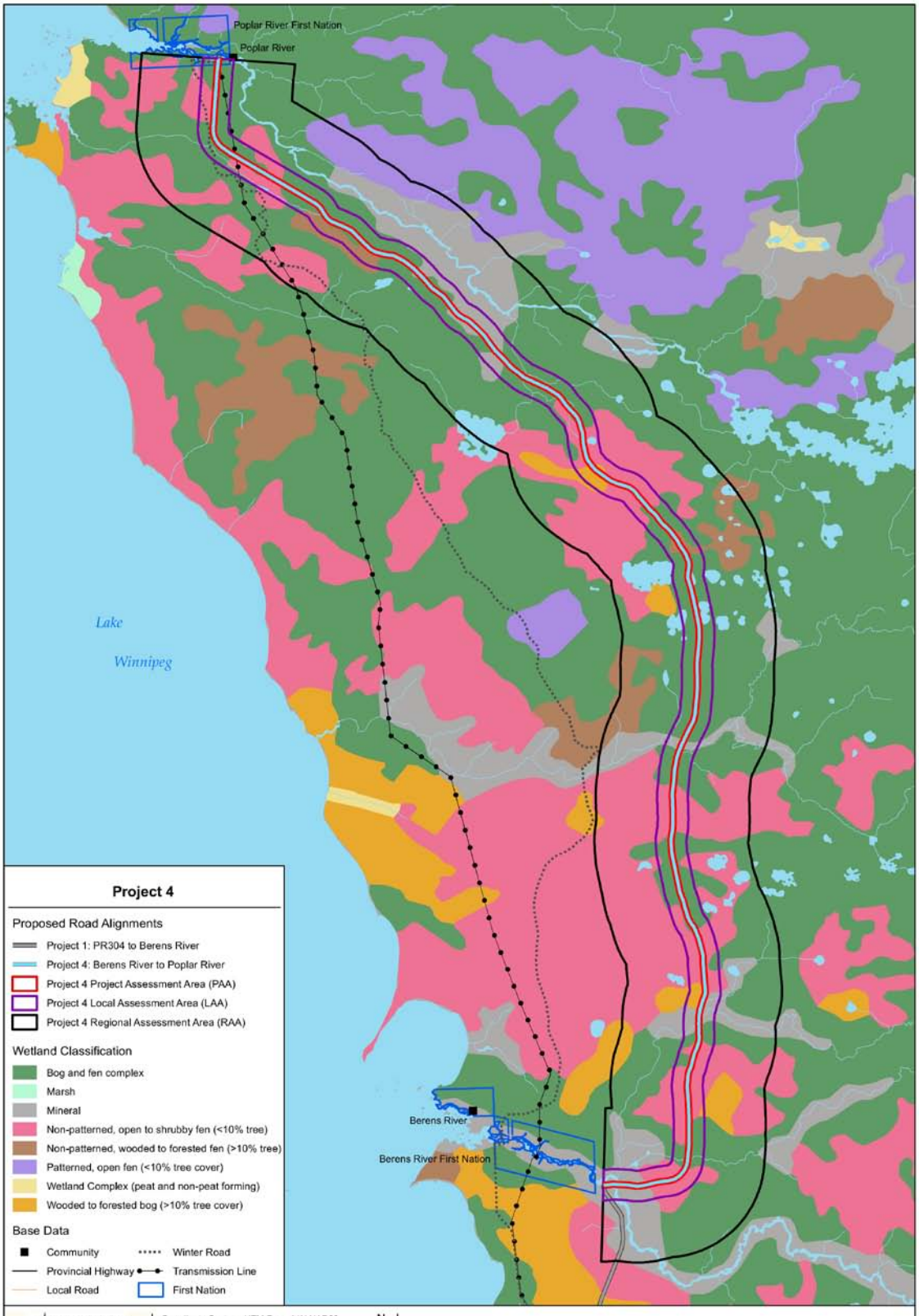
1:225,000

N

Project 4 Vegetation Survey

Land Cover Classification in the Project 4 Study Area

Map 06


Poplar River First Nation
Poplar River
Lake
Winnipeg
Berens River
Berens River First Nation
Project 4
Proposed Road Alignments
Project 1: PR304 to Berens River
Project 4: Berens River to Poplar River
Project 4 Project Assessment Area (PAA)
Project 4 Local Assessment Area (LAA)
Project 4 Regional Assessment Area (RAA)
Wetland Classification
Bog and fen complex
Marsh
Mineral
Non-patterned, open to shrubby fen (<10% tree)
Non-patterned, wooded to forested fen (>10% tree)
Patterned, open fen (<10% tree cover)
Wetland Complex (peat and non-peat forming)
Wooded to forested bog (>10% tree cover)
Base Data
Community
Winter Road
Provincial Highway
Transmission Line
Local Road
First Nation
MANITOBA East Side Road AUTHORITY
Joro Consultants
Coordinate System: UTM Zone 14N NAD83
Data Source: ESRA, Joro, MCWS
Date Created: July 29, 2015
0 2 4 Kilometres
0 2 4 Miles
1:225,000
N
Project 4 Vegetation Survey
Wetland Classification in the Project 4 Study Area
Map 07

Map 08 Removed due to Sensitive

Traditional Knowledge Information