EAST SIDE OF LAKE WINNIPEG (ESLW)
LARGE AREA TRANSPORTATION NETWORK STUDY

Final Report

March 31, 2011

Submitted to:
East Side Road Authority
200-155 Carlton Street
Winnipeg, Manitoba
R3C 3H8

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J D MOLLARD AND ASSOCIATES (2010) LIMITED
AECOM

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ACKNOWLEDGMENTS

SNC-Lavalin's Project Team wish to acknowledge the following for their valuable contributions to the East Side of Lake Winnipeg (ESLW) Large Area Transportation Network Study:

- The East Side Road Authority Executive and Staff
- The Wabanong Nakaygum Okimawin (WNO) Chiefs
- The ESLW First Nations Chiefs, Councils, Community Coordinators and Community Members
- The ESLW Northern Affairs Communities Mayors, Councils and Members
- The Manitoba Metis Federation
- Manitoba Aboriginal and Northern Affairs
- Manitoba Conservation
- Manitoba Culture, Heritage, Tourism and Sport
- Manitoba Industry, Economic Development and Mines
- Manitoba Infrastructure and Transportation
- The General Public at the Winnipeg Open House June 25, 2009

SNC-Lavalin's Project Team sincerely appreciates the welcome they received in all of the ESLW Communities they visited during 2 rounds of public engagement, as well as the considerable time and effort made by all community residents, frequently on a voluntary basis, to ensure meaningful and credible input to the study.

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*ASR = ALL-SEASON ROAD

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APPENDICES

1.0 INTRODUCTION

The Manitoba Government is committed to the development of an all-season surface transportation system on the East Side of Lake Winnipeg (ESLW). This all-season system would serve the communities in the area, and provide opportunities for social and economic development, while being environmentally responsive and respectful of aboriginal traditional activities, culture and land values. In October 2008, SNC-Lavalin Inc. (SNCL) was commissioned by the East Side Road Authority (ESRA) to conduct a Large Area Transportation Network (LATN) Study on the ESLW. This study consists of the multi-disciplinary planning and engineering work required to identify the preferred All-Season Transportation Network to connect the East Side communities to the rest of the All-Season Road (ASR) transportation network in Manitoba.

As specified in the Study Terms of Reference, the ESLW Large Area Transportation Network Study was conducted in six sequential tasks, as outlined below:

- Task 1: Baseline Information and Potential Route Network Options
- Task 2: Initial Stakeholder Engagement
- Task 3: Detailed Definition and Evaluation of Route Network Options
- Task 4: Second Stakeholder Engagement on Preferred Route Networks
- Task 5: Transportation Development Plan for Preferred ASR Network
- Task 6: Final Documentation

This Final Report concludes the work undertaken by SNC-Lavalin during this two-year study, consolidates and summarizes the key findings from each study task, documents the outstanding issues and recommends the next steps in the future phases of the ASR development project. Details of the work conducted under each study task are provided in five compendium reports, Volumes 1 through 5, corresponding to the task number listed above.

1.1 Study Area and Goals

The area to the east and northeast of Lake Winnipeg is one of the last major areas in Manitoba not served by an all-season road system. This area, known as the East Side of Lake Winnipeg (ESLW), extends for about 300 km from Norway House to Red Sucker Lake from west to east, and about 330 km from Little Grand Rapids to Oxford House from south to north (see Figure 1.1). The area is bounded on the west by Lake Winnipeg. The eastern limit of the study area is the Manitoba/Ontario boundary, and the southern limit is in the vicinity of the Atikaki Provincial Park.

The primary goal of this Large Area Transportation Network Study is to answer the following questions:

- Is it feasible to link the communities located in the East Side of Lake Winnipeg (ESLW) by an All-Season Road (ASR) network to the provincial road network in Manitoba?
- What is the likely scope of the social and economic benefits and impacts of an ASR network on the ESLW communities?
- What are the potential natural environmental and cultural impacts associated with an ASR network?
- What is the range of construction and maintenance costs for such an ASR network?

- Where is the best route network to service East Side communities, taking into account engineering, the natural and social environments, the provincial, regional and local economies and interests?
- What is the development strategy for an ASR network and the feasibility/desirability of work staging from a winter road to an ASR standard?
- Why is the ASR network desired and who are the potential partners who should fund the ASR construction?

1.2 Existing Transportation System

Currently there are just under 20,000 people[1] living in First Nations and Northern Affairs Communities on the East Side of Lake Winnipeg (ESLW) that do not enjoy the “Freedom to Move” available to most of Manitoba’s population.

The existing transportation system servicing this very large area (see Figure 1.2) consists of:

1. Year round air service (subject to weather conditions) to those communities that have public airports as follows:

- Oxford House FN, Gods Lake Narrows FN and NAC, Gods River FN, Red Sucker Lake FN, Island Lake NAC and Poplar River FN. The airports serving these communities are close by and accessible year round by an ASR.
- Red Sucker Lake NAC, Garden Hill FN, St. Theresa Point FN, and Little Grand Rapids FN and NAC. The airports serving these communities are close by but require water crossing and are not therefore accessible during freeze up and break up.
- Wasagamack FN and Pauingassi FN. These communities do not have public airports, and require water travel, in the case of Wasagamack to the St. Theresa Point airport, and in the case of Pauingassi to Little Grand Rapids airport. A new airport is proposed to service Wasagamack and St. Theresa Point that would be accessible by ASR from both communities.
- Where public airports are provided, they consist of gravel strips of varying lengths ranging from 2800 ft at Little Grand Rapids up to 4000 ft at Island Lake. The airports are generally capable of handling aircraft such as the passenger and cargo versions of the Fairchild Swearingen Metropolitan, and in some cases accommodate the de Havilland Dash 8 as well as the ATR 42-300. The airports have lighting systems that can be switched on remotely from an approaching aircraft. Aircraft fuel availability is sometimes limited.

Air service is, however, expensive for both passengers and freight. As noted above some communities such as Pauingassi and Wasagamack do not have airports; water or winter road travel is required to access neighbouring airports; others, such as Little Grand Rapids, Garden Hill and St. Theresa Point have airports, but also require water crossing or winter road travel to reach them. In the above named communities, travel is difficult during fall freeze-up and spring break-up, with expensive helicopter service being needed in emergencies. Fresh food flown in, such as milk, may be 2-3 times more expensive than in Winnipeg or Thompson. Lack of access to reasonably priced healthy food has an impact on the health of ESLW residents, who experience a much higher than normal incidence of diabetes.

[1] As documented in the Volume 1 Report of this study, the total population of First Nations on-reserve and Northern affairs Communities = 19,433 in the ESLW Study Area, excluding Norway House and Cross Lake which have existing ASR connection to the rest of the province (2010 population estimate).

2. Summer barge and boat service to communities along the east shore of Lake Winnipeg: Princess Harbour, Bloodvein, Berens River and Poplar River.
3. Winter road service to all communities:

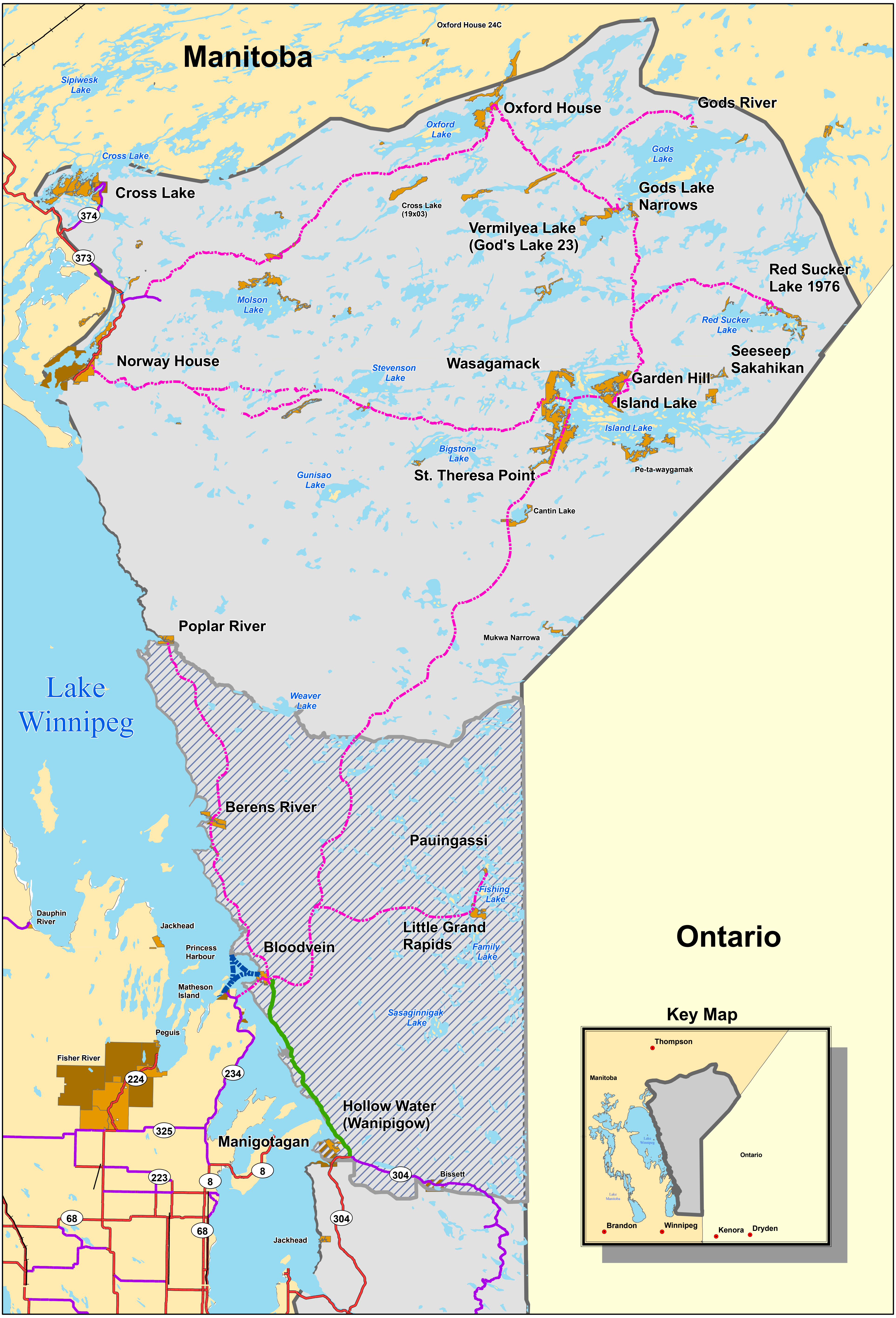
As shown in Fig 1.2 the existing winter road system connects ESLW communities to the existing Manitoba ASR system in the following manner:

- Oxford House, Gods Lake Narrows and Gods River are connected by an east-west overland public winter road system via Paimusk Creek Road to PR 373 just south of Sea Falls Ferry.
- Red Sucker Lake and the Island Lake communities are connected by a northeast/southwest public winter road system to Bloodvein, and thence to the Rice River Road and PR 304. Red Sucker Lake, Garden Hill, Island Lake NAC and Wasagamack traffic has to cross Island Lake to access this generally overland system. This public system is augmented by a generally overland private winter road between St. Theresa Point and PR 373 at Norway House. From Bloodvein south, winter road traffic can cross Lake Winnipeg to PR 234 north of Pine Dock, as an alternative to using the Rice River Road.
- Poplar River, Pauingassi and Little Grand Rapids are connected by generally overland public winter road routes to Bloodvein: Poplar River via Berens River; and Pauingassi/Little Grand Rapids via a connection to the Island Lake winter road.
- In some years an overland public winter road has also been provided between Gods Lake Narrows and Garden Hill, linking to the Red Sucker Lake winter road.

The existing winter road system generally follows the most direct route between communities, with necessary meanders to avoid difficult relief and rock outcrops. The winter road between Sea Falls and Oxford House in many locations follows a sandy esker ridge. The private winter road between St. Theresa Point and Norway House follows a moraine west as far as Stevenson Lake. Where the winter road system is located on firm soils its construction, maintenance and durability is more favourable, with the weak links in the system occurring where it is necessary to cross frozen wetlands, rivers, streams or other water bodies. This being the case some permanent structures such as Acrow or Bailey Bridges have already been provided at strategic water crossings. e.g. over the Hayes River at two locations. It can be seen on Fig 1.2 that in some locations the existing winter road system crosses Indian Reserve lands.

Ideally winter roads are in place for at least 2 months, allowing the shipping into the communities of bulk goods, building supplies and fuel, as well as giving area residents the opportunity to drive out to visit friends and family, do shopping and participate in recreational and cultural events. Winter road travel distances and times are long. For example, the distance from the end of the Rice River Road just south of Bloodvein to St. Theresa Point is 361 km and may take a private vehicle about 8-10 hours; from PR 373 just south of Sea Falls Ferry to Oxford House is 213 km and may take a fully loaded tractor semi-trailer truck about 12 hours. The ride-ability and duration of a winter road depends on several factors including the soil types, orientation and tree shade, the sequence of below freezing temperatures with snowfall (preferably before first snow fall), the amount of snowfall and the nature of vehicle types and operations using the road. In 2010, the winter roads were closed in mid March, after being open for about a month, after half a dozen tractor semi-trailer trucks became bogged down between Bloodvein and St. Theresa Point. When building supplies cannot be shipped by winter road, construction may be delayed for one year; when fuel delivery by road is delayed, it may have to be flown in at considerable extra cost to the user.

Figure 1.1: ESLW Large Area Transportation Network Study Area Map



Legend

- LATN Study Area
- PR304 To Beren's River Study Area
- Rice River Road
- Summer Ferry
- First Nation
- NAC Community
- Paved Highway/Road
- Un-Paved Highway/Road
- Rail Line
- Winter/Limited Use Road
- Lake

N

0 2.5 5 10 15 20 25 Km

Note:
This map is intended for illustrative purposes only. Do not rely on this map for legal administrative purposes, or as a precise indicator of routes, locations of features.
Source: National Topographic Data Base (NTDB) 1:50,000. Government of Canada, Natural Resources Canada, Centre for Topographic Information 2003/ Manitoba Land Information (MLI) 2009.
Projection: North_American_Lambert_Conformal_Conic (GCS_North_American_1983)

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East Side of Lake Winnipeg (ESLW)
Large Area Transportation Network Study

Study Area Map

Date: January, 2011	File Number: 020254	Sub Code: 000
Figure Number:	1.1	Rev. 0

File: H:\Arcview\020254EastLakeWinnipegRoad\GIS\MXD\Reports\SocioEcon_Final_Sept09\Fig_1_1_MBR_SocEcon_ContextMap.mxd

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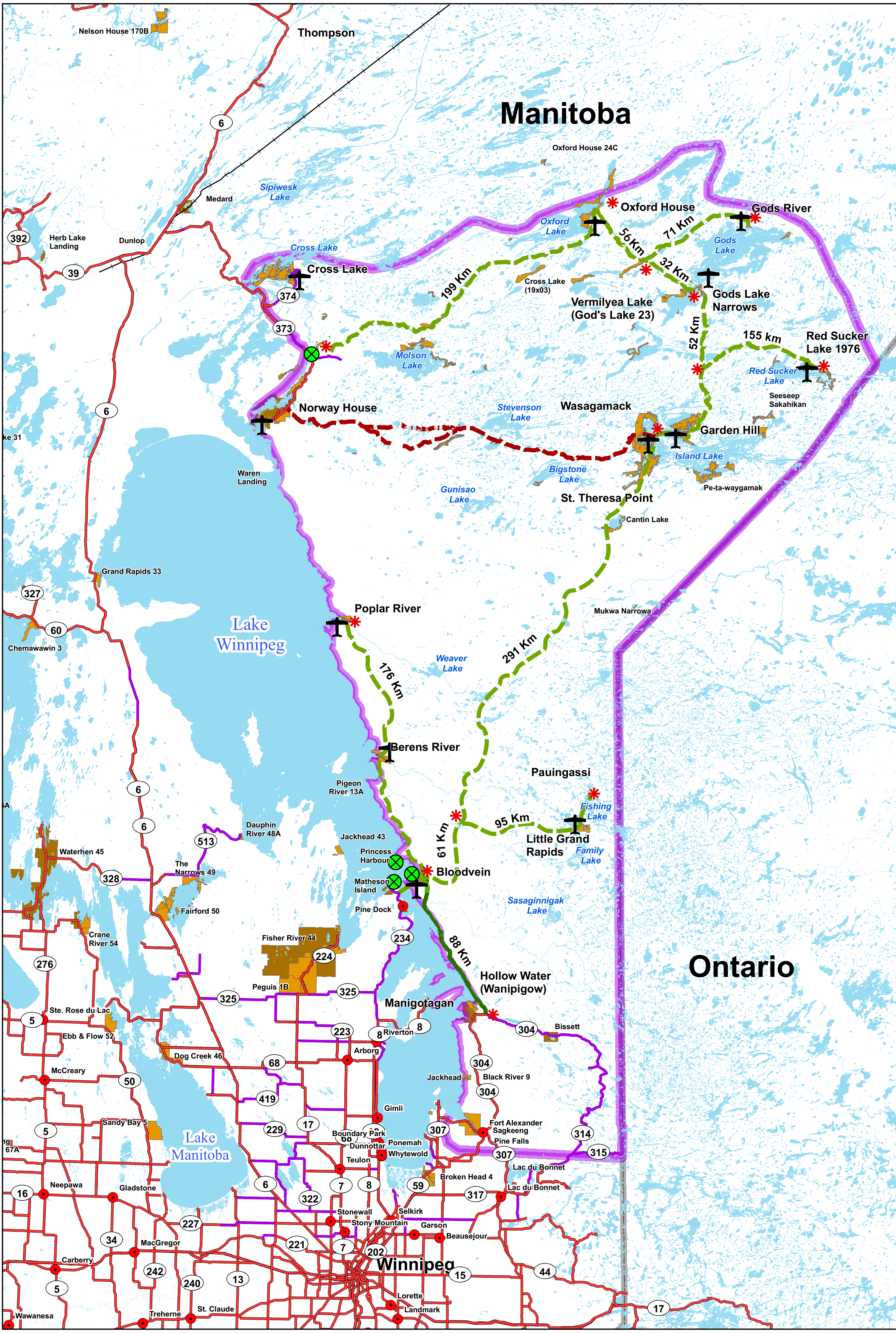
Figure 1.2: ESLW Large Area Transportation Network Study - Existing Transportation System



Legend

- LATN Study Area
- Provincial Winter Road
- Rice River Road
- Private Winter Road
- * 291 Km * Accumulated Distance
- Ferry
- Public Airport
- First Nation
- NAC Community
- Paved Highway/Road
- Un-Paved Highway/Road
- Rail Line
- Lake

N

0 2.5 5 10 15 20 25 Km

East Side of Lake Winnipeg (ESLW)
Large Area Transportation Network Study

Existing Transportation System

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Date: January, 2011	File Number: 020254	Sub Code:0000
Figure Number:	1.2	Rev. 0

In the Dillon 2000 study, East Side of Lake Winnipeg All Weather Road Justification and Scoping Study, it states, "A coincidence of high fall precipitation (11 percent probability) and high November to December temperatures (19 percent probability) could severely reduce the available time for winter road traffic. A warm February event (7 percent probability) could wipe out the winter road on its own."

4. Hydro-electric distribution service to all communities (Note: Shape files for these overhead lines were not available and so they are not shown on any figures in the report)

Just prior to the end of the 20th century, hydro-electric distribution service had been provided to all ESLW communities. This provided relief to the winter road system (and in emergencies, to the air service) by reducing the volume of fuel needed to be shipped on the system. Previously diesel oil had to be shipped in to power the diesel generators that produced electric power in the individual communities. The existing overhead hydro-electric distribution system services the Northern Sector communities from the North, and the Central and Southern sector communities from the south. The distribution lines, not being constrained by the terrain in the same manner as winter roads, or for that matter all-season roads, tend to run in fairly direct fashion from community to community.

5. Proposed all-season road (ASR) PR 304 to Berens River:

A proposed all-season road (ASR) connecting Berens River and Bloodvein to PR 304, via an upgraded Rice River Road, has received approval under the Manitoba Environmental Act and is in the final stages of receiving federal environmental impact assessment approval to proceed.

Conclusion

The high cost of goods and services, the unreliability of the winter road system, and the lack, in some communities, of secure year round access to their closest public airport, has a detrimental impact on the health, mobility and quality of life of ESLW residents. This situation can be significantly relieved by providing an all-season road network, initially connecting all communities to a public airport, and then to the existing Manitoba highway/road system. Such an ASR network will reduce the cost of goods and services, provide transportation system reliability, and offer meaningful opportunities to improve the health, mobility and quality of life of ESLW residents.

1.3 Study Management and Methodology

In November 2008, the Government of Manitoba announced the establishment of the East Side Road Authority (ESRA), with the mandate to undertake the East Side Transportation Initiative (ESTI), a strategic initiative to provide improved, safe and more reliable transportation service between all of the communities on the east side of Lake Winnipeg and the rest of the province.

The East Side Transportation Initiative has two primary objectives:

- Completion of the East Side Large Area Transportation Network Study – a study to examine transportation infrastructure improvements for the entire ESLW region;
- Construction of an all-season road from Provincial Road (PR) 304 near Manigotagan to Berens River.

The Large Area Transportation Network Study, the subject of the current study, was managed by ESRA and delivered by SNC-Lavalin as the prime consultant, along with AECOM, J.D. Mollard &

Associates, Dan Highway & Associates, Brian Wilkes & Associates, and Apex Engineering Ltd. making up the multi-disciplinary study team.

Based on the study goals, key tasks, as well as issues and challenges discussed earlier, a study methodology was developed to fulfill the study requirements in a systematic and thorough manner. Due to the large number of stakeholders and the significance of their participation in this study, the study work plan was based on two parallel and interactive processes: a technical process and a stakeholder and public engagement process[2] (see Figure 1.3).

The Technical Process:

At the outset of the study, this process included consideration of a number of alternative surface/air transportation modes, in addition to an all-season road (ASR) system, to service the remote ESLW communities. Generally the alternative modes considered were not considered appropriate as a permanent solution on the grounds of either cost, unreliability, environmental damage, safety impairment, or lack of freedom to move:

Table 1.1 summarizes the alternative modes considered, along with some of their key characteristics.

Table 1.1: Alternative Transportation Modes

Railway	• Construction cost on a per km basis comparable to that of an all-season road. • Lengthy connections needed to existing railhead/rail line at Pine Falls (CEMR) and Waboden (HBR) respectively, duplicate existing provincial roads (70 km of PR 304 and 131 km of PR 373). • Much flatter gradients rail versus road increases cost; may also be more difficult to maintain rideable profile over muskeg and permafrost pockets. • During construction phase difficult to offload/reload goods and people at continually advancing rail/winter road interface. • Less freedom to move than with a road system.
Hovercraft	• Suitable over large bodies of open water. • Would likely suffer skirt degradation over muskeg and swamp. • Potential damage of fragile environment over potential multiple routes. • May damage ice surface during freeze up, potentially breaking ice and creating hazards for snowmobilers.
Airships/Dirigibles	• Would need to be very large to haul TAC maximum highway loadings (Boeing Sky Hook HLV maximum pay load 40 tons). • More sensitive than fixed wing aircraft to inclement weather, potentially a significant factor east of Lake Winnipeg (Boeing HLV can only operate in winds up to 25 knots).
Ferries	• May be appropriate for summer transportation across lakes or rivers as an interim

[2] In this report, the terms community/public "engagement" and "participation" are used to refer to the communications and meetings conducted by the consultant team with the project stakeholders and the general public, for providing project information and receiving feedback for the selection of the preferred transportation network and routes.

	lower cost link in an all-season road system. • An ice bridge parallel to the ferry route could be used for winter transportation but has potential break through, with safety and environmental degradation risks. • Ferries may, where traffic volumes are relatively small and the cost of a bridge is high, be considered a more permanent link.
Improved Winter Roads	• Shift existing winter road onto firmer ground along a future ASR route. • Provide permanent bridges at major water crossings along future ASR route. • Could be initial phases in development of an ASR route.

As a result of the above considerations it was concluded that the most worthwhile, reliable, safe and equitable improvement to the existing ESLW transportation system would be the construction of an all-season road system, supplemented during its development with, where appropriate, improved winter roads and permanent bridges, as well as with either temporary or permanent ferry linkages. The rationale for this being, compared with either the existing system, or alternative modes such as rail, hovercraft or airships/dirigibles:

- Greater long term reliability for safely moving people and goods during all seasons and most weather conditions
- Greater freedom to move for all East Side communities, individuals and businesses
- More equitable system for travel and trade, on a par with existing ASR system serving most communities in province

The technical process for developing an ASR Network involved the identification of feasible all-season route alternatives based on important route selection criteria, including:

- The suitability of the terrain, soils and surface geological deposits to accommodate the road and to provide sources of granular materials to build the road
- Protection of the natural environment with its important animal, plant and fishery resources
- Protection of historical sites, artifacts, archaeological resources, the proposed UNESCO World Heritage Site, local culture and traditional land uses
- Enhancement of opportunities for social and economic improvements by providing more reliable access to communities, potential development sites and renewable natural resources
- ASR routes that lower transportation costs and are safe, reliable and efficient for the east side communities
- Provision of the most appropriate routes to enhance travel and trade opportunities between the East Side Planning Area and the rest of Manitoba

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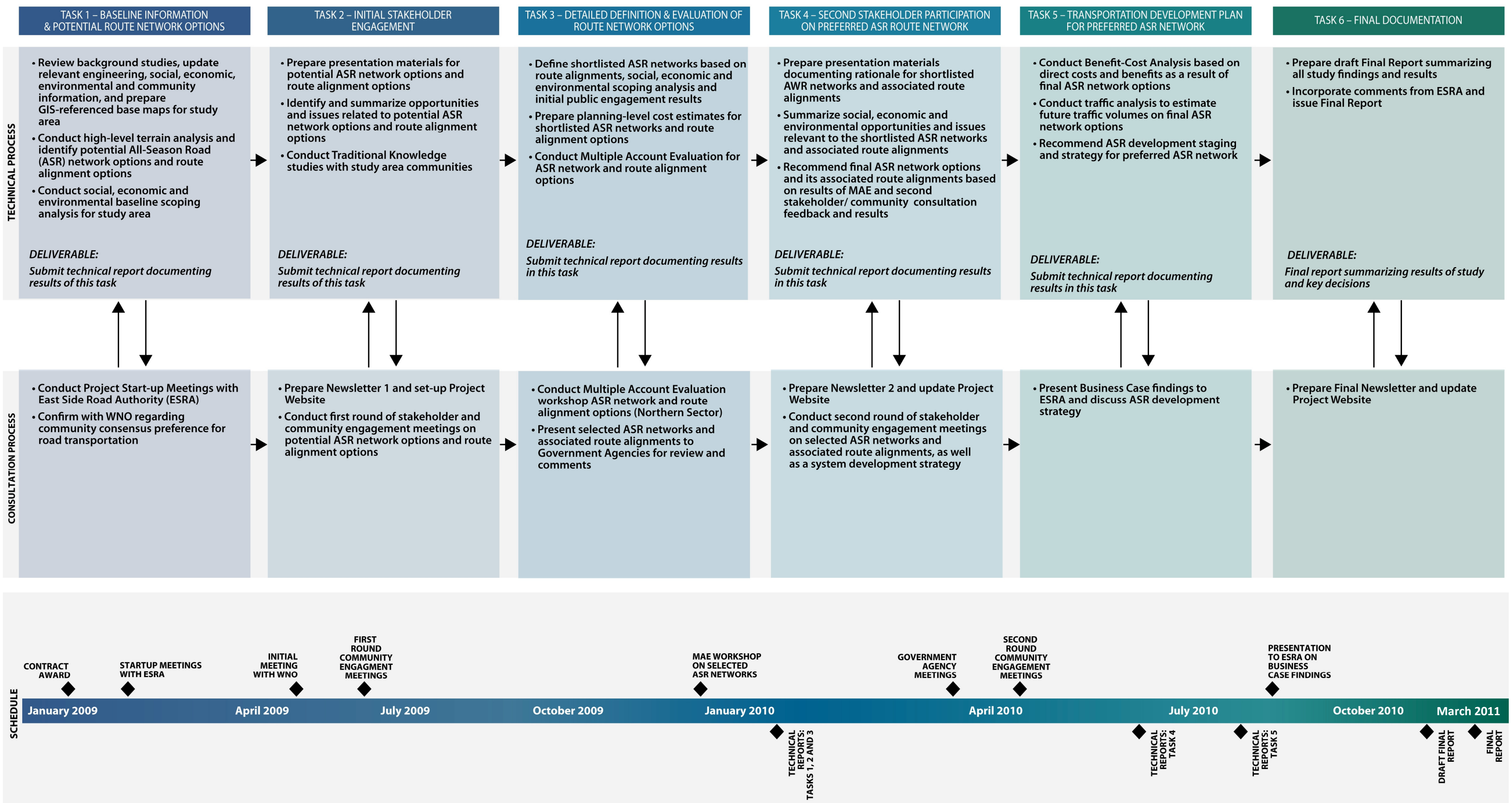
Figure 1.3: Study Flow Chart



The Public Engagement Process:

This process involved entering into dialogue with people living in the study region in order to gain their insight into preferences and potential impacts associated with the development of an all-season transportation network. The community and public engagement process included:

- Round 1 of community engagement meetings conducted between March 2009 and January 2010. The consultant team visited the majority of communities within the study area and introduced the study scope, approach, methodology, schedule, project team, as well as a number of preliminary ASR route options to the community members, and in return received valuable inputs on project issues and opportunities.

- During the initial round of engagement, in addition to the east side communities, meeting with the following stakeholder groups:
    - Wabanong Nakaygum Okimawin (WNO) Chiefs, April 30, 2009;
    - General public at an Open House in Winnipeg, June 25, 2009;
    - Manitoba Metis Federation (MMF), April 18, 2009 and December 09, 2009.

- Traditional Ecological Knowledge (TEK) studies completed at the majority of communities within the study area. These studies provided valuable input from the local residents which, when consolidated, are intended to be used to scope the environmental, social-economic and cultural implications of project development.

- Round 2 of community meetings conducted between May and June 2010 to present detailed findings of the short-listed ASR route network options incorporating the input received from the Round 1 meetings. Prior to the Round 2 meetings, a number of government agencies were consulted on March 18, 2010 in Thompson, MB, to discuss the study findings to date and critical issues associated with the ASR road development in the study area.

The detailed schedule and venue of the Round 1 and Round 2 meetings, and TEK Studies initiation and completion dates are shown in Appendix 1 of this report.

2.0 ASR NETWORK OPTIONS DEVELOPMENT AND EVALUATION

2.1 Preliminary ASR Network Options

During the initial phase of the Large Area Transportation Network Study, seven preliminary ASR route network options (Options A to G) were generated for connecting the communities on the East Side of Lake Winnipeg (ESLW) to the provincial all-season road (ASR) network in Manitoba. These network options (shown in Appendix 3A of the Volume 1 Report) were identified by the study team in consideration of topographic, physiographic, geological, social-economic and natural environmental information, using a context-sensitive transportation engineering approach. Parallel to this technical process, the study team visited most of the communities during the Round 1 engagement process to obtain community feedback and input on the seven route network options, as well as on the proposed evaluation process. Interim results from the Traditional Ecological Knowledge (TEK) studies were also analyzed and considered in the technical route evaluation.

East-West vs North-South Connection

Based on the feedback and input received from the communities, and further analysis of the preliminary network options, it became evident that network options can be classified into east-west and north-south connections:

- East-west connection focused on connecting the communities in the Northern Sector of the Study Area (communities around Gods Lake, Oxford Lake, Island Lake and Red Sucker Lake) to Provincial Trunk Highway 6 (PTH 6) via Cross Lake or Norway House. This east-west connection would support the current travel available in the winter via the existing east-west public and private winter road system connecting the Northern Sector communities to PR 373 north of, as well as in Norway House, and thence via PTH 6 to Thompson or Winnipeg (see Figure 1.2 in previous section of this report).
- North-south connection focused on connecting the communities in the Northern Sector of the Study Area to the south (Winnipeg) via Berens River or Bloodvein, the tie-in points to the provincial ASR network via PR 304, once the PR 304 to Berens River ASR project construction is completed. This north-south connection would support current travel available in the winter via the existing north-south public winter road system connecting the Northern Sector communities to Bloodvein and thence via Manigotagan to Winnipeg (see Figure 1.2).

Conclusion

Based on the technical route analysis and the travel preferences expressed by local residents during the community meetings, SNC-Lavalin is of the opinion that the east-west connection should receive priority over the north-south connection. The rationale for this conclusion is summarized as follows:

- **Length of Road and Travel Distances:** The lengths of new road construction and the travel distances are shorter for the east-west compared to the north-south connection, resulting in reduced construction cost and reduced travel time to the nearest population and supply centres (Thompson as compared to Winnipeg, Cross Lake or Norway House as compared to Berens River)[3]. A north-south ASR route from St. Theresa Point via Poplar River, Berens River and

[3] 2010 populations of these provincial and regional supply centres are: Thompson = 13,978; Winnipeg = 757,846; Cross Lake =5,582, and Norway House= 5,031, including on-reserve, (but not off-reserve populations) and NAC communities in Cross Lake and Norway House.

Bloodvein to PR 304 near Manigotagan would be about 486 km long. If it was possible to provide a more direct connection to PR 304 via Bloodvein, generally following the existing winter road route, the distance between St. Theresa Point and PR 304 would be in the order of 440 km. By contrast the distance from St. Theresa Point via an ASR route to PR 373 near Sea Falls is about 238 km. Providing a north-south route on the East Side of Lake Winnipeg, rather than an east-west route, to service the Island Lake, Red Sucker Lake and the Northern Cree communities (those at Oxford House and around Gods Lake) would result in an additional 202 to 248 km of travel for St. Theresa Point residents, before reaching the existing Manitoba all-season road system.

- **Impact on Ecologically Sensitive Environment:** An east-west ASR connection would result in less probable impact to the natural environment. All north-south connection options between Wasagamack/St. Theresa Point and Bloodvein/Berens River (as does the existing winter road) would potentially cross ecologically sensitive environment including undisturbed boreal forest (unless the options closely followed the existing winter road corridor), as well as endangered woodland caribou habitat. North-south route options would also be located through the existing Poplar River Provincial Park Reserve and the proposed UNESCO World Heritage Site (see Figures 3.4 and 3.5 in the next section of this report).
- **Construction Challenges:** North-south route options would also pose significant construction challenges, having to cross extensive rocky outcrops, swamp and muskeg. By contrast east-west route options can, in part, advantageously be located along moraine or esker features, with good foundations for road construction, as well as extensive availability of road building materials.
- **Road Construction Schedule:** Due to the shorter construction length, ASR linkage can be achieved sooner by going west rather than south. Considering the recent global climate changes, the likelihood of continued unreliability of the winter road system makes this an imperative.
- **Cultural and Community Linkages:** Provision of an east-west connection as a first priority is supportive of existing and potential social relationships and needs. Due to cultural and community ties, the travel preference of members of the Gods Lake and Oxford House communities is for an east-west connection to Thompson and Gillam via Cross Lake or Norway House. If the intercommunity system linking the Oxford Lake, Gods Lake, Island Lake and Red Sucker Lake communities was only connected to the south, the existing relationships, as well as future potential needs and affinities, would be seriously hampered. The current east-west winter road system[4] has favoured and promoted these relationships; the all-weather system should support, not sever these connections.
- **Enhanced Choices of Destination:** Provision of an east-west connection provides travellers with a choice at the junction of PR 373 and PTH 6 – to go north to Thompson or south to Winnipeg. Conversely, freight coming into the Northern Sector can come from either of those cities. A connection only to the south would be a barrier to Thompson trade in the Northern Sector.

[4] This includes the public winter road connecting Oxford House, Gods Lake Narrows and Gods River to PR 373, just south of Sea Falls Ferry; also the private winter road connecting Wasagamack and St. Theresa Point to PR 373 at Norway House.

Based on the above understanding, the seven preliminary ASR route network options were refined and four east-west route options were selected for further analysis: Options C, D, H and I, all focusing on the east-west connection in the Northern Sector of the Study Area. Option H was developed by the SNC-Lavalin consultant team as a modification to the earlier Option F, while Option I was suggested by a number of Chiefs in the Northern Sector of the study area. All route options utilize existing winter road corridors where feasible.

The four east-west oriented route network options, also referred to as Northern Sector route options, were then compared in order to further reduce the number of potential routes for detailed evaluation. The four options were evaluated based on three screening criteria: total length of construction, total construction cost and total travel distance for all communities to a common point, the intersection of PR 373 and PR 374 (96 km from PTH 6), the connection to the rest of Manitoba's road network. As a result of this screening evaluation, Option D was removed from further analysis. The route network options that were short-listed for further consideration were Options C, H and I (see Figures 2.1, 2.2 and 2.3 at the end of this section).

2.2 Input from Public Engagement Process

At the outset of this study in April 2009, the Study Team met with the Wabanong Nakaygum Okimawin (WNO), and in March 2010 with provincial government agencies in Thompson. Two rounds of public engagement were undertaken by the Study Team during 2009 and 2010, involving spending, in general, at least a day in each of the communities without ASR service, and meeting with the elected community leaders as well as the general public. During Round 2, in addition to meeting the elected leadership and general public, the Study Team conducted extensive interviews with people having key roles in the community, such as the Band Manager, the Store Manager, the Airport Manager, the School Principal and the Head Nurse.

During these community meetings and interviews, the Study Team found general support for connecting all communities to the existing all-season road (ASR) system in Manitoba: Poplar River and communities to the south to be connected to the proposed PR 304 – Berens River Road: Red Sucker Lake, Island Lake communities, Gods Lake communities and Oxford House, to be connected, as a first priority to the west, to either PR 373 near Sea Falls, or to PR 374 near Cross Lake. A recurring theme in the meetings with Chiefs, Mayors, Councillors and the general public was that, although an ASR system may bring challenges (such as easier access to drugs and alcohol, along with inroads by out-of-community hunters and fishers), overall the benefits were felt to outweigh the negatives. The expected benefits include a lower cost of living; improved local business and employment opportunities; easier access to preventative and curative medical services; and more opportunities for youth to stay closer to home when completing high school education, or participating in intercommunity recreational events,

<u>Round 1 Public Engagement:</u>

In Round 1 of the public engagement, the initial seven ASR network options were brought by the Study Team to all the ESLW communities that do not currently have ASR access. Public meetings were also held in Cross Lake and Winnipeg. As a result of feedback received from Round 1, some of the earlier options were dropped or modified, and some new ones developed that incorporated the more promising aspects of the earlier options. Four such options in the Northern Sector of the Study Area were taken forward to Round 2: Option C revised, and new options, Options H, I and J.

Round 2 Public Engagement:

Round 2 was undertaken from May 31 to June 15, 2010. The options presented in the Northern Sector of the Study Area were:

- Option C: This involved an east-west trunk route between Norway House and Island Lake, located south of Molson Lake, generally near the corridor of the existing private winter road, following a moraine with good terrain, between Stevenson Lake and St. Theresa Point/Wasagamack. The option included a new bridge at Sea Falls. East of Island Lake, the route extended to Red Sucker Lake, with branches south to Garden Hill and north to Gods Lake and Oxford House. The construction length (593 km) and cost of this option were the least of the 4 options. Although the distance from St. Theresa Point to the junction of PR 373/PR 374 was only 278 km, the travel distance from Oxford House was long, about 420 km to this same junction leading to PTH 6; also this route encountered poor terrain over the 75 km east from Norway House.
- Option H: This involved an east-west trunk route north of Molson Lake, generally parallel to the Echimamish/Hayes River corridor, where it encounters 33 km of poor terrain west of Anderson. A "Y" junction north of Bolton Lake had branches going south-east to Island Lake and Red Sucker Lake, and north-east to Gods Lake and Oxford House. At the west end of the east-west trunk, it was possible to go south-west through some Northern Flood Agreement lands along the Paimusk Creek Road to Sea Falls, where a new bridge was considered across the Nelson River (Sub-option Ha), or north-west to PR 374 near Cross Lake, where the existing Kichi Sipi Bridge crosses the Nelson River (Sub-option Hb). This option, Option H, was slightly longer than Option C (length of Ha 599 km, length of Hb 616 km), and its cost slightly more, but travel distances were much more equitably spread between the communities: St. Theresa Point to the PR 373/PR 374 junction was 282 km (Option Ha); Oxford House to the same junction was 275 km.
- Option I: This option was similar to Option C, except a branch route was introduced running from the vicinity of Stevenson Lake north-east towards Oxford House and Gods Lake. This option was longer, at 658 km, and more costly than Options C or H. Although the distance from Oxford House to the PR 373/PR 374 junction at 314 km, was significantly less than in Option C (420 km), it was still considerably longer than in Option Ha (275 km). Option I also encountered the 75 km section of poor terrain east of Norway House. Furthermore, should there be a need in the future for a more direct route between Oxford House or Gods Lake and Island Lake, to access regional facilities that may be developed, this option involved considerably longer travel than Options C or H. For example, the distance between Oxford House and Wasagamack was 242 km in Option I, 191 km in Option H, and 159 km in Option C.
- Option J: This option, which incorporated some common elements from Option H, was developed just before the Round 2 meetings, prior to there being an opportunity to prepare a detailed terrain analysis and cost estimate for it. The common elements with Option H included the ASR east-west trunk route parallel to the Echimamish River/Hayes River corridor north of Molson Lake, the interconnections of the Island Lake, Red Sucker Lake and Gods Lake communities, and two alternative ways (Ja or Jb) of connecting at the west end of the east-west trunk route to either Sea Falls or Cross Lake. The different elements compared with Option H were, (i) the branch route from Anderson to Stevenson Lake, then parallel to the private winter road corridor along the moraine, with good terrain, to St. Theresa Point/Wasagamack, and (ii) the branch route from Anderson, along the existing winter road, following a sandy ridge to Oxford

House. Compared with Option Ha, as it was drawn at that point, Option J reduced the travel distance from Oxford House to PR 373/PR 374 from 275 km to 230 km. Option H was subsequently modified to reduce this distance from 275 to 243 km, 13 km further than in Option J.

Central Sector:

During the Round 2 meeting at Polar River alternative route options were presented that included:

i) An ASR connection north to Norway House (138.2 km)

ii) An ASR connection south to Berens River (95.0 km)

The community members present stated a clear preference for connecting south to Berens River as their first priority.

Southern Sector:

During the Round 2 meeting at Pauingassi it was clear from the community members present that their priority was for an ASR connection south, to the existing airport at Little Grand Rapids. This would avoid the need for river travel, especially through the upper rapids and at night, in the case of emergency medical evacuations.

The Little Grand Rapids community members present at the Round 2 meeting saw an ASR west to the proposed PR 304 to Berens River ASR as their first priority. Concern was expressed to protect wildlife north and west of the community.

Short Term Transportation Priorities:
During the Round 2 public engagement, input and advice was also sought from the communities on short term transportation issues or priorities that could possibly be implemented before construction and operation of the full ASR network. Some of the ideas suggested included:

- Construction of permanent bridges at water crossings on the future ASR alignment, that could, on an interim basis, service and prolong the life of the Red Sucker Lake winter road system;
- Provision of ASR access from Wasagamack and St. Theresa Point to the proposed new airport;
- Lengthening and surfacing of the airport runway at Island Lake NAC;
- Provision of a cable ferry between Garden Hill and the existing airport at the Island Lake NAC;
- Provision of ASR access from Pauingassi to Little Grand Rapids Airport. Prior to this consider extending an existing ASR a short distance north from Little Grand Rapids Airport, on the east side of the river, to a new landing, to bypass the upper rapids.

2.3 Short-listed Route Network Options in Northern Sector

The three short-listed all-season road (ASR) route options in the northern sector of the study area, Options C, H and I, were evaluated using a Multiple Account Evaluation (MAE) framework. The evaluation results, as detailed in the Volume 3 Report of this study, suggested that Options C and I, compared to Option H, were considered less favourable, for the following reasons:

- Option C, (see Figure 2.1) although favoured by Wasagamack and St. Theresa Point, involved so much more travel for Oxford House, Gods Lake Narrows and Gods River, with a total population of over 4,000, that the option was not considered equitable. Furthermore Option C encountered 75 km of poor terrain east of Norway House, as well as impacting more potential woodland caribou winter habitat than Option H (see Figure 2.2).

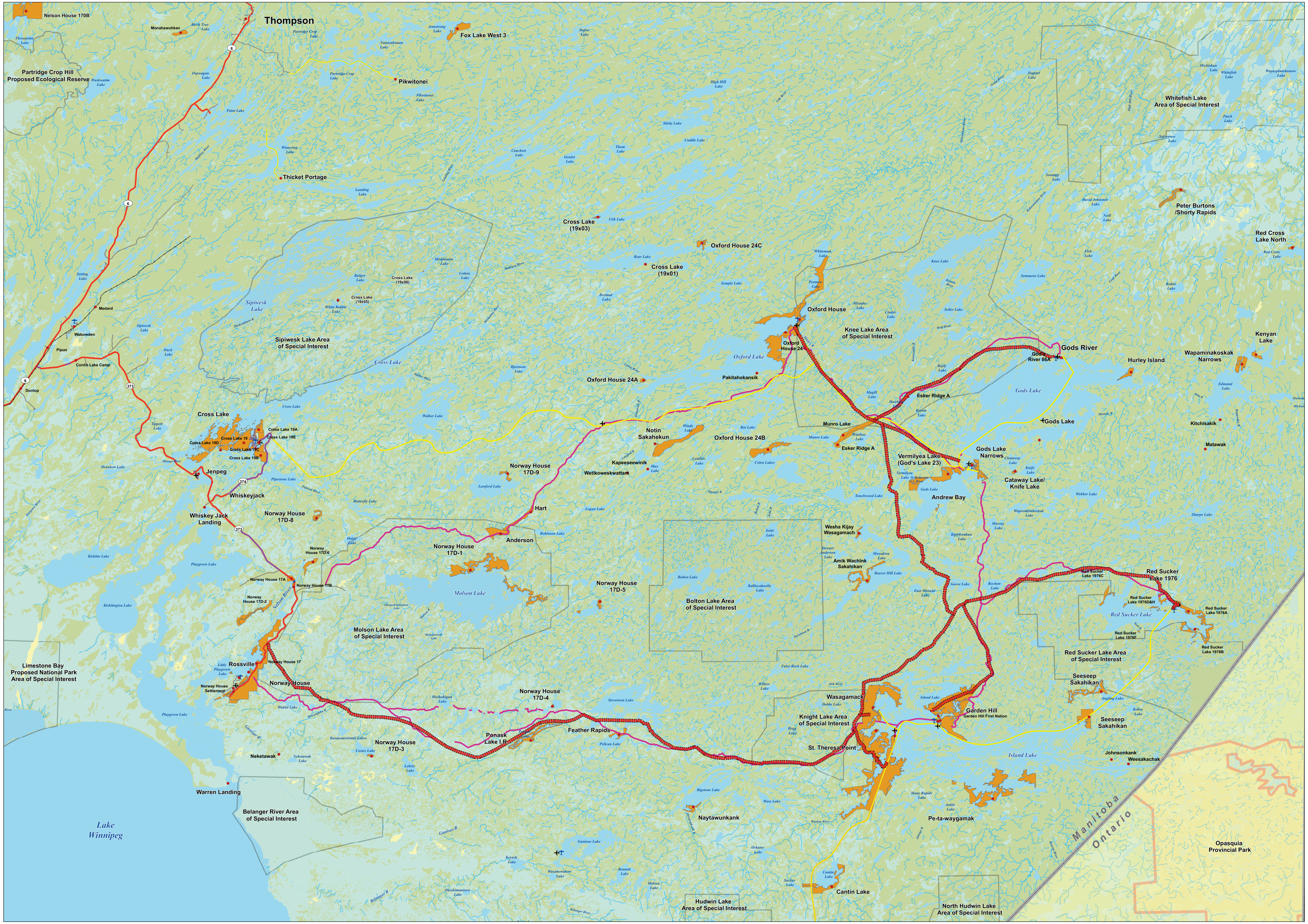
- Option C would result in the most impacts on Treaty Land Entitlement (TLE) and First Nations Reserve lands, in the section between Gods Lake Narrows and the main trunk route connecting the Island Lake communities. The TLE land located near the Kanuchuan Falls could not be easily avoided due to the extensive water crossings in the area; the only alternative was to locate the route through the Gods Lake Narrows Indian Reserve, which was also considered not feasible due to the traffic volumes on the future ASR main route, and the community disruption this could cause.

- Option I (see Figure 2.3) was dropped because it also, like Option C, involved considerable out-of-the way travel for Oxford House and the Gods Lake communities; the route also utilized the 75 km length of poor terrain east of Norway House, and impacted more potential woodland caribou winter habitat than Option H. Due to its longest construction length, Option I had the highest construction cost compared to Options C and H. Option I did not receive any community support during Round 2.

Based on the above analysis, Options C and I were screened out of further evaluation.

Subsequent to the Round 2 public engagement, Option H was slightly revised in the segment from Oxford House to the main trunk route, to make the travel distance from Oxford House to the west more comparable to the new Option J (see Figure 3.1 in next section of this report). Oxford House, during the Round 2 meeting, indicated that shorter travel to the west was a greater priority than to Gods Lake Narrows. These two options, the Revised Option H and Option J, were then further evaluated as the final ASR options in the Northern Sector.

Figure 2.1: East Side Transportation Study (ESTS) Option C



Legend

- Option C - All-Season Road Route
- Community
- Air Field
- Sea Plane Facility
- Paved Expressway / Highway
- Un-Paved Road
- Un-PavedExpressway / Highway
- 2008 Winter Road
- Historic Winter Road
- Rail Line
- Watercourse
- Transmission Line
- First Nation
- Forested
- Wetland
- String Bog
- Lake
- Provincial Boundary
- Areas Of Special Interest (ASI)
- Ecological Reserve
- Park Reserve
- Provincial Park

0 12.5 25 50 75 Km

Scale: 1:350,000

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East Side Road Authority

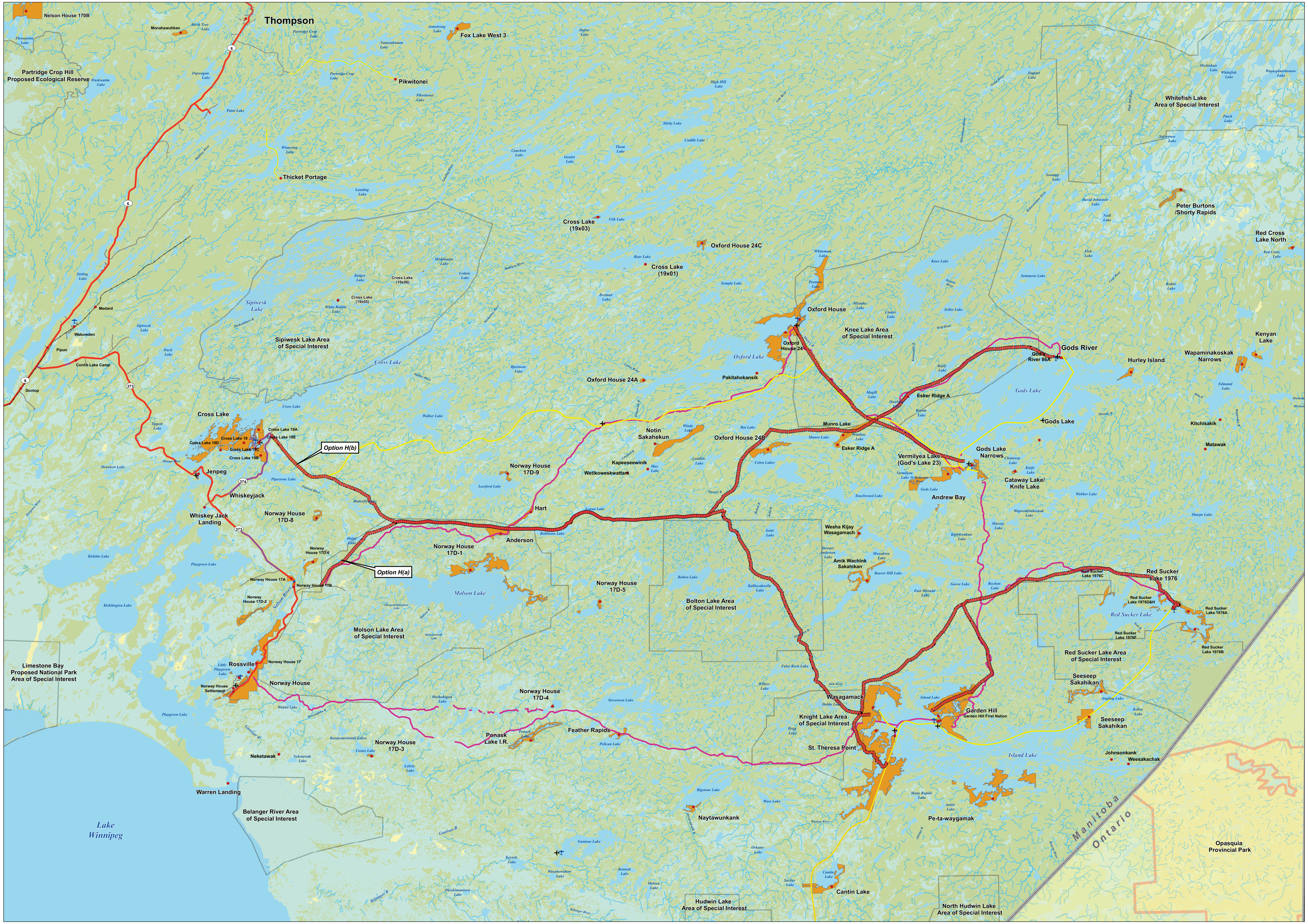
EAST SIDE TRANSPORTATION STUDY (ESTS)

Figure: 2.1

Option C

Date:	March, 2010	File Number:	020254-0000-4E00-0003	Rev:	PB

Figure 2.2: East Side Transportation Study (ESTS) Option H (Sub-options Ha and Hb)



Legend

- Option H - All-Season Road Route
- Community
- Air Field
- Sea Plane Facility
- Paved Expressway / Highway
- Un-Paved Road
- Un-PavedExpressway / Highway
- 2008 Winter Road
- Historic Winter Road
- Rail Line
- Watercourse
- First Nation
- Forested
- Wetland
- String Bog
- Lake
- Provincial Boundary
- Areas Of Special Interest (ASI)
- Ecological Reserve
- Park Reserve
- Provincial Park

N

0 12.5 25 50 75 Km

Scale: 1:350,000

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East Side Road AUTHORITY

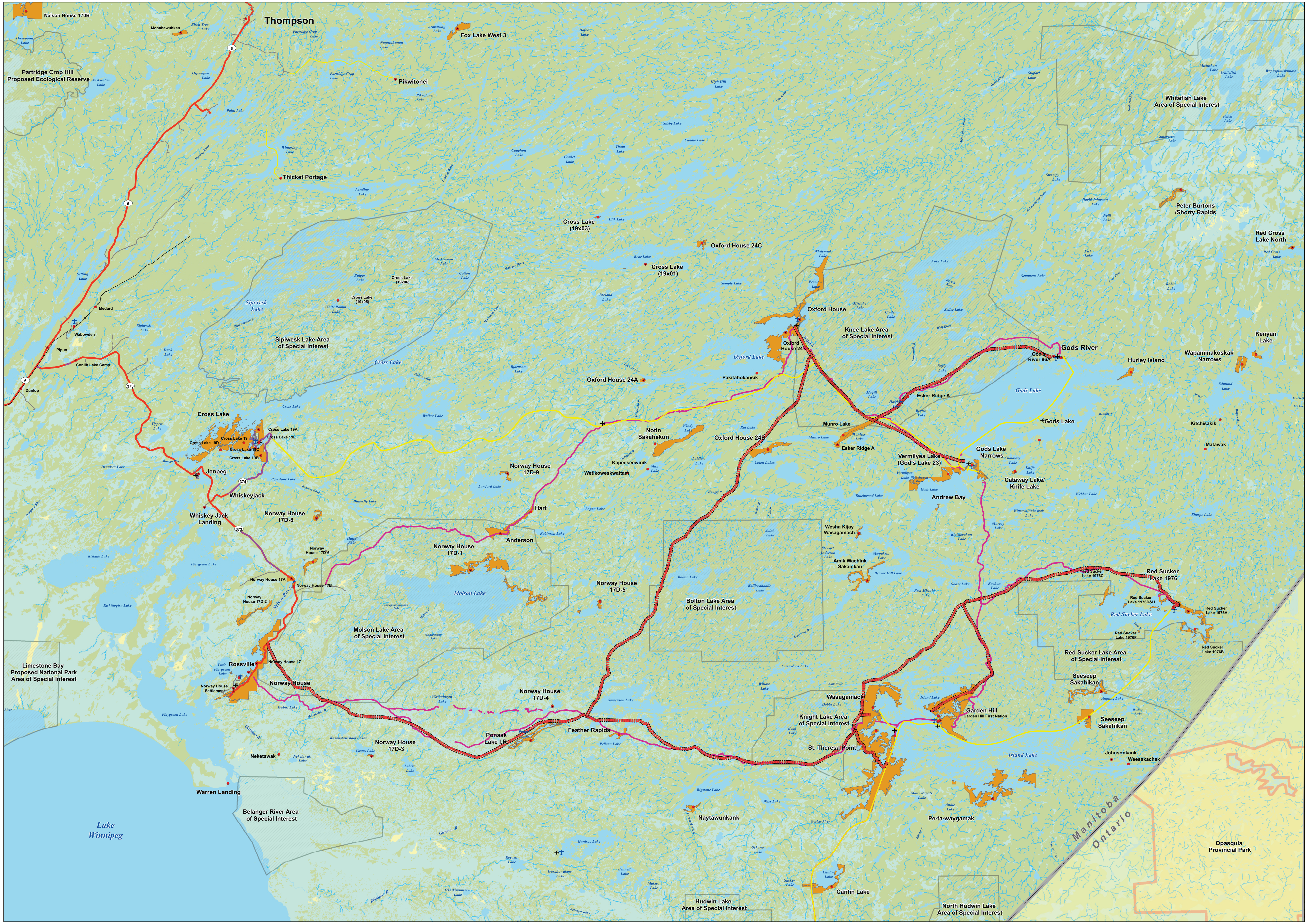
EAST SIDE TRANSPORTATION STUDY (ESTS)

Figure 2.2 Option H (a) / H (b)

Date:	April, 2010	File Number:	020254-0000-4E00-0007	Rev:	PB

Note:
This map is intended for internal use only.This map is intended for illustrative purposes only. Do not rely on this map for legal administrative purposes. Do not rely on it as being a\precise indicator of routes, locations of features.
Source: National Topographic Data Base (NTDB) 1:50,000. Government of Canada, Natural Resources Canada, Centre for Topographic Information 2003/ Manitoba Land Information (MLI) 2009. Projection: Canada_Lambert_Conformal_Conic (GCS_North_American_1983)

Figure 2.3: East Side Transportation Study (ESTS) Option I



Legend

Option I - All-Season Road Route

- Community
- Air Field
- Sea Plane Facility
- Paved Expressway / Highway
- Un-Paved Road
- Un-PavedExpressway / Highway
- 2008 Winter Road
- Historic Winter Road
- Rail Line
- Watercourse
- Transmission Line
- First Nation
- Forested
- Wetland
- String Bog
- Lake
- Provincial Boundary
- Areas Of Special Interest (ASI)
- Ecological Reserve
- Park Reserve
- Provincial Park

N

0 12.5 25 50 75 Km

Scale: 1:350,000

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East Side Road Authority

EAST SIDE TRANSPORTATION STUDY (ESTS)

Figure 2.3 Option I

Date: April, 2010 | File Number: 020254-0000-4E00-0009 | Rev: PB

Note:
This map is intended for internal use only.This map is intended for illustrative purposes only. Do not rely on this map for legal administrative purposes. Do not rely on it as being a\precise indicator of routes, locations of features.
Source: National Topographic Data Base (NTDB) 1:50,000. Government of Canada, Natural Resources Canada, Centre for Topographic Information 2003/ Manitoba Land Information (MLI) 2009. Projection: Canada_Lambert_Conformal_Conic (GCS_North_American_1983)

3.0 FINAL OPTION EVALUATION: OPTIONS H VS J

3.1 Northern Sector

Option J was developed just before the Round 2 meetings and included a significant number of common elements from Option H. This Option was developed addressing one major concern, that with Option H, about 290 km of new road would be located over undisturbed environmentally sensitive territory. Option J, by making greater use of corridors already occupied by the existing winter road system, reduced the km of proposed all-season road to be built on new territory to approximately 110 km from about 290 km.

Building on the evaluation framework used earlier in this study, the evaluation criteria for comparing Options H and J included the following considerations:

- Capital Cost
- Travel Distance to Provincial ASR Network
- Social/Community Benefits and Impacts; Regional and Local Economy Benefits and Impacts
- Natural Environment Impacts
- Relation to Existing Winter Road System
- Southern Connection
- Connection Points to Provincial ASR Network (PR 373/PR 374)

Each final ASR option was analyzed based on their merits and potential impacts under these evaluation criteria. Comparison was then made based on the advantages and disadvantages of each option, along with a discussion of data limitations and areas of special concern. The Technical Memo dated October 29, 2010, included in Appendix 2 of the Volume 5 Report, has extensive discussion on the evaluation of Options H and J.

Figure 3.1 Final Options H and J in Northern Sector (Constraints Map, Northern Sector), shows the route network options, Option H/Sub-options Ha and Hb in red line; Option J/Sub-options Ja and Jb in green line; and a number of potential constraints to route location. Where the route options overlap they are shown in red/green dashed line. Future southern connections to Poplar River as shown in red dashed, Option H, or green dashed, Option J.

The constraints shown are essentially land or water use/designation constraints and include:

- The Hayes Heritage River System. This system, which links Lake Winnipeg to Hudson Bay at York Factory, includes a portion of the Nelson River and the Echimamish River, as well as the Hayes River itself. Although crossings of the system already exist, any new crossings will require careful design and assessment. Furthermore a 200 m buffer needs to be respected between a new ASR and the river.
- Areas of Special Interest (ASIs) and rare geological formations within them.

- Non-populated Indian Reserves (IRs), Treaty Land Entitlements (TLEs) and Northern Flood Agreement lands (NFAs). These are further potential constraints on route location. ASR routes can be close to these lands to facilitate access, but preferably should not actually cross these lands.

- Mine sites, mineral leases, mining clauses, and quarry withdrawals. All of these, except quarry withdrawals, should be avoided where possible, although as with IRs, TLEs and NFAs, having the ASR route close by will facilitate future access. The quarry withdrawals cover much large areas that cannot be avoided.

As shown in the Constraints Map Figure 3.1, it is noteworthy that Options H and J, along with the Sub-options Ha/Ja and Hb/Jb, have many common elements, namely:

- The Sub-option Ha/Ja connecting to Sea Falls and Hb/Jb connecting to Cross Lake: both of these ASR sub-options make use of the existing or old winter road corridors;

- The east-west trunk route along the Hayes River System corridor between Butterfly Lake and Robinson Lake: this also follows an existing winter road corridor;

- The interconnecting ASR routes between Gods Lake Narrows and Gods River: these also use existing winter road corridors;

- The interconnecting ASR routes between Red Sucker Lake, Garden Hill, Wasagamack and St. Theresa Point: portions of these routes follow existing winter roads.

The major difference in layout of the ASR route network between Options H and J lies in the location of the east-west trunk routes between Robinson Lake (near Anderson), Oxford House and Island Lake. The northern trunk route of Option J generally follows the existing winter road corridor, along good terrain, to Oxford House; the southern trunk route joins the private winter road corridor along good terrain, from Stevenson Lake to Wasagamack. Option H strikes a middle of the road location for its east-west trunk, over new territory to a point north of Bolton Lake, where it branches north-east to Oxford House or south-east to Island Lake.

Within subject areas that may be considered significant under the above evaluation criteria, further differences between Option H and J are as follows (within the Northern Sector of the Study Area):

<u>Capital Cost</u>

Although distances are not shown on the Constraints Map Figure 3.1 shown at the end of this section (they are shown in Appendix 2) it can be seen by inspection that Option J is longer than Option H. The total system length of Option J/Sub-option Ja, at 647.9 km, is longer than Option H/Sub-option Ha at 596.8 km i.e. the difference is 51.1 km. There is a similar difference between Option J/Sub-option Jb, at 665.4 km, and Option H/Sub-option Hb at 614.2 km. As a result of the greater system length the construction costs associated with Option J are marginally greater than per Option H. The cost difference is about 7%. However, taking in account uncertainty of information regarding actual ground conditions, lengths and depths of water crossings, etc, when developing construction costs, as well as the additional amount of winter road construction for Option H, both options could be considered similar for costs, since the range of precision of the construction costs is estimated to be between -25% and +50%.

Travel Distance/Time to Provincial ASR Network (Distances/Times shown in Volume 5 Appendix 1, Table 2.2, Page 4)

This refers to the person-km, tonne-km or average travel time if every person in every community travels to the junction of PR 373/ PR 374, or a tonne of freight is moved from this junction to every person in every community. In Option J the travel distance from St. Theresa Point/Wasagamack to a common point for both options, Option J and Option H, near Butterfly Lake, is 186 km. For Option H this distance is 182.4 km. This gives a slight advantage to Option H, since significant populations around Island Lake and Red Sucker Lake are serviced by the ASR link. In the case of Oxford House the distance to this common point is 152.8 km with Option J, and 164.2 km with Option H, giving an advantage to the former. In the case of Gods Lake Narrows and Gods Lake, the distance to the common point near Butterfly Lake from a common point where the ASR routes to both communities join, is 160.6 km for Option H and 171.8 km for Option J, giving an advantage to the former.

Overall the difference between the two options, coupled with their sub-options, in terms of overall community travel distance for people or freight, or travel time, between the junction of PR 373/PR 374 (a common point for both options as well as their sub-options), and the communities, is in the range of approximately 1% to 3% (1% refers to the Options H and J with their “a” sub-options and 3% to the Options H and J with their “b” sub-options). Although Option H is marginally better than Option J in this respect, the difference is negligible.

Social/Community/Benefits and Impacts; Regional and Local Economy Benefits and Impacts

i. Travel Distance between Cree and OjiCree Communities (Social/Community Benefits and Impacts)

Inspection of the Constraints Map Figure 3.1 shows that travel between the Northern Cree communities (Oxford House, Gods Lake Narrows and Gods River) and the Island Lake/Red Sucker Lake OjiCree communities will be more extensive with Option J than Option H. For example the distance from Oxford House to Wasagamack is 157.3 km in Option H and 281.3 km in Option J, a difference of 124 km, which, at an average speed of 80 km/h, represents just over 1.5 hours extra travel time. Although outside the scope of this study, this situation could be addressed in the future for Option J by extending an all-season road south from Gods Lake Narrows to connect with the proposed ASR between Red Sucker Lake and Garden Hill. This future ASR route could be located in the same corridor as an existing winter road; however this would result in long distance traffic crossing through the Gods Lake Narrows community. Another option, as shown in Option C (Figure 2.1 in the previous section) would be to bypass Gods Lake Narrows and cross Gods Lake in the vicinity of Kanuchuan Rapids. This route would however need to cross a Treaty Land Entitlement.

ii. Impact on Mine Sites, Mineral Leases, Mining Claims and Quarry Withdrawals (Regional and Local Economy Benefits and Impacts)

Option H crosses a mining claim south of Oxford House. Option J runs just north of the same claim. No other mine sites, mineral leases or mining claims are crossed by either option. Option J is closer than Option H to a string of mining claims along the northwest shore of Oxford Lake, and extending due west from the lake. In terms of future ASR access potential, this gives Option J an advantage over Option H. However both options would likely spur more mining exploration within the Northern Sector, since it is known to have considerable mineral potential. Both options cross quarry withdrawal areas, Option J to a greater extent than Option H. However these quarry withdrawal areas are so extensive, surrounding in several cases the communities to be serviced by the ASR network, that it is not feasible to avoid them. Furthermore it will be necessary to establish further quarry withdrawal corridors along the preferred ASR network to preserve materials for road construction.

iii. Impact on Unpopulated Indian Reserves, Treaty Land Entitlements and Northern Flood Agreement Lands (Social/Community Benefits and Impacts)

It can be seen on Figure 3.1 that both Option H and Option J are located just to the west of TLE land, west of Wasagamack/St. Theresa Point. Initially it was intended to connect either option, H or J, at this location to the proposed ASR within the two communities. The proposed ASR within the communities here is located on right-of-way in the process of transfer from the federal government to the provincial government. As well as providing a provincial road connection between the two communities, this internal road enables secure all-year access to the proposed new airport, intended to service both communities and replace the existing island based St. Theresa Point airport. The potential encroachment on the TLE land has been avoided for both options by providing a bypass route further west. Unfortunately however this does add to both the system length and system cost. It also increases out-of-the way travel to access these communities for traffic to and from Garden Hill and Red Sucker Lake.

After the announcement of acceptance by ESRA of Option J on November 9, 2010, SNCL further refined this option to avoid where possible all unpopulated Indian Reserve Lands (IRs), Treaty Land Entitlements (TLEs) and Northern Flood Agreement lands (NFAs). The Constraints Map reflects this. However, it was not considered advantageous to totally avoid TLE and NFA lands where both Sub-options Ha and Ja tie into the existing Paimusk Creek Road, the gravel road running east from PR 373 just south of the Sea Falls Ferry across the Nelson River. Option H east of Anderson has not been refined and crosses TLE lands south of Logan Lake (Hayes River System) and unpopulated IR lands north of Wanless Lake. If Option H had been pursued, adjustment of the ASR route away from these areas would have required investigation.

Natural Environmental Impacts

i. Impact of road located in new corridor

Option H would have a major impact on the natural environment as approximately 290 km is located in undisturbed environmentally sensitive land, compared to 110 km for Option J. Option H would cause new fragmentation to boreal forest with associated negative impacts on birds, animals and habitat in the area.

ii. Impact on Hayes River System (Heritage Resource)

Inspection of the Constraints Map Figure 3.1 shows that both options, H and J are located fairly close to or cross the Hayes River Heritage System in a number of locations. Where running parallel to the system, it will be important to respect a 200 m buffer. Compared with its earlier location Option J has been shifted a little west from Knee Lake to respect this buffer. Crossings of the system will require more detailed study and assessment in later phases of the project development. At this time it is felt there is little to distinguish Option H from Option J in terms of their impact on the Hayes River Heritage System.

iii. Impact on Protected Areas

It can be seen from the Constraints Map that Options H and J both cross Areas of Special Interest (ASIs). The most critical constraints within the ASIs are some rare geologic formations. Option J just crosses the southern boundary of a rare geologic formation just west of St. Theresa Point. Options H and J cross the southern boundary of another rare geologic formation at Anderson. Since it may be possible to minimize potential adverse impacts on these formations at a later stage of the route design, the difference between the two options is not considered significant.

Relation to Existing Winter Road System

The existing winter road system is shown as a dash/dot red line on the Constraints Map and has been described in a general sense, in an earlier section of this report dealing with the existing transportation system. About 48% of Option H is located in the same general corridor as existing winter roads, although the direct overlap of the ASR right-of-way with the existing winter road right-of-way is small, less than 2%.

About 80% of Option J follows existing winter road corridors, with actual overlap of rights-of-way being about 9%.

When comparing the “non-common” portions of the Option H and Option J networks northeast of Anderson to Oxford House, Gods Lake Narrows and Gods River, and also southeast to Island Lake, it is noted that:

- Option H is located across virgin territory and does not coincide with any existing winter roads.
- Option J follows existing winter road corridors extensively, including the winter road along the esker that runs between Anderson and Oxford House, as well as the winter road along the moraine between Stevenson Lake and St. Theresa Point.

As a consequence, with respect to Option J:

- The nature of the terrain and the underlying soils are overall better known, as a result of the experience gained through use of the corridor by heavy trucks during the winter road season.
- Construction of an ASR will be along a greater length where disturbances have already been created, thus reducing the extent of new environmental impacts.
- Staging of construction of the ASR will be simpler since more existing winter road is in place to facilitate the import of personnel, machinery and materials.
- Availability of proximate materials for road construction is less of an unknown, than with a route across a greater extent of virgin territory.

The several known entities listed above, coupled with the extensive use of existing winter road corridors, should facilitate the engineering and environmental approvals of the ASR network, allowing earlier completion of construction, thus enabling communities to reap earlier benefits from the ASR system.

In view of the above conclusions, in its relation to the existing winter road system, Option J is considered more favourable than Option H.

Southern Connection

In terms of the layout of the future southern connections between the Northern Sector ASR network and Poplar River (within the Central Sector, just off the south border of Figure 3.1; but shown later in Figure 3.4 at the end of this section) the following differences between Option H and J are noted:

- The future southern connection for Option H is 138.2 km long and would cross the Belanger River ASI south of Norway House, and within the ASI, the tip of a very rare geologic formation. The option also crosses TLE land at the Belanger River itself, as well as the Provincial Park Reserve (which is included within the proposed UNESCO World Heritage Site) surrounding Poplar River.
- The two future Southern connection options (lengths 127.8 km or 138.3 km) associated with Option J cross only the Poplar River Provincial Park Reserve. On balance therefore Option J is preferred to Option H in terms of a shorter connection length being available and a lesser number of constraints being encountered.

Connection Points to Provincial ASR Network (PR 373/PR 374)

In the comparison of Options H and J, the suffixes "a" and "b" were given to two alternative ways of connecting a new all-season road (ASR) to the existing Manitoba ASR system. From a common point just east of Butterfly Lake, Options H and J can be connected to either PR 373 just south of Sea Falls (named as Sub-options Ha/Ja), or to PR 374 near Cross Lake (named as Sub-option Hb/Jb).

With implementation of either Option H or Option J east of Butterfly Lake, there will be a significant volume of two-way traffic travelling between either PR 373 or PR 374 and the eastern populations, totalling just under 14,000, within the Cree and Oji-Cree communities. This will likely include significant volumes of commercial transport trucks, buses and private automobiles between the ASR system east of Butterfly Lake and the junction of PR 373/PR 374, the gateway to PTH 6, en route to Thompson and Winnipeg.

In summary, the main differences between the two Sub-options are:

a) Connection to PR 373 south of Sea Falls (Sub-options Ha/Ja):

- Would necessitate replacing the existing 8-car cable ferry across the Nelson River (Heritage River) with a new fixed bridge in order to provide reliable all-season service to ESLW communities. This may also be an important benefit to Norway House (current population 4,981).
- Would provide shorter travel distance and times to Norway House Hospital for ESLW communities, than Sub-options Hb/Jb
- Would provide improved access to other social services, educational and recreational facilities, as well as businesses, in Norway House[5]
- Would require a crossing of the Echimamish River (Heritage River) (if east-west trunk route located north of Echimamish River)
- Would have impacts on TLE and NFA lands: however access to these lands would likely thereby be improved

b) Connection to PR 374 near Cross Lake (Sub-options Hb/Jb):

- ESLW traffic would utilize the modern Kichi Sipi Bridge over the Nelson River to access PTH 6

[5] The Study Team has not had an opportunity yet to meet with the Norway House Council and community to find out their route preferences, if any.

- Does not require new crossings of the Nelson or Echimamish Rivers (Heritage Rivers) (if east-west trunk route located north of Echimamish River)
- Would provide improved access to social services, educational and recreational facilities, as well as businesses in Cross Lake (current population 5,543)
- Does not impact TLE or NFA lands
- Has the support of Cross Lake
- Reduces the overall ASR project capital cost by about $14 Million (including 20% contingency, 10% engineering and 15% project management)

East-West ASR Network Recommendation

As a result of the technical evaluation and community input obtained during the two rounds of public engagement, the East Side Road Authority (ESRA) accepted a recommendation for an east-west all-season road (ASR) network in the Northern Sector of the study area on November 9, 2010. This acceptance was based on the Option J network linking the Northern Cree and Island Lake communities to the west, initially via the connection at Sea Falls with PR 373 towards Norway House (Sub-option Ja), with a connection to Cross Lake as a future consideration (Sub-option Jb).

3.2 Central and Southern Sectors

In the southern portion of the study area, the development of the ASR network has advanced through the completion of the Environmental Impact Assessment for the PR 304 to Berens River Project. The construction of this project was anticipated to commence in the fall of 2010, and when completed will extend the provincial road network north to Berens River.

To link the communities of Poplar River, Pauingassi and Little Grand Rapids to the rest of the provincial road network, the preferred ASR route network is described below.

Central Sector: Poplar River Connection to Berens River

A preliminary route option was identified involving a generally direct route, approximating the winter road corridor between Berens River and Poplar River approximately 93 km in length. Input received from the Round 2 Community Engagement Meetings for the PR 304 to Berens River ASR Environmental Impact Assessment indicated a concern for routing through the extensive area of muskeg and swamp located south and east of the Poplar River community. It was recommended that the preferred routing be modified to follow the Poplar River corridor upstream. This would avoid the muskeg and flood prone area over a distance of approximately 20-30 km to a point approximately 10 km downstream of Weaver Lake. From that point the route heads south towards Berens River. The outwash deposits associated with the Poplar River valley provide good terrain conditions for the ASR (see Figure 3.2 at the end of this section).

Southern Sector: Pauingasssi/Little Grand Rapids Connection to Berens River/Bloodvein

This network connection is comprised of two parts (see Figure 3.3 at the end of this section):

a) Main West to East Trunk

The main trunk extends from the junction of the branch connections leading to Pauingassi and Little Grand Rapids communities to the future ASR from PR 304 to Berens River. This route partially follows the winter road corridor to a point west of Round Lake where it crosses the Pigeon River (thus avoiding impacts on the Atikaki Provincial Park). From this point, the road extends west to connect to the extended PR 304 at a point midway between Bloodvein and Berens River (thus utilizing the bridge to be built as part of the PR 304 to Berens River Project over the Bradbury River). The total distance of this new road connection is approximately 99 km.

b) Pauingassi and Little Grand Rapids Branch Connection

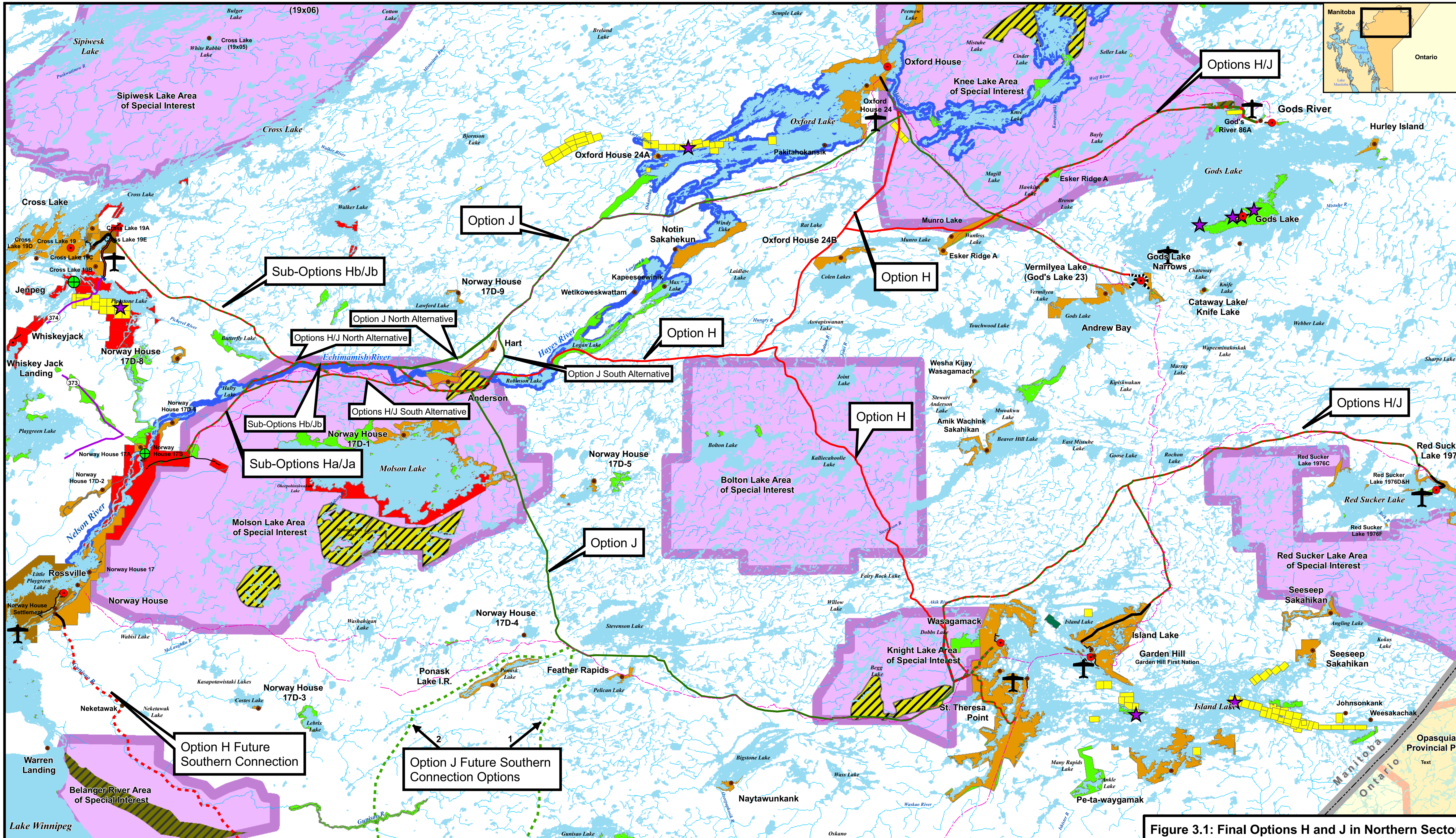
The road segment between Pauingassi and Little Grand Rapids is approximately 32 km in length and provides a direct connection between the two communities and access to the airport near Little Grand Rapids. Within the Little Grand Rapids Reserve Lands, two sub-options have been identified to provide a bridge crossing of Root Lake and assured access, avoiding the need to cross the lake, to the existing Little Grand Rapids Airport. Sub-option 1, involving a lower cost and shorter travel distance to the community of Little Grand Rapids, is considered the preferred option in this connection.

Central and Southern Sectors: Constraints Maps

The two figures 3.4 and 3.5 at the end of this section show land use/designation constraints on route selection in the Central and Southern Sectors of the Study Area. The route between Poplar River and Berens River crosses the Poplar River Provincial Park Reserve, a part of the proposed UNESCO World Heritage Site; also a quarry withdrawal area. Since the route is necessary if Poplar River is to be serviced by an ASR, these potential conflicts are considered acceptable.

The route west from Pauingassi/Little Grand Rapids also crosses the UNESCO site and quarry withdrawals. It skirts north of Round Lake and narrowly avoids Atikaki Provincial Park. These potential conflicts are also considered acceptable, since there is no other feasible way of providing ASR access within Manitoba to these 2 communities.

Figure 3.1: Final Options H and J in Northern Sector (Constraints, Northern Sector)



Legend

- Route Option H
- Route Option J
- Route Sub-Options Ha/Ja, Hb/Jb and Option H/J Overlaps
- Proposed IR Road
- Existing IR Road
- Option H Future Southern Connection
- Option J Future Southern Connections 1 and 2
- Hayes River -Heritage River
- Protected Areas
- Treaty Land Entitlement Areas
- Northern Flood Agreement Areas
- Very Rare Geologic Formation
- Rare Geologic Formation
- Mine Sites
- Mineral Leases
- Mining Claims
- Quarry Withdrawals
- First Nation
- NAC Community
- Community/Geographic Reference (Geographical Names Of Canada Database)
- Ferry
- Public Airport
- Paved Highway
- Un-Paved Highway
- Winter/Limited Use Road
- Provincial Boundary
- Watercourse
- Lake

Note: No Quarry Leases, or Patent Claims occur within this portion of the study area.

Scale: 1:700,000 (10 5 0 10 20 30 Km)

Note: This map is intended for illustrative purposes only. Do not rely on this map for legal administrative purposes, or as a precise indicator of routes, locations of features. Source: National Topographic Data Base (NTDB) 1:50,000. Government of Canada, Natural Resources Canada, Centre for Topographic Information 2003/ Manitoba Land Information (MLI) 2009. Projection: North_American_Lambert_Conformal_Conic (GCS_North_American_1983)

SNC·LAVALIN

East Side of Lake Winnipeg (ESLW) Large Area Transportation Network Study

Constraints, Northern Sector

Date:	Nov, 2010	File Number:	020254-0000-4E03-1101 Rev: PB
Map:			14-6a

Figure 3.2: Proposed All-Season Road – Poplar River to Berens River

Legend

- Poplar River to Berens River ASR
- Little Grand Rapids/Pauingassi to Berens River/Bloodvein ASR
- PR 304/Berens River ASR
- Proposed I.R. Road
- Areas Of Special Interest (ASI)
- Park Reserve
- Provincial Park
- First Nation
- NAC Community
- Community/Geographic Reference (Geographical Names Of Canada Database)
- Un-Paved Road
- Winter/Limited Use Road
- Watercourse
- Wetland
- String Bog
- Lake
- Forested

N

6 3 0 6 12 Km

Scale: 1:350,000

Note: This map is intended for illustrative purposes only. Do not rely on this map for legal administrative purposes, or as a precise indicator of routes, locations of features. Source: National Topographic Data Base (NTDB) 1:50,000. Government of Canada, Natural Resources Canada, Centre for Topographic Information 2003/ Manitoba Land Information (MLI) 2009. Projection: North_American_Lambert_Conformal_Conic (GCS_North_American_1983)

SNC·LAVALIN

East Side Road Authority

East Side of Lake Winnipeg (ESLW)
Large Area Transportation Network Study

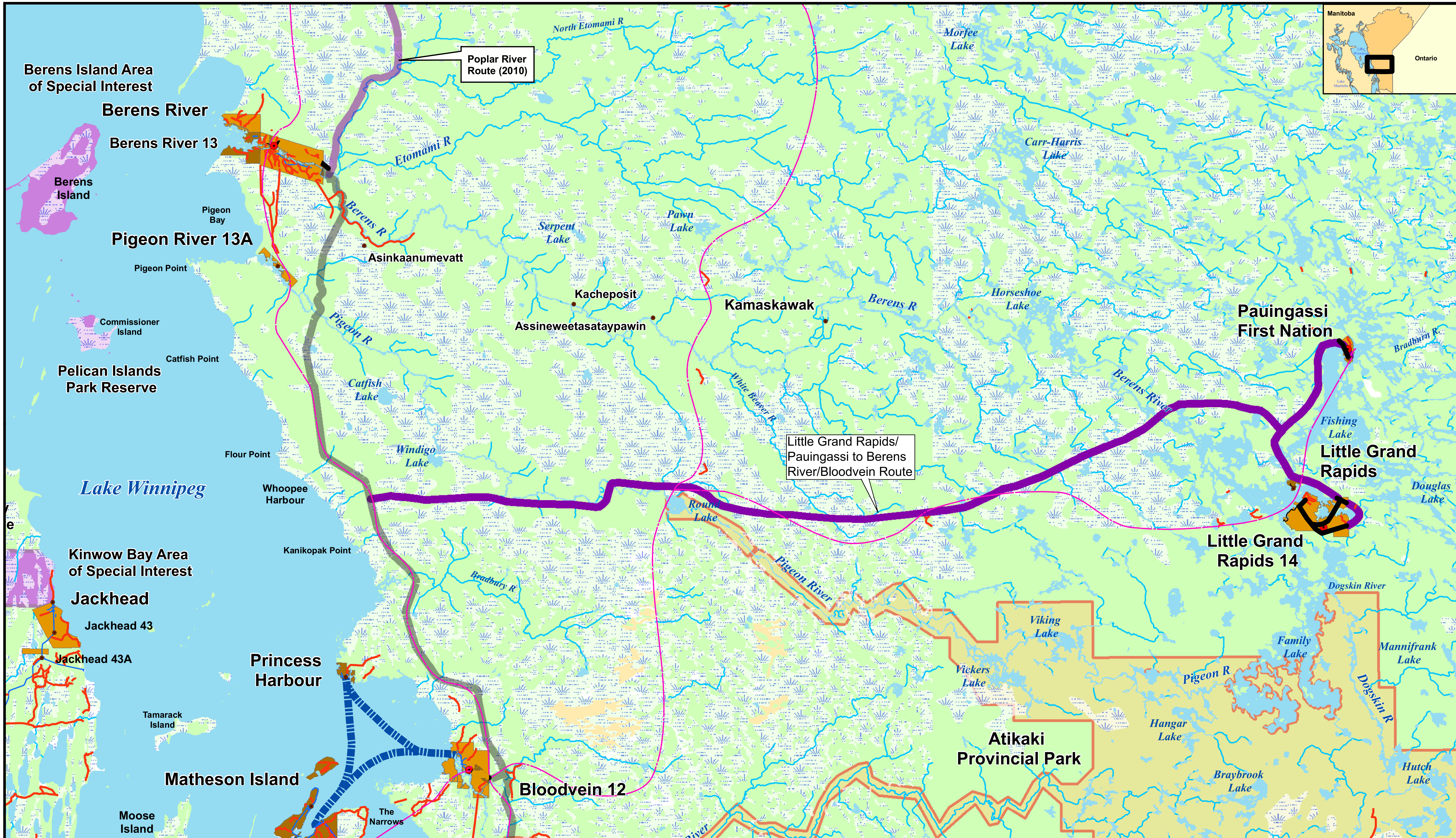
Proposed All-Season Road
Poplar River to Berens River

Date:	April, 2010	File Number:	020254-0000-4E03-0006 Rev: PB

Map: Figure 3.2

File: H:\Arcview\020254EastLakeWinnipegRoad\GIS\1_ESLW_2010\MXD\TimStevens_Jan2011\Fig_2_6_ESLW_SocEcon_PoplarAccess_2010Data_Fig4_2_1 .mxd

Figure 3.3: Proposed All-Season Road – Little Grand Rapids/Pauingassi to Berens River/Bloodvein



Legend

- PR 304/Berens River ASR
- Poplar River to Berens River ASR
- Little Grand Rapids/Pauingassi to Berens River/Bloodvein ASR
- Proposed I.R. Road
- Areas Of Special Interest (ASI)
- Provincial Park
- First Nation
- NAC Community
- Community/Geographic Reference (Geographical Names Of Canada Database)
- Un-Paved Road
- Winter/Limited Use Road
- Watercourse
- Wetland
- String Bog
- Lake
- Forested

5 2.5 0 5 10 15 Km
Scale: 1:350,000

SNC·LAVALIN
East Side Road Authority

East Side of Lake Winnipeg (ESLW)
Large Area Transportation Network Study

Proposed All-Season Road
Little Grand Rapids/ Pauingassi
to Berens River/ Bloodvein

Date: January, 2011 File Number: 020254
Map:

Figure 3.3

Figure 3.4: Final Options in Central Sector (Constraints, Central Sector)

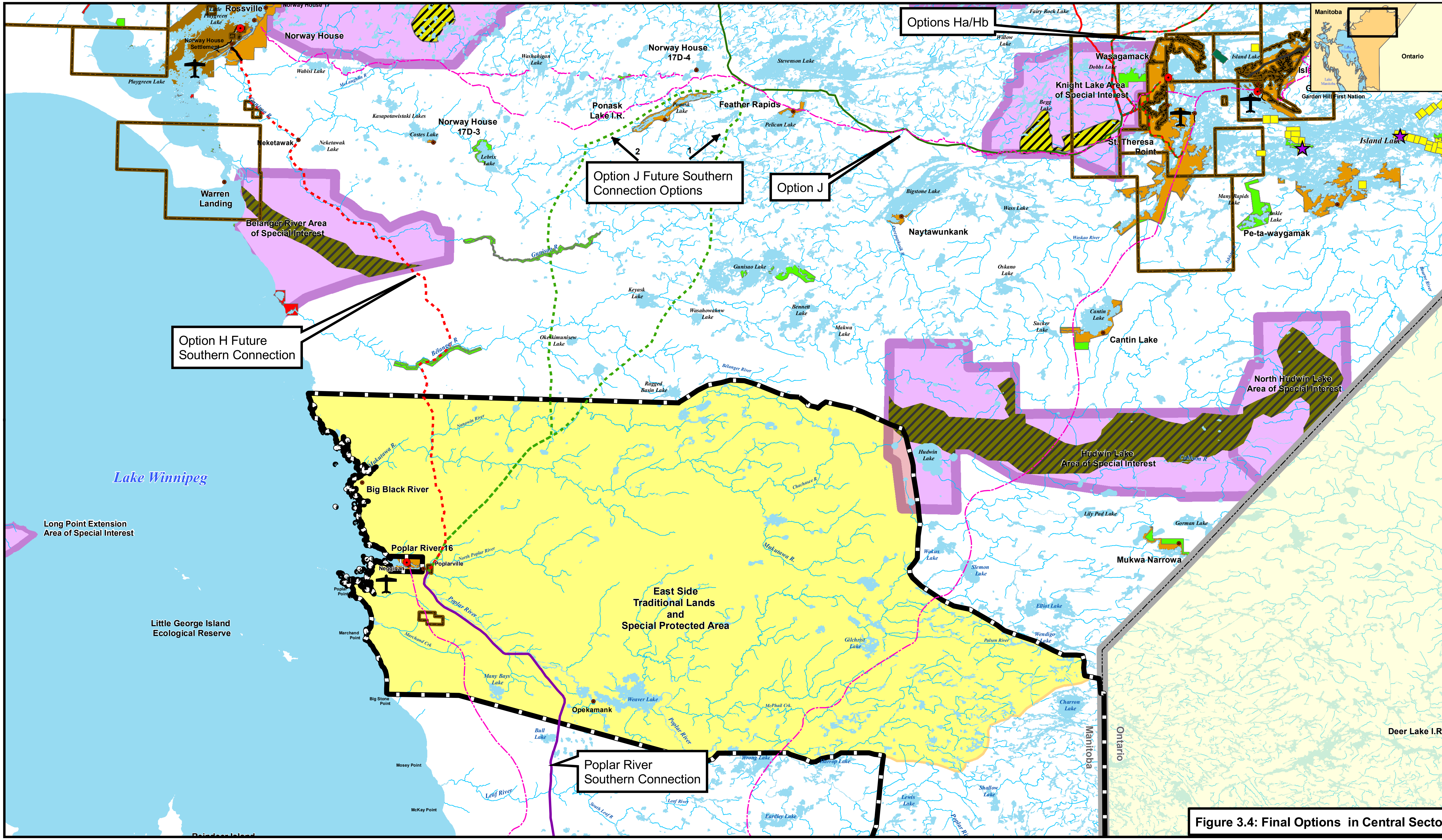


Figure 3.4: Final Options in Central Sector

Legend

- Route Option H
- Route Option J
- Route Sub-Options Ha/Ja, Hb/Jb and Option H/J Overlaps
- Proposed IR Road
- Option H Future Southern Connection
- Option J Future Southern Connections 1 and 2
- Poplar River Southern Connection
- Protected Areas
- Special Protected Area Pimachiowin Aki Potential World Heritage Site
- Treaty Land Entitlement Areas
- Northern Flood Agreement Areas
- Very Rare Geologic Formation
- Rare Geologic Formation
- Mine Sites
- Mineral Leases
- Mining Claims
- Quarry Withdrawals
- First Nation
- NAC Community
- Community/Geographic Reference (Geographical Names Of Canada Database)
- Public Airport
- Paved Highway
- Un-Paved Highway
- Winter/Limited Use Road
- Provincial Boundary
- Watercourse
- Lake

Note: No Quarry Leases, or Patent Claims occur within this portion of the study area.

Note: This map is intended for illustrative purposes only. Do not rely on this map for legal administrative purposes, or as a precise indicator of routes, locations of features. Source: National Topographic Data Base (NTDB) 1:50,000. Government of Canada, Natural Resources Canada, Centre for Topographic Information 2003/ Manitoba Land Information (MLI) 2009. Projection: North_American_Lambert_Conformal_Conic (GCS_North_American_1983)

Scale: 1:1,700,000 (Km: 10 5 0 10 20 30)

SNC·LAVALIN

East Side of Lake Winnipeg (ESLW)
Large Area Transportation Network Study
Constraints, Central Sector

Date: Nov., 2010 | File Number: 020254-0000-4E03-1101 Rev: PB

Map: **14-6b**

Figure 3.5: Final Options in Southern Sector (Constraints, Southern Sector)

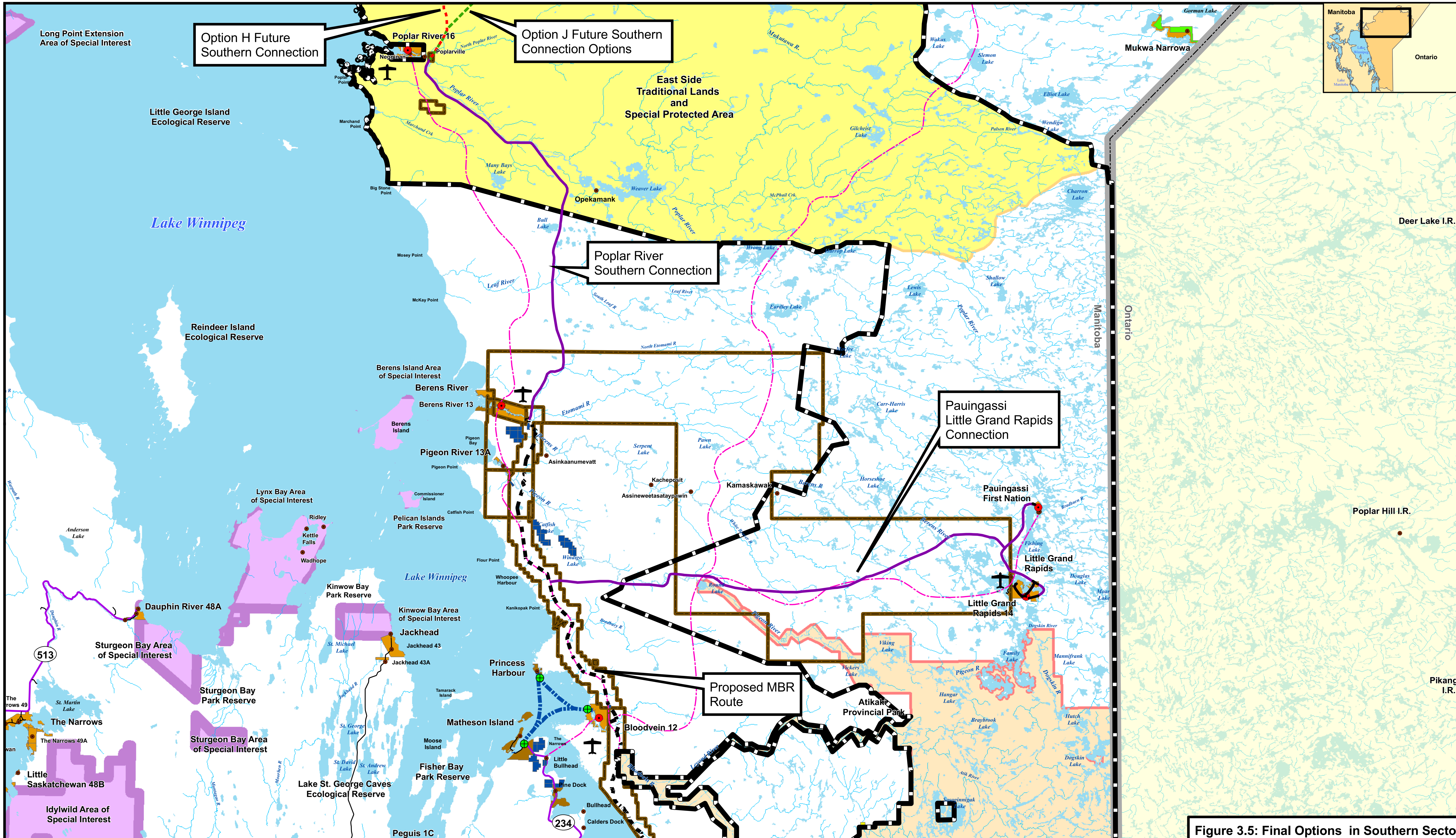


Figure 3.5: Final Options in Southern Sector

Legend

Route Option H	Option H Future Southern Connection
Route Option J	Option J Future Southern Connections 1 and 2
Route Sub-Options Ha/Ja - Hb/Jb and Option H/J Overlaps	Poplar River, Pauingassi, Little Grand Rapids Routes
Proposed IR Road	Proposed Route PR 304 (Manigotagan) to Berens River

- Protected Areas
- Special Protected Area Pimachiowin Aki Potential World Heritage Site
- Treaty Land Entitlement Areas
- Northern Flood Areement Areas
- Quarry Leases
- Mining Claims
- Quarry Withdrawals
- First Nation
- NAC Community
- Community/Geographic Reference (Geographical Names Of Canada Database)
- Ferry
- Public Airport
- Paved Highway
- Un-Paved Highway
- Winter/Limited Use Road
- Provincial Boundary
- Watercourse
- Lake

Note: No Mine Sites, Mineral Leases, or Patent Claims occur within this portion of the study area.

Note:
This map is intended for illustrative purposes only. Do not rely on this map for legal administrative purposes, or as a precise indicator of routes, locations of features.
Source: National Topographic Data Base (NTDB) 1:50,000. Government of Canada, Natural Resources Canada, Centre for Topographic Information 2003/ Manitoba Land Information (MLI) 2009.
Projection: North_American_Lambert_Conformal_Conic (GCS_North_American_1983)

N

10 5 0 10 20 30 Km

Scale: 1:700,000

SNC·LAVALIN

East Side of Lake Winnipeg (ESLW)
Large Area Transportation Network Study

Constraints, Southern Sector

Date:	Nov., 2010	File Number:	020254-0000-4E03-1101 Rev: PB
Map:	14-6c		

File: H:\Arcview\020254EastLakeWinnipegRoad\GIS\1_ESLW_2010\MXD\RegionalDataMXD\Fig_A14_6c_MBR_SocEcon_AllConstraints_South_Dec15Rev.mxd

4.0 ASR NETWORK COSTS AND BENEFITS

A benefit cost (BC) analysis was undertaken for ESRA's Northern Sector recommended ASR network known as Option J/Sub-option Ja (connecting to PR 373 near Sea Falls), including also the preferred routings servicing Poplar River, Pauingassi and Little Grand Rapids in the Central and Southern Sectors of the Study Area. Analysis was also undertaken for Option J/Sub-option Jb (connecting to PR 374 at Cross Lake) as well as for the other front running ASR network option, Option H, along with Sub-options Ha and Hb.

The benefit cost analysis quantifies the life cycle costs to the infrastructure provider and the benefits to the transportation system users. The analysis assumes:

- All benefits and costs are assessed in a 25 year framework with future amounts discounted to a present value at a 6% real discount rate with sensitivity tests at 5% and 10%.
- They are incremental benefits and costs relative to a status quo base case using the existing transportation system.
- For analysis purposes, all capital costs are assumed in year 0 and all benefits and recurring costs start in year 1 to year 25.

4.1 Project Costs

The project costs include the present value of the capital, maintenance costs and residual values over a 25-year project life at a discount rate of 6% for each route network option. All dollar amounts are expressed in 2010 dollars and discounted to year 0 (current year 2010). Values for the base case (existing transportation system) and the final ASR network options (H and J in the Northern Sector together with the preferred ASR route network in the Central and Southern Sectors) are shown in Table 4.1.

Capital Costs

Based on the various terrain units and water crossings identified by J. D. Mollard and Associates (JDMA) and referencing a standard Geometric Design Criteria (GDC) and bridge clear widths developed for the All Season Road (ASR), Class D Capital Cost estimates were developed for the final network Options H and J, each with two sub-options (Ha/Ja and Hb/Jb), as well as the preferred Central and Southern Sector options.

The capital costs shown in Table 4.1 include the entire network for the ESLW, including the following ASR segments:

- ASR in Northern Network = $1,741 Million, $1,724 Million, $1,862 Million and $1,849 Million for Options H/Ha, H/Hb, J/Ja and J/Jb respectively
- ASR between Poplar River and Berens River = $316 Million
- ASR between Little Grand Rapids/Pauingassi and the future PR 304 extension between Bloodvein and Berens = $509 Million
- Proposed ASR between Berens River and PR 304/Manigotagan = $286 Million (outside of scope of Large Area Transportation Network Study)

The project costs include the present value of the capital, maintenance costs and residual values over a 25-year project life at a discount rate of 6% for each route network option. All dollar amounts are expressed in 2010 dollars and discounted to year 0 (current year 2010).

Annual Maintenance

The base case is the existing transportation system including the winter road network linking the ESLW communities to the Provincial system. The 2009/10 Manitoba Infrastructure and Transportation (MIT) provincial winter roads budget was $9.7 Million for a road network of around 2,178 km or $4,454 per km to manage, create and maintain the winter road system each year. The proposed ASR options include gravel roads, with an annual maintenance cost of $4,835/km in the Manigotagan area, based on 2008 values. To account for inflation and the more northerly location of the proposed routes, a 2010 figure of $6,000/km is assumed for annual gravel road maintenance. Bridge maintenance costs are assumed at 0.1% of bridge capital cost per year.

Residual Values

This reflects the value of the asset continuing in its current use beyond the end of the 25-year planning period and is included in the financial account as a recoverable. MIT typically amortizes their gravel roads over a 40-year period. New structures are assumed to have a 75-year life. Structures already in place for the existing winter roads are assumed to have 30 years of remaining life and for analysis purposes, the total value of existing winter road structures is $10 Million.

4.2 Project Benefits

Project benefits are calculated based on the difference between the direct costs incurred by users of the transportation system in the base case and each of the proposed ASR options. The change (usually a reduction) in direct user costs for any option is the measure of benefit used in the Benefit/Cost analysis. All benefits are assessed over a 25-year planning period and discounted to a single present value at the 6% discount rate used in this analysis.

Based on population projections, annual growth in demand over the planning period is estimated at 2.3%[6]. The proposed case with the AWR in place assumes a slightly higher growth rate at 2.8% per annum, including the effects of induced travel associated with the future ASR.

The direct user costs have been divided separately into costs for freight, passenger and medical transport. The cost accounting includes values of travel time plus vehicle operation and ownership costs. Not all of these costs have a direct market value but they do influence consumer mode choice.

With a new AWR in place, reductions in freight costs stem from:

- a mode shift from air to road,
- larger payloads on ASR and
- some reduction in travel time.

Reductions in passenger travel costs stem from a shift from air to surface transport.

[6] Source: Manitoba's Aboriginal Community: A 2001 to 2026 Population & Demographic Profile", Manitoba Bureau of Statistics, July 2005.

The reduction in Medical Transport stems from a lower unit cost when patients have better access to local health services rather than using air ambulance services.

The induced benefits shown in Table 4.1 are benefits attributable to the higher growth rate assumed in the proposed ASR case. Induced benefits are calculated as one half of the additional benefits which would occur if normal growth were 2.8% instead of 2.3%.

As shown in Table 4.1, the benefit/cost ratios range from 0.22 to 0.25 when all the market (airfare, freight rates) and non-market (value of travel time and auto ownership) costs are included. All options are similar but Option H has slightly higher benefits and slightly lower costs which contributes to a higher B/C ratio compared to Option J.

The Provincial input/output model was used to estimate the direct, indirect and induced employment associated with each route network option and its associated sub-options. The results are shown in the bottom lines of Table 4.1, under economic impact. The model estimated direct employment of about 22,000 person years (PY) and indirect employment of about 15,000 PY. Direct employment includes those jobs directly resulting from construction of the road such as construction, maintenance and road related businesses. The indirect and induced jobs are those involved in supplying goods and services to the direct activity, or are involved in new economic activity created as a result of the new road network.

By inspection of the middle lines of Table 4.1, under project benefits, it can be seen that benefits to local communities include a reduction in freight costs of up to 50%, as freight shifts from air to road. This should lead to improvements in living standards. Benefits to passenger travel are less tangible but offer communities a choice between higher cost air travel and lower cost, but more time consuming road travel. Assuming a $10/hr value of time for road passenger travel and $20/hr for air, and typical vehicle and aircraft costs, the aggregate reduction in costs for passenger travel is about 8%.

The Provincial input/output model estimated that the project will generate $2.1 Billion in gross domestic product (GDP), close to the net present value (NPV) of the project.

4.3 Greenhouse Gases

In addition to the Project Costs and Benefits shown in Table 4.1, it is anticipated that there will be an overall reduction on greenhouse gas emissions in ASR scenario. The overall reduction, estimated at about 30% or 16,000 tonnes/yr, will be the result of:

- A shift from air freight and private vehicle freight to commercial road transport.
- An increase in truck payload which accommodates the above mode shift without increasing the number of trucks.
- Private vehicles driving to Thompson instead of Winnipeg.

At current GHG costs of about $25/tonne, this reduction is worth about $400,000/year. If this were added to the benefit stream, it would increases the present value of benefits by $6 to $7 Million. GHGs related to construction activities are not included in the estimate.

If the ASR Network was in place today, it is anticipated that 6.10 million litres of fuel would be saved per year by the shift in travel from air and winter roads to the ASR system.

Table 4.1: Benefit Cost Analysis ($ Million 2010)

ACCOUNT	Base Case	Option H		Option J	
		Ha (Norway House)	*Hb (Cross Lake)*	*Ja (Norway House)*	*Jb (Cross Lake)*
Network Length (km)	*1,210*	*978*	*995*	*1,029*	*1,046*
PROJECT COSTS[1,2] ($Millions)					
Capital Cost	$0	$2,853	$2,835	$2,974	$2,960
Annual Maintenance ($mill/yr)	$5.4	$6.3	$6.4	$6.6	$6.7
Residual Value in Yr 25	$1.7	$1,199.1	$1,178.3	$1,249.7	$1,230.5
Present Worth	$69	$2,654	$2,642	$2,768	$2,759
Net Cost		$2,586	$2,573	$2,699	$2,690
PROJECT BENEFITS[3] ($Millions)					
Freight Costs	$953	$470	$475	$473	$503
Passenger Costs	$1,016	$928	$933	$931	$951
Medical Transport	$153	$92	$92	$92	$92
Present Value	$2,121	$1,490	$1,499	$1,496	$1,546
Normal Benefits		$631	$622	$625	$576
Induced Demand		$13	$13	$13	$12
Total Benefits		$644	$635	$638	$588
Benefit/Cost Ratio		**0.25**	**0.25**	**0.24**	**0.22**
NPV		**($1,941)**	**($1,939)**	**($2,061)**	**($2,103)**
ECONOMIC IMPACT					
Direct Employment (PY)[4]		21,535	21,421	22,406	22,331
Indirect & Induced (PY)[4]		14,752	14,668	15,347	15,288
Multiplier Effects ($ Millions)					
Direct		$2,282	$2,268	$2,375	$2,365
Indirect		$1,891	$1,878	$1,968	$1,958
Induced		$1,221	$1,214	$1,270	$1,265
Total		$5,395	$5,359	$5,614	$5,588

Notes:

1. Capital costs include 20% contingeny,10% engineering and 15% project management.

2. Costs are shown for the complete ASR network including the Northern, Central and Southern Sectors; for the Northern Sector, Options Ha and Ja include the proposed Sea Falls Bridge and upgrade of the existing Paimusk Creek Road.

3. Project benefits are calculated based on the difference in transport costs between the base case and each ASR scenario.

4. PY = Person years

4.4 Economic Impact

Economic impacts shown in Table 4.1 are derived from the Provincial Input/Output model for Manitoba and based on the cost of construction broken down by construction activity. Economic impact is not a direct benefit for inclusion in benefit cost ratios, but is a measure of the economic "reach" of the project through the Provincial Economy as a whole. The impacts include:

- Direct Employment – The number or person years of employment engaged in constructing the new road network.
- Indirect and Induced Employment – The additional employment by suppliers to the project and employment due to expenditures from increased income earnings.
- Direct Impacts – Cost of construction.
- Indirect Impacts – The measure of economic output by suppliers to the project, for example the companies that build construction equipment, supply materials or fuel to the project.
- Induced Impacts – The measure of increased economic activity as wages earned during the project are re-spent in the economy.

4.5 Conclusions

Based on the above parameters used to measure ASR network capital and maintenance costs, as well as travel cost savings for the movement of people and goods, all within a 25-year planning horizon, the benefit cost ratio comes out in the region of 0.25. This is not unexpected, because although the population being served is more than 19,000 (2010 population, not including Norway House or Cross Lake) and may grow to more than 34,000 over 25 years, communities are widely scattered and the challenging terrain and river crossings between communities result in high construction costs.

A number of factors could significantly increase the ratio of benefits to costs:

- Population growth greater than the assumed 2.3% compound growth per annum.
- Adoption of a discount rate less than 6% (currently and over the last several years the Bank of Canada interest rates have been at all time lows).
- An increase in the frequency of late openings, coupled with early closures of the winter road system, as well as an increased likelihood of years, when there will be no opening at all of the winter road system. In the Dillon 2000 Study, East Side of Lake Winnipeg All-Weather Road Justification and Scoping Study, it was assumed that on average every 10 years the winter road system would not be operational. The effect of a greater frequency of reduced opening periods, or no openings at all, is to significantly increase the cost of shipping dry goods, building supplies and fuel into the communities because, except for the communities along the Lake Winnipeg shoreline that have access to barge service in the summer, air transport would be the only option for inland communities. The cost of shipping freight by air is significantly higher then by winter road. In view of some of the uncertainties associated with air travel, with vulnerability to inclement weather such as snows storms, fog or low cloud, provision of ASR service to the more than 19,000 people living on the ESLW could be considered not only a social necessity from an equality perspective i.e. freedom to move, but also a safety and reliability imperative.

The following are potential social-economic benefits associated with ASR development beyond the benefit/cost analysis discussed above:

- **Infrastructure Improvements:** The reduced cost of transporting people and goods to and from the ESLW communities may enable a number of key infrastructure projects to be accelerated, such as providing more homes in the communities with clean piped water and piped sewage. Although some homes currently have piped water, many families need to collect clean water at community standpipes, and transport it home by vehicle. Some homes have septic holding tanks, but these also need pumping out at frequent intervals. Other necessary infrastructure projects include new schools and institutional buildings as well as rehabilitation of older facilities. With an ASR system in place skilled trades and materials can be brought in at less cost and on a, "when and as needed," basis.

- **Enhancing UNESCO World Heritage Site:** With the proposed ASR network, the UNESCO site would be directly accessible from Poplar River, Pauingassi and Little Grand Rapids, all of which lie within its proposed boundaries. Establishment of the UNESCO site would undoubtedly open up considerable opportunities for international ecotourism, as well as international research initiatives focused on the boreal forest and its associated flora and fauna, and its role within the northern boreal forest ecosystem. This could bring extensive employment and business benefits to the local communities.
- **Potential Opportunities for Mine Development:** The Northern Sector of the study area has had operational mines in the past, and currently includes extensive mining sites, mineral leases and mining claims, in the vicinity of Oxford Lake, Gods Lake, Island Lake and Cross Lake. Construction of an ASR network would undoubtedly spur further exploration. If new mining activity can be conducted outside of the proposed UNESCO site, in partnership with First Nations and Aboriginal peoples, it could bring substantial employment and business benefits to the region. Mining royalties would also accrue to the federal and provincial governments.
- **Potential Opportunities for Harvesting Renewable Forest Resources:** Re-establishment, outside of the proposed UNESCO site, of harvesting of forest products and their processing could benefit the local ESLW economy. Tembec at one time operated along the Rice River Road. Providing an ASR network into previously inaccessible areas, would enable closer assessment of forest potential, and could make harvesting of renewable forest resources sufficiently economic to be profitable, even though the quality of wood available may not be as high as in other areas of the province. Again this activity would need to be in a partnership with the First Nations and Aboriginal peoples to maximize employment and business benefits to local communities.

Although this study has not examined the full costs to the federal and provincial governments in maintaining the existing transportation system in support of the ESLW communities, it is evident from the above discussion that both levels of government could experience significant cost savings, as well as increased revenues, by investing in the recommended ASR network.

5.0 TRANSPORTATION DEVELOPMENT PLAN

5.1 Refinement of Preferred Option (Option J/Sub-option Ja)

Subsequent to ESRA's acceptance of Option J/Sub-option Ja as the preferred ASR route for the Northern Sector, the SNC-Lavalin consultant team proceeded to refine this network option, Option J, with the following objectives:

- To minimize potential impacts on the Hayes/Echimamish Heritage River corridor to the extent possible.
- To minimize potential impacts on Indian Reserve (IR), Treaty Land Entitlement (TLE) and Northern Flood Agreement (NFA) lands to the extent possible.

In an initiative undertaken outside this current study, new low level photography was flown around and between Red Sucker Lake, Island Lake, Gods Lake and Oxford House. J.D. Mollard and Associates refined the ASR route options in these areas and noted that Option J does not infringe on the 200 m Hayes River System buffer, neither on any unpopulated IRs, nor on any TLEs in these zones of the Study Area (see Figure 5.1a).

Further to the west, it was noted that Option J/Sub-option Ja was encroaching on unpopulated IRs, TLEs and NFA lands in the following locations (see Figure 5.1b):

- The north east arm of Option J just west of Windy Lake was just crossing, as does the existing winter road, the south west extremity of a TLE that runs south west from Oxford Lake. The ASR route has now been adjusted to avoid this.
- The southeast arm of Option J was just crossing the unpopulated IR land at the eastern extremity of Molson Lake. It has now been shifted east to avoid this.
- Sub-option Ja, as does the existing winter road, crosses TLE and NFA lands approaching and along the Paimusk Creek Road. It is noted that PR 373 is also located within NFA lands south of the Sea Falls Ferry. Since this last segment of the proposed ASR is the tie-in to the existing Manitoba ASR system at PR 373, and also makes full use of the existing Paimusk Creek Road, a narrow but serviceable ASR, it is felt that no shift of the ASR route is warranted at this time. Shifting north would like complicate the geometry of the southern approach to a new bridge at Sea Falls; shifting south would unnecessarily increase travel and still require crossing NFA land closer to Norway House.

Option J was initially identified to be crossing, as does the existing winter road, unpopulated IR land at Anderson, just west of Robinson Lake. To avoid the impacts, two alternatives are available:

I. Relocate the north east branch of Option J (the branch to Oxford House) north of the IR land, away from the winter road, as well as the esker it follows, which is straddled here by both the winter road and part of the IR, and to then keep the ASR route north of the Echimamish River (Hayes System). Respecting the 200 m buffer along the river, however, puts the ASR through some difficult terrain with rough bedrock outcrops. With this alternative, it is necessary to relocate the south east branch of Option J (the branch to Island Lake) south of the IR land and then to cross the Echimamish River west of the IR, to join up with the ASR route north of the river; or

II. Relocate the north east branch of Option J east of the IR, again away from the winter road and esker, and to join up with the south east branch of Option J, south east of the IR. The route would then continue west, on a location south of the Echimamish River. Although this area has deep organic deposits trapped between rock ridges, it is not considered quite as challenging as north of the river.

Figure 5.1b also shows how Sub-option Jb, a future connection to PR 374 at Cross Lake, could connect to Option J whether it is located to either the north or to the south of Echimamish River.

Another complicating factor at Anderson is a rare geologic feature, a glaciofluvial deposit that is located in the north east corner of the Molson Lake Area of Special Interest. This feature abuts the south east boundary of the IR land, and is a southern extension of the esker referenced above. The south east arm of Option J was previously cutting through the middle of this feature. Probably the most desirable approach here is to shift Option J (for both the north and south of the Echimamish River alternatives) to the southern rim of this geologic feature, as shown in Figure 5.1b, so as to minimize its impact thereon.

Table 5.1a shows the construction lengths and capital costs for the entire network, within the Northern, Central and Southern Sectors, of the refined version of Option J/Sub-option Ja. The lengths and costs are broken down to reflect the difference between locating the ASR either north or south of the Echimamish River (Hayes River System).

Figure 5.1a: Preferred Network Option J (Sub-option Ja)

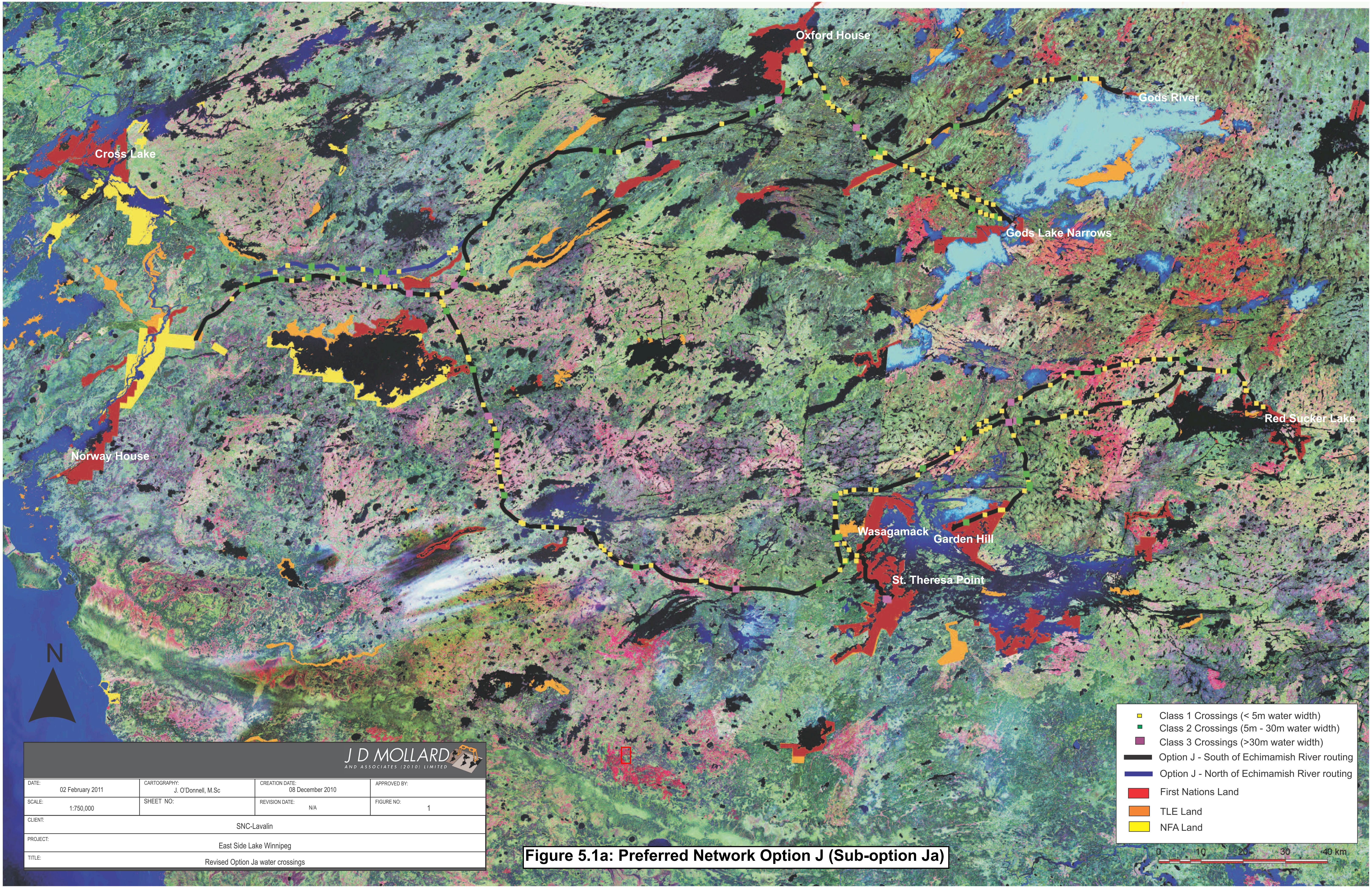


Figure 5.1a: Preferred Network Option J (Sub-option Ja)

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Figure 5.1b: Option J (Sub-options Ja and Jb) North and South of Echimamish River

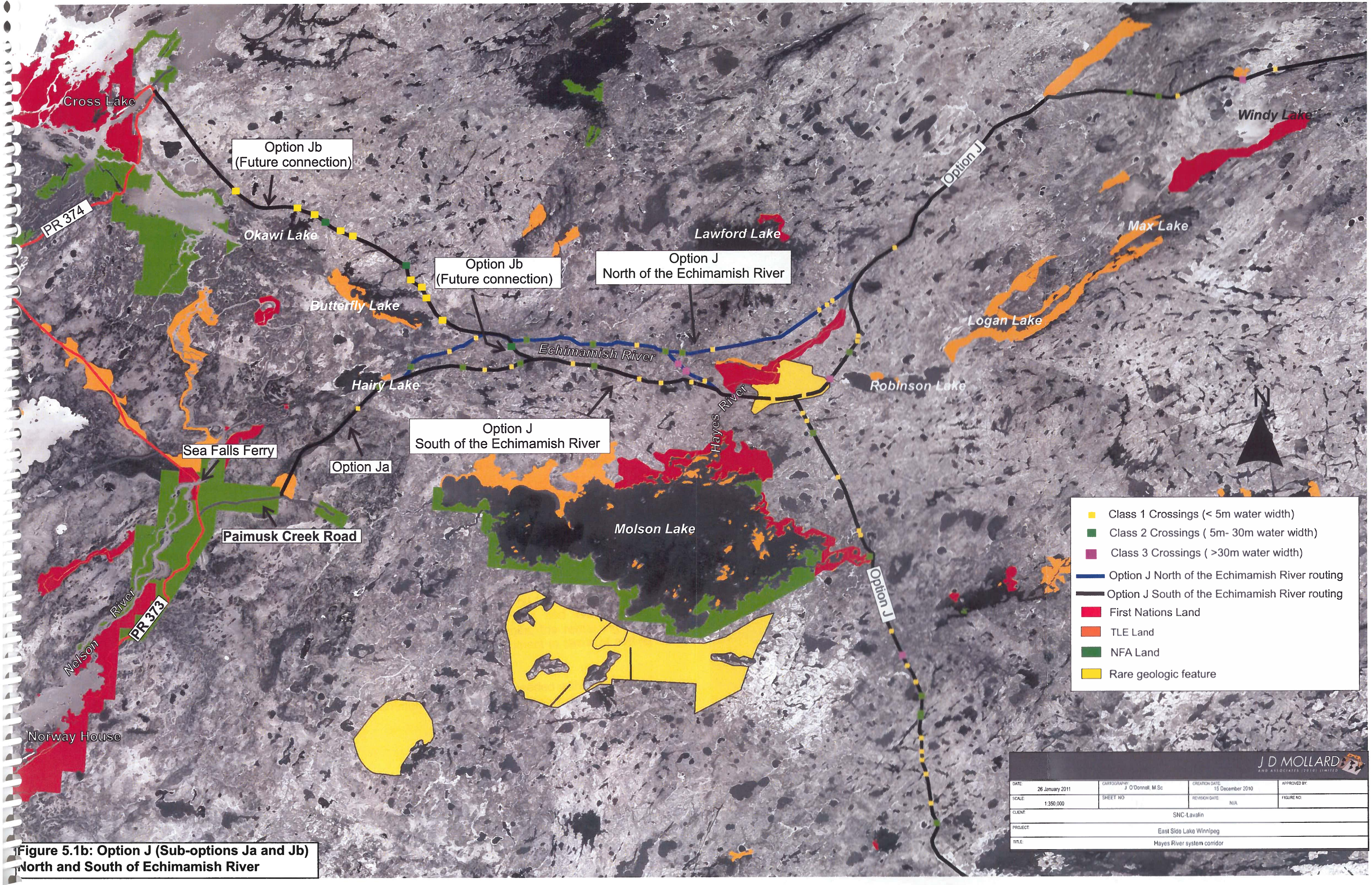


Figure 5.1b: Option J (Sub-options Ja and Jb) North and South of Echimamish River

Table 5.1a: Preferred ASR Network (Option J/Sub-option Ja): Lengths and Costs

Road Segment	Construction Length		Capital Cost* ($ Million)	
	North of Echimamish River	South of Echimamish River	North of Echimamish River	South of Echimamish River
i) ASR in Northern Network (Option J/Sub-option Ja)	657 km	648 km	Road = $1,655 Structures = $223 Sub-total = $1,878	Road = $1,620 Structures = $208 Sub-total = $1,828
ii) Poplar River to Berens River	93 km		Road = $241 Structures = $76 Sub-total = $317	
iii) Little Grand Rapids/Pauingassi to proposed ASR (PR 304 extension to Berens River)	131 km		Road = $398 Structures = $111 Sub-total = $509	
Total Network**	881 km	872 km	Road = $2,294 Structures = $410 Total = $2,704	Road = $2,259 Structures = $395 Total = $2,654
Unit Capital Cost ($ Million/km)			$3.069	$3.044

Notes:

** Capital Cost includes 20% contingency, 10% engineering and 15% project management. Structure costs include all water crossings including: Class 1 (Culverts < 5 m), Class 2 (Bridges 5-30 m) and Class 3 (Bridges > 30 m) crossings.*

*** The proposed ASR segments between PR 304/Manigotagan and Berens River are currently in the detailed design/pre-construction phase, and are not included in Table 5.1a or the transportation development plan in this section.*

The costs in the above Table 5.1a include ASR connections within IRs, but not the proposed PR 304 to Berens River ASR.

ASR connections within IRs are necessary to provide continuity between the proposed provincial ASR network outside of the IRs, and the existing road system within the First Nation communities. With the exception of the proposed ASR within the St. Theresa Point and Wasagamack communities, which is to be built on right-of-way acquired by the Province, the remaining ASR connections within IRs will become the responsibility of the federal government in terms of setting aside right-of-way, road construction and road maintenance.

Table 5.1b following is a tabulation of all the lengths of ASR connections needed within IRs, along with their approximate capital cost and the government responsible for their construction and maintenance.

Table 5.1b: All-Season Road Connections within Indian Reserves

First Nations Community	Length of Internal ASR Connection (km)	Approximate Capital Cost of ASR Connection ($ Million) (Assume $3.0 Million/km)	Comments
Garden Hill Red Sucker Lake Oxford House	16.1 5.8 2.5	48.3 17.4 7.5	
Between Wasagamack and St. Theresa Point	27.2	81.6	Manitoba in process of acquiring ROW. ASR interconnects 2 communities and provides all-season access to proposed airport.
Gods River Gods Lake Narrows Poplar River	0 0 0	0 0 0	Existing community road at IR boundary ditto ditto
Pauingassi	1.9	5.7	
Little Grand Rapids: Option 1 (West) Option 2 (East)	 7.7 7.1	 23.1 21.3	West option crosses water but overland portion is entirely within IR. East option avoids water but requires additional ASR outside the IR.

Table 5.1c shows the construction lengths and estimated capital costs for Sub-option Jb, a future connection to PR 374 at Cross Lake. If the main east-west trunk route is located north of the Echimamish River (see Figure 5.1b) then the connection to Cross Lake would be about 48 km long. If the main east-west trunk route is located south of the Echimamish River, in the same general corridor as the existing winter road, then the connection to Cross Lake will be about 55 km long and involve another crossing of the Echimamish River.

Table 5.1c: Future ASR Network Connection to Cross Lake (Option J/Sub-option Jb): Lengths and Costs

Road Segment	Construction Length		Capital Cost* ($ Million)	
	Main East-West Trunk North of Echimamish River	Main East-West Trunk South of Echimamish River	Main East-West Trunk North of Echimamish River	Main East-West Trunk South of Echimamish River
PR 374, Cross Lake to Main East-West Trunk	47.8 km	55.0 km	131	163**

Notes:

** Capital Cost includes 20% contingency, 10% engineering and 15% project management. Structure costs include all water crossings including: Class 1 (Culverts < 5 m), Class 2 (Bridges 5-30 m) and Class 3 (Bridges > 30 m) crossings.*

*** Based on same unit cost, $ Million/km, as with main east-west trunk north of Echimamish River but with additional $12.0 Million for Echimamish River crossing.*

It should also be noted that Figure 5.1a, as well as showing alternative routings for Option J/Sub-option Ja north and south of the Echimamish River, also shows two alternative routings between Red Sucker Lake and Island Lake. The northern alternative routing is currently preferred because it mainly avoids the Red Sucker Lake ASI. Minor alternatives are also shown west of Wasagamack/St. Theresa Point and between Gods Lake Narrows and Oxford House. Further evaluation on-site of these alternatives should be made to determine a preferred location.

5.2 ASR Network Characteristics

Projected Traffic

For estimating traffic volumes on the future ASR network, SNC-Lavalin developed a simple gravity model for the ESLW Study Area. This gravity model estimates the number of trips between two communities based on the population and travel distance between the communities. Future road traffic using a completed ASR network is estimated by comparing the proposed system with the characteristics of the existing ASR system linking Cross Lake and Norway House to each other and to external destinations via PTH 6. These external destinations include Winnipeg, Brandon, the Pas, Flin Flon and Thompson. Current population at these destinations was derived from Statistics Canada and travel distances were taken from the MB Official Highway Map, with allowance made for the delays at the Sea Falls Ferry (see Volume 5 Section 4 for a complete description of the development and calibration of the gravity model used in this study).

Functional Classification

Based on the Transportation Planning Policy developed by the Manitoba Infrastructure and Transportation[7], population nodes (including cities, towns, villages and First Nation Reserves) provide the most viable highway class ranking linkage. Based on the functional classification and estimated traffic volumes of the ASR links in the preferred ESLW network, design standards for each road link are recommended. As shown on Figure 5.2, SNC-Lavalin recommends that most of the ASR network in the Northern Sector be classified as a Secondary Arterial system (Design Classification). This is based on the majority of the existing community populations being in the range 1,000-10,000 (First Nations on-reserve populations plus Northern Affairs Community populations). The exceptions are the community connectors servicing Gods River and Red Sucker Lake, where the populations are in the 500 to1000 range, warranting a Collector A Classification.

In the Central and Southern Sectors, Secondary Arterial classification is also warranted for all of the network except the connection to Pauingassi, where the population (in the 500 to 1,000 range) calls for a classification of Collector A. Even though the population of Bloodvein is a little under 1,000, Berens River and Poplar River to the north, as well as Little Grand Rapids to the east, have populations in the range 1,000 to 10,000, therefore justifying Secondary Arterial classification for the ASR north from PR 304 to all four of these communities.

Design Standards

The table in the legend for Figure 5.2 lists the design criteria for four Design Standards (A, B, C and D) applicable to the ESLW ASR network, based on the MIT Basic Design Standards. Applicable design standards for each link in the system are also shown along the entire ASR network.

Inspection of the Figure 5.2 illustrates the following:

- Depending on the terrain and appropriate design standard, design speeds will desirably be in the range 80 to 120 km/h
- Design Standards A, B and C apply to gravel roads that, dependent on traffic conditions, will be slated for hard surfacing in the future. Lane widths will be 3.7 m in each direction of travel, with shoulder widths ranging from 1.3 m to 2.5 m.
- Design Standard D applies to gravel roads that will likely remain gravel in the future, with a road width of 8.0 to 8.4 m
- Bridge widths are in the range of 9.6 to 12 m
- Surface finish ranges from Gravel (which will need dust control), to, in the future, Asphalt Surface Treatment or Bituminous Pavement

In accord with usual practice in establishing a pioneer road system such as is needed on the ESLW, the entire ASR network is envisaged to initially be built with a gravel surface. However, wherever Secondary Arterial classification is called for, the road bed and bridge sub-structures should be built with the flexibility to accommodate future surfacing or bridge widening with minimum additional or throw-away costs. Although not shown on Figure 5.2, the proposed minimum right-of-way width for the entire ASR network is 100 m, with clearing of 50 to 60 m.

[7] "Transportation Planning Policy: TP 1/98 - A Highway Functional Classification System for Rural Provincial Highways in Manitoba", Transportation Systems Planning & Development Branch, MIT, December 1997.

Loadings

Roadway and bridge loadings for the Secondary Arterial system (future Provincial Trunk Highways) should be as follows:

- Roadway design should be as needed for an RTAC Route (Highway Traffic Act) and capable of accommodating a maximum prescribed GVW of 62,500 kg with the flexibility to go to 63,500 kg as allowed in adjacent provinces. Subject to onsite geotechnical conditions, a typical cross section with minimum layer designs is as follows; Subbase comprised of a minimum of 500 mm of 150 mm Φ minus blast rock over a non-woven geotextile, 75 mm sand cover above the rock and a Granular Base material comprised of 100 mm of Traffic gravel Type "D" modified.
- Bridge structure design should be as needed for an RTAC route i.e. the bridge should be designed to handle an HSS 30 design vehicle as an AASHTO "Strength I" live load (defined as normal vehicle use of bridge), and use live load factor of 1.75.

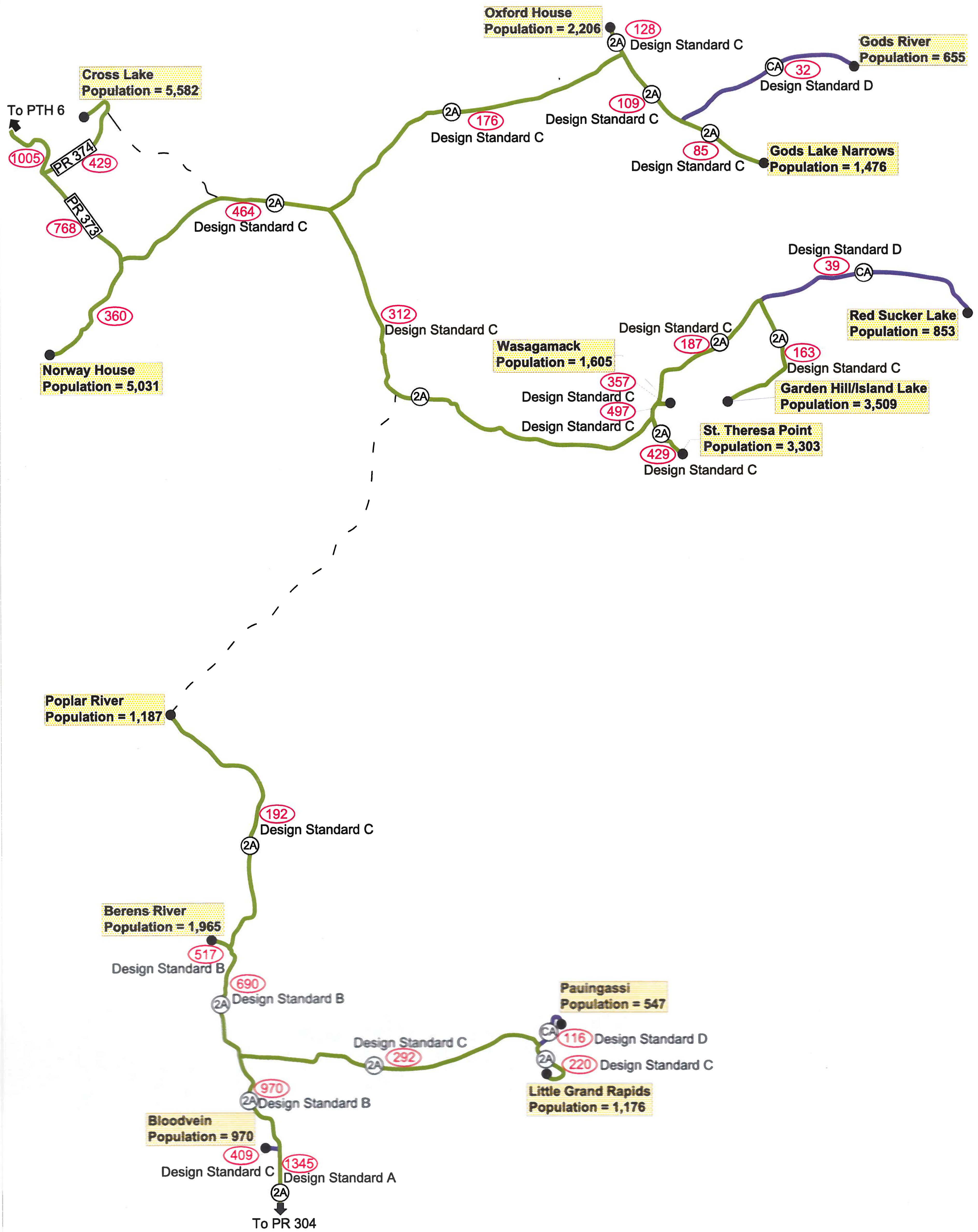
Roadway and bridge loadings for the Collector system (future Provincial Roads) should be as follows:

- Roadway structure design should be as needed for a B1 Route (Highway Traffic Act), and capable of accommodating a maximum prescribed gross vehicle weight (GVW) of 47,630 kg. Subject to onsite geotechnical conditions, a typical cross section with minimum layer design is as follows; Subbase comprised of a minimum of 500 mm of 150 mm Φ minus blast rock over a non-woven geotextile, 75 mm sand cover above the rock and a Granular Base material comprised of 100 mm of Traffic gravel Type "D" modified.
- Bridge structure design should be as needed for an RTAC route. Currently in Manitoba RTAC routes are designed to carry vehicles with a maximum prescribed GVW of 62,500 kg. However adjacent provinces to Manitoba have RTAC loading as 63,500 kg, and Manitoba is considering raising their 62.5 tonnes loading to 63.5 tonnes. Since the community connectors (rural collectors) may take delivery of heavy loads in the winter, when the RTAC loads can travel on the B1 routes, bridges on the B1 routes should be designed accordingly i.e. the bridges should be designed to handle an HSS 30 design vehicle as an AASHTO 'Strength I' live load (defined as normal vehicle use of bridge), and use live load factor of 1.75.

Corridor Management

Access control and land management along the network will be important to maintain the functionality, reliability and safety of the ASR system. This can be achieved through various statutory processes as well as through the application of the appropriate Provincial Land Use Policies.

Figure 5.2: ESLW Design Standards Map



LEGEND

- 2A — Secondary Arterial 1,000 - 10,000 Population
- CA — Collector A 500 - 1,000 Population
- Future Connections
- Community 2010 Population (including FN on-reserve and NAC)
- Projected 2035 AADT (veh/day)
- * Design Standard Refers to Cross Section Drawing Numbers in MIT Basic Design Standards

Design Standard A (3*)	Design Standard C (5*)
Secondary Arterial	Secondary Arterial / Collector A
20-Year AADT 1,000 - 6,000	20-Year AADT < 500 / 300 - 1,000
Design Speed: 110-120 km/h	Design Speed: 90-110 km/h
Lanes: 2 x 3.7 m	Lanes: 2 x 3.7 m
Shoulders: 2 x 2.5 m	Shoulders: 2 x 1.3 m
Bituminous Pavement	Asphalt Surface Treatment
Bridges > 60 m: 9.6 m	Bridges > 60 m: 9.6 m
Bridges < 60 m: 12 m	Bridges < 60 m:10.8 m

Design Standard B (4*)	Design Standard D (6*)
Secondary Arterial	Collector A
20-Year AADT 500 - 1,000	20-Year AADT < 300
Design Speed: 100-120 km/h	Design Speed: 80-100 km/h
Lanes: 2 x 3.7 m	Width: 8 - 8.4 m
Shoulders: 2 x 2 m	Gravel
Bituminous Pavement	Bridges > 60 m: 9.6 m
Bridges > 60 m: 9.6 m	Bridges < 60 m: 9.6 m
Bridges < 60 m: 12 m	

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Figure 5.2: ESLW Design Standards Map

5.3 ASR Network Phasing

For the development of the ASR network, it is assumed that the road will be developed in three major phases, assuming a 25 year development timeframe from the current year 2010:

I. Functional Design & Environmental Assessment (2011–2012)

II. Detailed Design/ASR Pre-construction Activities (2013-2015)

III. ASR Construction Activities (2016-2035)

Similar to the execution of the Large Area Transportation Network Study, it is anticipated that each development phase will consist of two parallel and interactive processes: a technical process and a legislative/stakeholder engagement process, as summarized in Table 5.2. Dependent upon available resources and budget, the work phases could be staggered over a number of years, synchronized with the proposed work staging of the entire ASR network.

5.3.1 Functional Design & Environmental Assessment

Following the Large Area Transportation Network Study, it is estimated that two years would be required for functional design and engineering, environmental assessment and right-of-way designation and acquisition. The key activities in the technical process will include the following:

Functional Design and Engineering

- Corridor Protection: Withdraw quarries, within 1 mile corridor on each side of preferred routes within ASR network (total corridor width 2 miles).
- Survey & Mapping: conduct ground-controlled aerial photography at 1:15,000[8]; provide 1 m contours at select bridge locations and community road tie-ins.
- Geotechnical & Materials: conduct geotechnical investigation at select locations to confirm foundation requirements at river crossings, treatment for thaw settlement and erosion issues, and sourcing of construction aggregates.
- Road design: develop vertical and horizontal alignment for the selected ASR routes; identify sources of construction materials, preliminary drainage requirements and right-of-way units for land assembly; develop layouts for road tie-ins to community roads, as well as other roads, trails and airports.
- Bridge/Structural Design: conduct preliminary design of river and stream crossings along selected routes, including hydrology and foundation design.
- Cost Estimating & Constructability Review: provide cost estimates at preliminary design level and constructability review to ensure value for money at an early design stage.
- Identification of impacts to the natural environment and design of mitigation measures.

[8] Note that low level aerial photography has been completed for the intercommunity connections in the Island Lake, Oxford House and Gods Lake areas during in the early fall of 2010. The rest of the recommended ASR network would need to be surveyed to complete the functional design and engineering of all ASR routes in the Study Area.

Environmental, Social and Economic Impact Assessment

- Identify and confirm renewable and non-renewable resource and harvesting data in study area (e.g. caribou, quarries, mining and mineral extraction, fisheries, etc).
- Conduct field surveys at select locations to confirm presence of unique features, such as fisheries and wildlife values, woodland caribou, parks and protected areas, archaeological and cultural artefacts, and sensitive areas identified through the Traditional Ecological Knowledge Studies.
- Consult Manitoba Conservation, Fisheries and Oceans Canada and other regulatory agencies to confirm requirements for environmental impact assessment and permitting processes.
- Identify potential project-specific mitigation strategies.

Table 5.2: Future Development Phases of Proposed ASR

	FUNCTIONAL DESIGN & ENVIRONMENTAL ASSESSMENT	DETAILED DESIGN/ ASR PRE-CONSTRUCTION	ASR CONSTRUCTION
Technical Process	Large Area Transportation Network Study (Complete January 2011) • Corridor protection • Low level aerial photography for entire ESLW network • Functional design and engineering at 1:5,000 • Clearing and preliminary ground surveys • Geotechnical investigations • Environmental, social and economic impact assessment (including monitoring of caribou) • Right-of-way designation and acquisition	• Preliminary and Detailed Design (including environmental mitigation and compensation) • Clearing of right-of-way • Construction of winter roads along proposed ASR routes • Improve/provide ferry service at key locations (Garden Hill/Island Lake/Wasagamack, Sea Falls) • Construct permanent bridges along future ASR alignment wherever feasible • Crushing and stockpiling of rock and other granular materials for road building	• Priority 1: ASR segments to address immediate safety/operational concerns • Priority 2: ASR main trunk routes providing priority connection to the rest of the provincial road network • Priority 3: Inter-community ASR segments to connect all communities to the provincial road network
Legislative/Stakeholder Process	East Side Road Authority • Multi-year capital and maintenance funding plan • Present to INAC, Province and Local Communities for: - Approval - Funding for next phase - Procure consultants • Community Benefits Agreements • Training programs: - Training of road building and maintenance personnel	East Side Road Authority • Present to INAC, Province and Local Communities for: - Approval - Multi-year funding for road construction - Facilitate environmental approval process - Procure consultants/Owner's Engineers/contractors • Training programs	East Side Road Authority • Present to INAC, Province and Local Communities for: - Approval - On-going funding for road construction, maintenance and environmental mitigation - Reporting on construction progress - Reporting on monitoring of natural environment, social issues & benefits associated with project development
	2011-2012	2013-2015	2016-2035

5.3.2 Detailed Design/ASR Pre-construction Activities

Following the functional design and environmental assessment of the recommended ASR network, it is assumed that three years would be required for detailed design and a number of ASR pre-construction activities. This timeframe is considered achievable given strong support from the communities, willingness from the governments to proceed, timely project funding approvals, and a coordinated and expedited permitting process.

The key activities in the technical process will include the following:

- Detailed Design and Pre-Construction Activities such as stockpiling of materials.
- Winter Road Phase and Priorities
  - Maintain the annual winter road program by building along the alignment or general corridor of the future ASR network to the extent feasible (see Figure 5.3a).
- Ferry Priorities
  - In addition to the winter road system, it is recommended that ferry services be improved and augmented prior to the construction of the ASR system, including a new cable ferry between Garden Hill and Island Lake Airport (Priority #1); twinning the existing Sea Falls ferry (Priority #2); and a new ferry service between Garden Hill and the proposed ASR system at either St. Theresa Point or Wasagamack (Priority #3). Table 5.3.a illustrates the locations, types and notional costs of proposed ferries.
- Permanent Bridge Priorities
  - To extend the operational life of the winter road system, it is recommended that permanent bridges be built wherever feasible along the proposed ASR routes.

Figure A3.1 in Appendix 3 shows water crossings greater than 30 m along the recommended Option J/Sub-option Ja ASR network (Full network). Construction of permanent bridges at these locations, as well as at certain key crossings where the crossing length is less than 30 m, in advance of ASR construction, would likely significantly extend the operational season for the winter road system, prior to completion of the entire ASR network.

5.3.3 ASR Construction Activities

Following the 5-year period for functional engineering, environmental assessment, detailed design and pre-construction activities, construction of the ASR network could start in Year 6 (from current year 2010) and proceed in 5-year or 10-year increments to complete the various segments of the ASR network within a 20 year construction window from 2016 to 2035. A multi-year phasing plan was developed for the construction of the ASR network, consisting of three priority packages in the sequencing of the ASR construction:

- Priority 1: ASR for Immediate Safety Benefits; Commence Connection to the Provincial Road Network:
  - Provide ASR access to the closest airport for communities currently without road access to an existing or proposed airport. i.e. Pauingassi/Little Grand Rapids; St. Theresa Point/Wasagamack. Note: Prior to connecting Pauingassi/Little Grand Rapids/Airport with an ASR, consider extending existing ASR north from Little Grand Rapids Airport to new landing, avoiding upper rapids, to provide safer water travel to Pauingassi.
  - Upgrade Paimusk Creek Road and build ASR to Anderson.

Table 5.3a: Ferry Priorities

Ferry Location/ Crossing Distance	Ferry Type	Cost of Ferry	Cost of Access/Landings	Annual Operating/Maintenance Cost	Comments
Garden Hill to Island Lake NAC and the Airport (Island Lake crossing–550 m approx.)	4-car (or 1 WB-20 tractor trailer) cable ferry	$4-5 Million(1)	$2-3 Million(1)	$200,000(2)	Priority #1 Would provide more reliable and longer duration access between Garden Hill and the Airport/Island Lake NAC. Likely to become a permanent crossing. Landing cost includes docks at both ends of crossing.
Sea Falls (Nelson River crossing–330 m approx.)	8-car (or 2 WB-20 tractor trailers) cable ferry	$6-9 Million(1)	$1 Million(2)	$800,000(2)	Priority #2 Add-on to existing ferry operation, until new bridge completed by MIT over Nelson River. Landings similar to existing. Needed to handle increased traffic from ESLW.
Garden Hill to St. Theresa Point or Wasagamack (Island Lake crossing–between 15-23 km approx.)	8-car (or 2 WB-20 tractor trailers) self propelled ferry	$8-12 Million(1)	$2 Million(3)	$400,000(3)	Priority #3 Stop-gap improvement to connect to ASR network at Wasagamack, until new ASR completed by ESRA between Garden Hill and Wasagamack. Landings similar to Islandview/Bloodvein Ferry.
Total Cost		$18-26 Million	$5-6 Million	$1.4 Million	

(1) Derived from AECOM estimates

(2) Derived from MIT estimates for existing Sea Falls Ferry (CF Alfred Settee)

(3) Derived from MIT estimates for Islandview/Bloodvein Ferry (MV Edgar Wood)

- Priority 2: Connection to the Provincial Road Network:
  - Construct ASR between key connection points in the ESLW network and the provincial road network, including the following segments: Anderson to Oxford House; Anderson to St. Theresa Point; Poplar River to Berens River; Pauingassi/Little Grand Rapids to PR 304 to Berens River ASR.

- Priority 3: Completion of Community Connections:
  - Provide ASR intercommunity connections to complete the ESLW ASR network, including the following segments: Oxford House to Gods Lake Narrows and Gods River; Wasagamack to Garden Hill and Red Sucker Lake.

Table 5.3b summarizes the ASR segments to be constructed in the various priority packages, along with the segment lengths and capital costs. The staging of the ASR construction is further depicted in Figure 5.3b.

Rest Areas

Wayside rest areas have been allowed for within the ASR network. They can consist of a local widening of the gravel ASR to provide a lay by width of 5 m x 150 m long, with 50 m tapers added at each end. An additional gravel area 10 m x 15 m adjacent to the lay by would allow for a shelter, portable toilets and garbage cans. Ten rest areas have been included, located at approximate 100 km intervals, on one side of the road throughout the proposed ASR network. The rest areas should be able to safely accommodate 3 WB-20 tractor trailers and 6 small cars.

Figure 5.3a: East Side of Lake Winnipeg (ESLW) – Large Area Transportation Network Study Work Phasing – Winter Road Phase

Legend

- Existing Winter Road
- New Winter Road
- Proposed All-Season Road
- Provincial Road
- Existing Ferry
- New Ferry
- New Bridge (Sea Falls)

N

0 25 50 100 Km

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East Side of Lake Winnipeg (ESLW) Large Area Transportation Network Study

Work Staging: Winter Road Phase

Date: December 2010	File Number: 331027	Sub Code: 2000
Figure: 5.3a		

File: H:\Arcview\020254EastLakeWinnipegRoad\GIS\1_ESLW_2010\MXD\RegionalDataMXD\Fig_5_2_ESLW_SocEcon_WinterRoadPhase_2010Data.mxd

Figure 5.3b: East Side of Lake Winnipeg (ESLW) – Large Area Transportation Network Study Work Staging – All-Season Road Phase

Legend

- Proposed All-Season Road
- Priority 1
- Priority 2
- Priority 3
- Potential Future Connection
- Provincial Road
- Existing Ferry
- New Ferry
- New Bridge (Sea Falls)

N

0 25 50 100 Km

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East Side of Lake Winnipeg (ESLW)
Large Area Transportation Network Study

Work Staging: All-Season Road Phase

Date: November 2010	File Number: 331027	Sub Code: 2000
Figure: 5.3b		

File: H:\Arcview\020254EastLakeWinnipegRoad\GIS\1_ESLW_2010\MXD\RegionalDataMXD\Fig_5_3_ESLW_SocEconAll_SeasonrRoadPhase_2010Data.mxd

Table 5.3b: ASR Priority Segments, Lengths and Costs (Option J/Sub-option Ja)

	ASR Segment	Construction Length (km)	Capital Cost* ($ Million)	
2016-2020	Priority 1:			26.2 km/year
	1. Pauingassi and Little Grand Rapids to Little Grand Rapids Airport (32.2 km)	32 km	$157	
	2. St. Theresa Point and Wasagamack to the proposed new airport*	26 km	$73	
	3. PR 373 south of Sea Falls to Anderson, including upgrade of Paimusk Creek Road*	73 km	$206	
	Total	131 km	$436	
2021-2030	Priority 2:			46.1 km/year
	4. Anderson to Wasagamack/St. Theresa Point junction*	146 km	$412	
	5. Anderson to Oxford House*	123 km	$347	
	6. Pauingassi-Little Grand Rapids junction to future ASR between Bloodvein and Berens River	99 km	$352	
	7. Poplar River to Berens River	93 km	$317	
	Total	461 km	$1,428	
2031-2035	Priority 3:			56.0 km/year
	8. Intercommunity connections between Wasagamack and Garden Hill, and between Red Sucker Lake and the Wasagamack/Garden Hill junction*	158 km	$446	
	9. Intercommunity connections between Oxford House junction and Gods Lake Narrows, and Gods Lake Narrows junction and Gods River*	122 km	$344	
	Total	280 km	$790	
	Total network	872 km	$2,654	

Note:

**For the ASR segments in the Northern Sector, capital costs per segment are estimated using an average construction cost of $2.82 Million per kilometre (including all water crossings and 20% contingency), plus 10% engineering and 15% project management.*

Potential Future ASR Connections

Once the above ASR segments are constructed, the following ASR connections can be considered for future implementation to complete the ESLW ASR network:

- ASR between the Norway House junction near Butterfly Lake and PR 374 at Cross Lake (48 km). Rationale: Provides alternative ASR access to the Northern Sector ESLW communities via the Kichi Sipi Bridge and bypassing Sea Falls.
- ASR between Stevenson Lake and Poplar River (128 km). Rationale: Complete a 3rd continuous north-south route in Manitoba (in addition to PTHs 6 and 10); provides alternative shorter route to Winnipeg for the Northern Sector ESLW communities, and shorter route to

Thompson and Northern Sector communities for travel from Central and Southern Sector communities.

In providing a summary of the costs associated with each phase of developing the full ASR network, it was first necessary to estimate what percentages of the engineering and project management costs associated with delivery of the entire ASR network should be assigned to each work phase. This estimated breakdown is shown in Table 5.4a, and is based on underlying assumptions that engineering is about a 10% add on to the construction cost, and project management about a 15% add on. The individual percentages shown in Table 5.4a are a first cut estimate, and will need to be refined in future phases of the project development.

Using some of the percentages from Table 5.4a, Table 5.4b provides a summary of the costs associated with each phase of developing the full ASR network. It should be noted that these phases can, in some cases, proceed in parallel and will need to be carried out over a time frame determined by statutory approvals, provincial/federal priorities and budget availability.

We have shown a sum of $315 Million in Table 5.4b which is, we understand the amount budgeted over the next 15 years for Community Benefit Agreements, Local Hiring and Procurement. On the assumption it is an integral component of the ASR network development it was felt important to include this sum in the network phasing cost estimates.

Table 5.4a: All-Season Road Network Phasing: Estimated Percentages of Construction Cost Expended on Engineering and Project Management by Work Phase

Work Phase	Engineering (10% of Construction Cost)	Project Management (15% of Construction Cost)	Total
Functional Design ASR Network	0.5	0.5	1.0
Environmental Assessment ASR Network	0.5	0.5	1.0
Detailed Design Roads/Bridges, ASR Network	1.0	1.0	2.0
Detailed Design Environmental Mitigation, ASR Network	0.5	0.5	1.0
Pre-ASR Construction Activities:			
• Winter Roads Construction and Maintenance	0.5	1.0	1.5
• Ferry Procurement and Operation	0.5	1.0	1.5
• Permanent Bridges Construction	2.0	4.0	6.0
ASR Construction	4.5	6.5	11.0
Totals	10%	15%	25%

Table 5.4b: Cost Estimates, Network Phasing ($2010)

Work Phase/Possible Duration	Net Cost/Construction Cost ($ Million)	Capital Cost ($ Million)	Annual Operations/ Maintenance Cost ($ Million)	Comments
Functional Design ASR Network 2011-2012	$22	- -	- -	This work can be phased over a 2-year period 2011-012 or longer, but start/finish dates need to be synchronized with construction priorities.
Environmental Assessment ASR Network 2011-2012	$22	- -	- -	
Detailed Design Roads/Bridges ASR Network 2013-2015	$44	- -	- -	This work can be phased over a 2-year period 2013-2015 or longer, but start/finish dates need to be synchronized with construction priorities.
Detailed Design Environmental Mitigation ASR Network 2013-2015	$22	- -	- -	
Pre-ASR Construction Activities: 2013-2015				
• Winter Roads Construction and Maintenance	- -	- -	$4.5**	984 km of winter road will be phased out and replaced by ASRs.
• Ferry Procurement and Operation including Landings	- -	$23-32	$1.4	Costs are for two cable and one self propelled ferry. One cable ferry is permanent. Two ferries will be phased out as replaced by ASRs, including new MIT bridge @ Sea Falls.

Work Phase/Possible Duration	Net Cost/Construction Cost ($ Million)	Capital Cost ($ Million)	Annual Operations/ Maintenance Cost ($ Million)	Comments
• Permanent Bridges Construction	$316	$395	$0.4***	Some permanent bridges will carry over into ASR construction phase.
ASR Construction 2016-2035 (Including Rest Areas at $0.91 Million)	$1,807	$ 2,259	$ 5.5****	Option J/Sub-option Ja, total network with main E-W trunk south of Echimamish River, system length 872 km.
Community Benefits Agreement/Local Hiring and Procurement	$315			Most of this investment will likely be expended in the front end of a 15-year ASR construction program.

Notes:

** The costs in the table include ASRs within IRs*

*** Annual winter road clearing and maintenance costs are estimated at $4,454 per km based on the MIT provincial winter road budget for 2009/2010*

**** Based on 0.1% of capital cost of bridges, rounded up to closest $100,000*

***** Based on $6,000 per km per annum*

6.0 STUDY CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Further to the questions raised earlier in the report under the Study Area and Goals, the Large Area Transportation Network Study has concluded the following:

i) **ASR Network Feasibility:** It is feasible to construct and operate an all-season, all-weather road network that connects all isolated communities located within the study area to the provincial road network in Manitoba. However there will be high costs incurred in such undertaking due to the distances between communities as well as the nature of the terrain, topography, soil and water conditions encountered. The study analysis has confirmed that in order to optimize benefits resulting from the system investment, the initial links constructed should be from:
- the Oxford House, Gods River, Gods Lake Narrows, Red Sucker Lake, Garden Hill, Wasagamack and St Theresa Point communities to the west, to PR 373 just south of Sea Falls Ferry, and
- Poplar River, Pauingassi, Little Grand Rapids, Berens River, and Bloodvein to the south via PR 304

At some future date, additional ASR links could be provided to PR 374 near Cross Lake, to bypass the Sea Falls crossing, as well as between Poplar River and the proposed ASR network in the Northern Sector (see Figure 6.1 at the end of this section). As well as showing Option J, the proposed ASR network, including future connections, this figure shows travel distances between communities; in some cases 2 route alternatives between common points; and water crossings where the channel width is greater than 30 m.

ii) **Social and Economic Benefits:** The likely scope of the social and economic benefits and impacts of an ASR Network on the ESLW communities include:
- A reduction in average freight costs of up to 50%, as freight shifts from air to road. This should lead to improvement in living standards.
- Improved access to lower cost goods and services both within and outside the communities; to consolidated social services, health care services, education and recreation facilities; to employment opportunities; to airports; to other east side communities and the rest of the province; in a nutshell, "Freedom to Move."
- Improved access to traditional culture and land use activities, albeit with care needing to be taken in the design of the ASR route network system to avoid, minimize or mitigate detrimental impacts on these activities.
- Improved access to heritage resources such as the Hayes River System and the proposed UNESCO World Heritage Site.
- Improved access to unpopulated Indian Reserves, Treaty Land Entitlement areas and Northern Flood Agreement lands.

Economically, those businesses and activities directly linked to a new road network that will likely benefit include:
- Road construction and maintenance contractors
- Freight and passenger transportation companies

- Purveyors of fuel, food and accommodation services to the travelling public
- Tourism, hunting and fishing operations
- Resource development
- Health care, to the extent that centralized local services become possible

These activities in turn will likely generate further demand for other suppliers of goods and services in the community.

Offsetting this, air freight services are likely to decline and airport facilities consolidate as the road network links communities together and to the Provincial Road network.

Another downside is the potential for increased access to drugs, alcohol and gang influences. However, in general, people present at the community meetings felt this to be outweighed by the social benefits of ASR access.

The numbers of expected jobs created through construction of the entire East Side ASR network are:

- Direct employment 22,000 person years (PY)
- Indirect and induced employment 15,000 person years (PY)

It should be possible to fill many of the direct employment jobs associated with road and bridge construction through two of ESRA's initiatives:

- *Community Benefits Agreements (CBAs)*

  These are agreements designed to generate jobs, training and economic opportunities for local communities for pre-construction activities such as gravel crushing, right-of-way clearing, access road exploratory clearing and road upgrading.
- *Aboriginal Benefits and Tendering Strategy*

  This will identify local procurement requirements for contractors bidding on construction tenders. Contractors will be required to:
  - hire a percentage of their workers from the east side region
  - provide positions for newly trained workers
  - purchase goods and services from local service providers

Implementation of the above initiatives will be a way to engage the communities, so that local residents participate in, and benefit from, the construction of the road network, so achieving a long-lasting legacy for the region.

iii) **Natural and Cultural Impacts:** The potential natural and cultural impacts associated with an ASR network include:

- Potential impact on an endangered species, the Woodland Caribou. More information is needed on the numbers and range of this ungulate and can be achieved through a scientific survey including collaring and tracking of some animals. SNCL has been informed by ESRA that a study on woodland caribou has already commenced.
- Potential impact of the ASR at water crossings on fish and fish habitat. Since very little is known about impacts at specific crossing sites, field surveys and sampling will

be needed to supplement information already available from the TEK studies carried out as part of this study.

- Potential impact of the ASR on cultural sites as well as archaeological remains and artefacts. This will need to be addressed during design of the preferred route network. The TEK studies may give an indication of hot spots where archaeological sites and artefacts may be found.
- The impact on existing culture of introducing an ASR system with year round freedom for travel, to and from the communities, may be detrimental in areas additional to drug and alcohol abuse and gang activity. Preparation of adults, with a special emphasis on youth, may be required in some or all communities through education and other outreach programs.

iv) **Capital and Maintenance Costs:** The range of capital and maintenance costs for the ASR network (Option J/Sub-option Ja) preferred by ESRA is as follows:

- Northern, Central and Southern Sectors (including ASR connections within IRs but not PR 304 to Berens River ASR)
    i. System Length 872 km
    ii. Capital Cost ($2010) $2,654 Million
    iii. Annual Maintenance Cost ($2010) $5.9 Million

Notes: 1. This length and cost are for the routing of Option J south of the Echimamish River, the currently preferred location.
2. These costs do not include costs for winter roads, new ferries or ferry infrastructure.
3. The range of precision for the construction costs upon which the estimated capital costs is based, is likely between -25% to +50%. The capital cost shown can be used for preliminary budgeting purposes, within the Province's multi-year capital program. Subsequent functional design along the routes within the preferred all-season road network will enable a greater level of confidence in the project quantities and costs.

v) **Community Input:** Community members who attended the study meetings generally supported the concepts of:

- Connection to the west in the Northern Sector as the first priority
- Connection to the south in the Central and Southern Sectors as the first priority

Although all of the preferred network as outlined below in vi) will have impacts on the social and natural environment, the impacts are considered manageable as well as necessary to achieve a critical improvement in the overall wellbeing of ESLW communities.

vi) **Recommended Network:** The preferred network that has been selected by ESRA to service the communities in the Northern Sector is Option J/Sub-option Ja, which connects the Northern Cree and Island Lake/Red Sucker Lake OjiCree communities to the west, to PR 373 south of the Sea Falls crossing of the Nelson River. The benefits of Option J/Sub-option Ja in the Northern Sector are as follows:

- Compared with connecting to the south, this option involves less system length and can consequently be built more quickly.

- Travel patterns to the west have already been forged through existing private and public winter roads that connect to the west, respectively to PR 373 in, and also north of Norway House.
- Connection to the west may also encourage reliance on the role of Thompson as a service centre, thus strengthening the northern Manitoba economy.
- Option J makes extensive use of the corridors containing the existing winter road system, where soil conditions are generally well known, and where fragmentation of the natural environment has already occurred. These existing winter road corridors have a certain familiarity to travellers, and suitability for ASR construction staging.
- Connecting first to PR 373 near Sea Falls and Norway House, rather than to PR 374 near Cross Lake, may be considered beneficial in spurring earlier construction of a fixed bridge over the Nelson River at Sea Falls. This would be on the premises that this is an improvement that Norway House (the community of which has not yet met the ESRA/SNCL team) would like to see, as well as being a project that MIT will see the need to support to replace the existing ferry.
- 80% of Option J/Sub-option Ja is located within the same corridors as the existing winter road system.

In the Central and Southern Sectors a network has been identified that connects, in the case of Poplar River, to Berens River (this is a shorter distance then connecting north to Norway House), and in the case of Pauingassi/Little Grand Rapids to the PR 304 to Berens River ASR project.

vii) **Development Strategy:** The transportation development strategy for the ASR network involves many steps: design; environmental assessment; possibly formal consultation; stockpiling of construction materials; provision of new or improved ferry service; new winter roads as well as bridges along future ASR routes; providing assured year round access for all communities to airports; construction of all-season roads; and asset operation and maintenance. To support these many steps training of First Nations and Aboriginal construction and maintenance personnel will be required, along with social educational and awareness programs to ready communities for the realities of ASR access.

viii) **Overall Benefits:** The proposed ASR network is desired on the ESLW for the following reasons:

- To improve the wellbeing of over 16,000 residents of Manitoba living and working on the ESLW (the population number does not include Bloodvein, Berens River, Norway House or Cross Lake).
- To ensure the businesses and communities on the ESLW are served by an all-season transportation service on par with that enjoyed by the majority of Manitoba businesses and residents.
- To eliminate the need to airlift freight into the communities in years when, because of a mild winter, it is not possible to establish and operate a winter road system.
- To reduce and eventually eliminate the cost of providing annually a winter road system on the ESLW.
- To reduce the cost to the federal and provincial governments of supporting the First Nations and Northern Affairs Communities on the ESLW.
- To provide increased business and employment opportunities for ESLW residents in such areas as tourism, ecotourism, commercial fishing, mining, boreal forest

harvesting, construction, maintenance and highway oriented services such as providing travellers with food, fuel and accommodation.

- To decrease the costs to utility agencies such as MB Hydro and MB Telephone System to access their lines and equipment on the ESLW.
- To increase, in partnership with First Nations and Aboriginal people the opportunities for business development on the ESLW including mining exploration, commercial fishing, world class tourism and other activities appropriate to the ESLW.

Potential Funding Partners

From the above preliminary list of reasons as to why the proposed ASR network is desired, it can be seen that potential funding partners with ESRA for the ESLW network could include:

- Federal Government (Indian and Northern Affairs Canada, Transport Canada)
- Provincial Government (Conservation; Culture, Heritage and Tourism; Infrastructure and Transportation; Aboriginal and Northern Affairs)
- Utility agencies that operate on the ESLW

If mining or forest product companies were given provincial permission, preferably in partnership with First Nations, to set up business on the ESLW, the royalties that would accrue to the federal and provincial governments could be used to offset the cost of the ASR network.

Identified Network Corridors Approved by ESRA

This report has identified network corridors for the future development of all-season road infrastructure to connect all communities on the East Side of Lake Winnipeg to the Manitoba road system. The road network plan has now been approved by ESRA.

Data Limitations

The two year study report was done at a strategic level to help guide and scope out the next stages of road development. In scoping out future work, the study recommendations were based upon use of the following data:

- Terrain conditions and water crossings derived from satellite imagery, high level (about 1:60,000 scale) black and white stereo aerial photographs, small scale topographic mapping, surficial and bedrock geology maps
- As a proxy, since there is little information available on the numbers and movements of Woodland Caribou, a Species at Risk, within the study area, a Habitat Suitability Index (HSI) prepared for the vegetated areas encountered along ASR route network options. (As noted earlier, SNCL has been informed that a study on woodland caribou has now commenced).
- Reports of good fishing in some of the lakes in the study area, although nothing is known about fisheries values at potential ASR water crossings.
- Traditional Ecological Knowledge (TEK) Studies coordinated by local residents within all the communities in the study area. These studies have yielded important information on local activities such as trapping, berry picking, special gathering/burial/spiritual areas, hunting and fishing. This information, in aggregated form to maintain confidentiality, will be an important

consideration, as the location of a selected all-season road network moves from a fairly broad corridor definition down to a specific alignment.

- Area constraints, where known. These include Indian Reserve lands (IRs), Treaty Land Entitlements (TLEs), Northern Flood Agreement lands (NFAs), mineral leases, mining claims, quarry withdrawals and rare or unique features within Areas of Special Interest (ASI), as well as lakes supporting fly-in fishing lodges. Where the boundaries have been defined, the proposed UNESCO World Heritage Site has also been shown as a potential constraint, including the Poplar River Provincial Park Reserve. Trunk ASR routes are intended to avoid IRs, TLEs and where possible, NFAs. Community connectors will need to cross IR boundaries in some cases to connect up with the existing IR road system, new roads within IRs, being a federal responsibility. While needing to avoid TLEs, mineral leases, mining claims and quarry withdrawals, there may be merit in having the ASR fairly close by, in order to facilitate access to these areas.

Future Data Collection

The data that was lacking in this study to undertake better analysis for decision, and that is required to be collected in order to carry out the next task, Functional Design and Environmental assessment includes:

- Acquisition of new low level (about 1:14,000 scale) aerial photography along the preferred Option J/Sub-option Ja and Jb corridors, between PR 373/PR 374 in the west and Oxford House, Wasagamack and St Theresa Point in the east; also between Poplar River and Berens River and between Pauingassi/Little Grand Rapids and the PR 304 to Berens River ASR Project. New low level photography was already flown in 2010 covering the areas around the Northern Cree communities of Oxford House, Gods River and Gods Lake Narrows, as well as around the Island Lake and Red Sucker Lake communities. The area between the Northern Cree communities and the Island Lake/Red Sucker Lake communities was also flown in 2010. The new low level photography is needed to enable refinement of the ASR routes within the preferred network.
- Field data based on new surveys of the numbers and movements of Woodland Caribou. This data is needed to better assess the potential impact of the preferred ASR network on this Species at Risk.
- Field data based on new surveys of fisheries values in water bodies adjacent to and crossed by the preferred ASR network. This data is needed to better identify fisheries avoidance or mitigation requirements.

In addition to collection of the above new data, further refinement of the routes within the preferred network will likely be required, where they are close to unpopulated IRs, TLEs or NFAs; where they are connecting to existing roads within populated communities; or where they potentially conflict with traditional land uses identified in the TEK studies.

6.2 Recommendations

The key recommendations for the next phases of this project are summarized as follows:

- Option J along with Sub-option Ja connecting to PR 373 near Sea Falls is the study recommended road network option. (This is one of the two options presented by SNCL for ESRA's consideration and subsequently accepted by ESRA)
- Put in place procedures to protect land required for the future all-season road network development.
- Develop a long term plan and program for infrastructure construction, as well as identifying funding requirements for the phased development of the all-season road network.
- Conduct official consultations with the First Nations communities along and affected by the recommended all-season road routes as required by regulatory guidelines.
- Consult the Governments of Canada, Manitoba, First Nations, the Manitoba Metis Federation and other key stakeholders for project concurrence and to secure funding for the next development phase of the project.
- Acquire low level aerial photography for the entire ESWL.
- Undertake functional design and environmental assessment studies to confirm the alignment of the preferred routes, with the following steps:
  - Detailed route engineering at 1:5,000 using low-level, ground-controlled 1:15,000 aerial photos along the preferred ASR corridors
  - Hydrology design for major bridge crossings along the preferred route
  - Local transportation studies to determine the tie-in points of the proposed road to existing trails, community infrastructure and airport/marine facilities
  - Financial analysis to determine construction scope, financing and partnering options and procurement packages
  - Conduct environmental, social and economic impact assessment to secure project permits and licenses required before construction commences, including:
    - Detailed environmental survey for the preferred ASR routes in the Northern Sector and the Central and Southern Sectors, including an inventory of the natural and social environmental features to avoid, mitigate or compensate for (e.g. archaeological/cultural artifacts, flora & fauna, fisheries and fish habitat, wildlife and wildlife habitat, trap lines and sacred sites)
    - Conduct an inventory of renewable and non-renewable resource and harvesting data (e.g. caribou, quarries/mineral extraction, forestry, fisheries)
    - Confirm minimization/avoidance/mitigation of impacts of the proposed road on the natural environment including woodland caribou, rare or unique features within Areas of Special Interest (ASIs) or other protected areas
    - Update mining and mineral exploration activities in the vicinity of the preferred routes

This report concludes the work completed under a two-year multidisciplinary study to identify the preferred All-Season Transportation Network to connect the East Side communities to the rest of the All-Season Road (ASR) network in Manitoba.

Figure 6.1: East Side of Lake Winnipeg (ESLW) – Large Area Transportation Network Study Option J – Proposed All-Season Road (ASR) Network with Future Connections

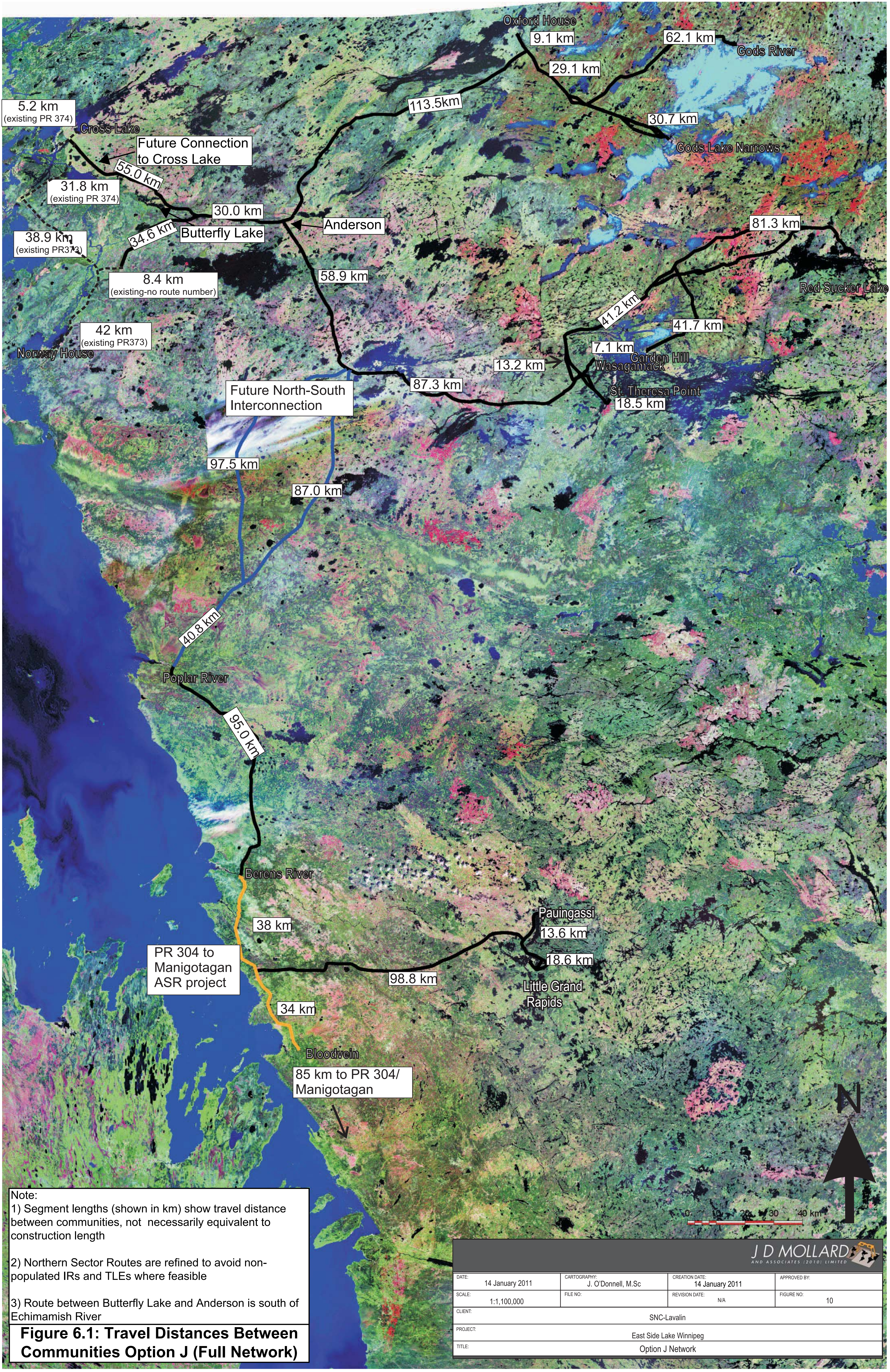

Figure 6.1: Travel Distances Between Communities Option J (Full Network)

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Appendix 1:
Schedule of Rounds 1 and 2
Stakeholder Engagement Meetings; and
Traditional Ecological Knowledge Studies

Table A1.1: Round 1 Community Engagement Schedule

Community	Date of Meeting	Location	
		Leadership Meeting	Community Meeting
Hollow Water FN	Mar 30, 2009	Leaders participated at Manigotagan community meeting	Band Hall
Bloodvein FN	Mar 31, 2009	Leaders participated at community meeting	School Auditorium
Berens River FN, NAC	May 5, 2009 Jul 6, 2009	Leaders participated at community meeting	Community Hall in Berens River NAC Community
Poplar River FN	Apr 2, 2009 Dec 2, 2009	Band Office Band Office	Poplar School Auditorium Band Office
Little Grand Rapids FN, NAC	May 6, 2009 Dec 3, 2009	Meeting not held Meeting not held	Band Office Band Office
Pauingassi FN	May 7, 2009 Dec 3, 2009	Band Office Meeting not held	Local School Gymnasium Health Centre
Norway House Cree Nation, NAC	Apr 15, 2009	Band Office	Not Conducted
Pimicikamak Cree Nation (Cross Lake), NAC	Jul 15, 2009	Band Office	Community Hall
Garden Hill FN, Island Lake NAC	Jun 1, 2009	Band Office	Gymnasium of The NAC school
St. Theresa Point FN	Jul 14, 2009	Band Office	Band Office
Wasagamack FN	Jun 2, 2009	Band Office	Community Hall
Red Sucker Lake FN, NAC	Jan 27, 2010	Band Office	Community Hall
Bunibonibee Cree Nation (Oxford House), NAC	Jul 13, 2009	Band Office	Oxford House Elementary School
Manto Sipi Cree Nation (Gods River)	Apr 16, 2009	Band Office	Amos Okemow Memorial School
Gods Lake Narrows FN, NAC	Apr 17, 2009	Band Office	Gods Lake Narrows School

Note: FN = First Nation, NAC = Northern Affairs Community

Table A1.2: Round 2 Stakeholder Engagement Schedule

Community	Date	Leadership Meeting	Community Meeting
Little Grand Rapids FN, NAC	May 31, 2010	Meeting not held	Band Hall
Pauingassi FN	June 1, 2010	Band Office	Band Hall
Poplar River FN	June 2, 2010	Band Office	Community Drop-in House
Wasagamack FN	June 3, 2010	Band Office	Community Hall
St. Theresa Point FN	June 4, 2009	Band Office	Band Hall
Garden Hill FN	June 7, 2010 & June 15, 2010	ESRA Office (June 7, 2010)	Youth Centre (June 15, 2010)
Island Lake NAC	June 8, 2010 (a.m.)	Councillors attended the community meeting	Island Lake Community Centre
Red Sucker Lake FN, NAC	June 8, 2010 (p.m.)	Band Office	Community Hall
Gods Lake Narrows FN	June 9, 2010 (a.m./p.m.)	Band Office	Band Hall
Gods Lake Narrows NAC	June 9, 2010 (p.m.)	Councillors attended the community meeting	Community Hall
Manto Sipi Cree Nation (Gods River)	June 10, 2010	Chief and Council attended the community meeting	Amos Okemow Memorial School Gymnasium
Bunibonibee Cree Nation (Oxford House), NAC	June 11, 2010	Band Hall	Band Hall
Pimicikamak Cree Nation (Cross Lake FN)	June 12, 2010	Informal meeting with SNCL Project Manager and ESRA Vice President of Engineering and Construction	Outdoors (Community BBQ) at Information Centre for both members of Pimicikamak Cree Nation and residents of Cross Lake NAC
Cross Lake NAC	June 12, 2010	Community Hall	
Norway House Cree Nation, NAC*		Not Conducted	Not Conducted

Notes: FN = First Nation, NAC = Northern Affairs Community

** Leadership and community meetings were not conducted with the Norway House First Nation or the adjacent NAC community as part of the Round 2 engagement process. A meeting was held with the Chief and Council on April 15, 2009 during Round 1 of the engagement process.*

Table A1.3: Traditional Ecological Knowledge (TEK) Studies Initiation and Completion Dates

Community	Initiation Date	Completion Date
Hollow Water FN	March 30, 2009	January 30, 2010
Bloodvein FN	March 31, 2009	January 30, 2010
Berens River FN, NAC	May 5, 2009	January 30, 2010
Little Grand Rapids FN, NAC	May 6, 2009	January 30, 2010
Pauingassi FN	May 7, 2009	January 30, 2010
Poplar River FN	April 2, 2009	January 30, 2010
Wasagamack FN	June 2, 2009	June 3, 2010
St. Theresa Point FN	July 14, 2009	June 4, 2010
Garden Hill FN	June 1, 2009	May 17, 2010
Island Lake NAC	June 2, 2009	June 3, 2010
Red Sucker Lake FN, NAC	January 27, 2010	July 30, 2010
Gods Lake Narrows FN, NAC	April 17, 2009	May 26, 2010
Manto Sipi Cree Nation (Gods River)	April 16, 2009	August 30, 2010
Bunibonibee Cree Nation, Oxford House NAC	July 13, 2009	June 11, 2010
Pimicikamak Cree Nation, Cross Lake NAC	July 15, 2009	September 13, 2010
Norway House Cree Nation, NAC*	Not Conducted	

Notes: FN = First Nation, NAC = Northern Affairs Community

** TEK Studies were not conducted with the Norway House First Nation or the adjacent NAC community as permission was not received from the communities to proceed.*

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Appendix 2:
Travel Distances between Communities

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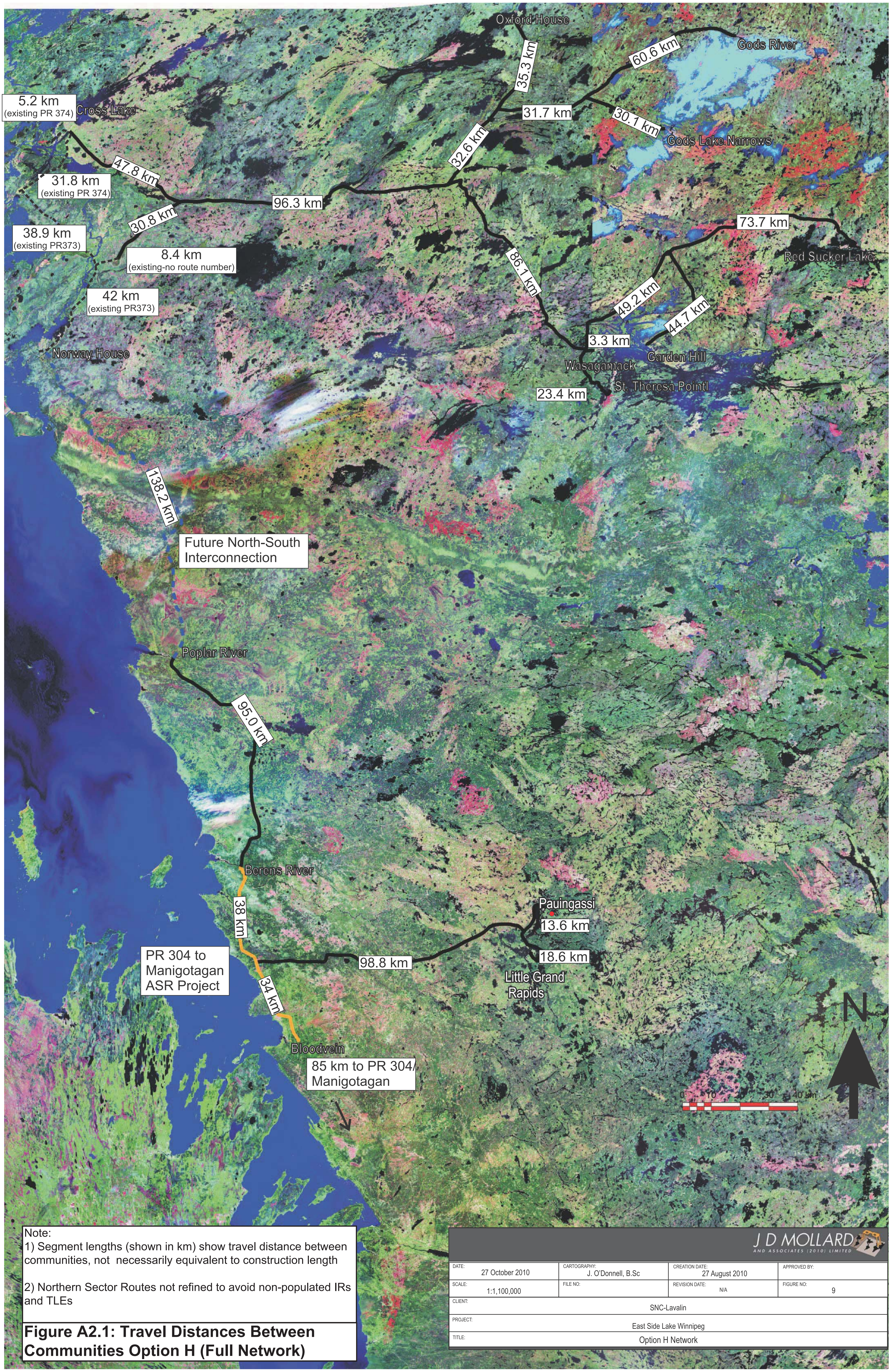
Figure A2.1:
Travel Distances between Communities
Option H (Full Network)



Note:
1) Segment lengths (shown in km) show travel distance between communities, not necessarily equivalent to construction length

2) Northern Sector Routes not refined to avoid non-populated IRs and TLEs

Figure A2.1: Travel Distances Between Communities Option H (Full Network)

DATE: 27 October 2010	CARTOGRAPHY: J. O'Donnell, B.Sc	CREATION DATE: 27 August 2010	APPROVED BY:
SCALE: 1:1,100,000	FILE NO:	REVISION DATE: N/A	FIGURE NO: 9
CLIENT: SNC-Lavalin			
PROJECT: East Side Lake Winnipeg			
TITLE: Option H Network			

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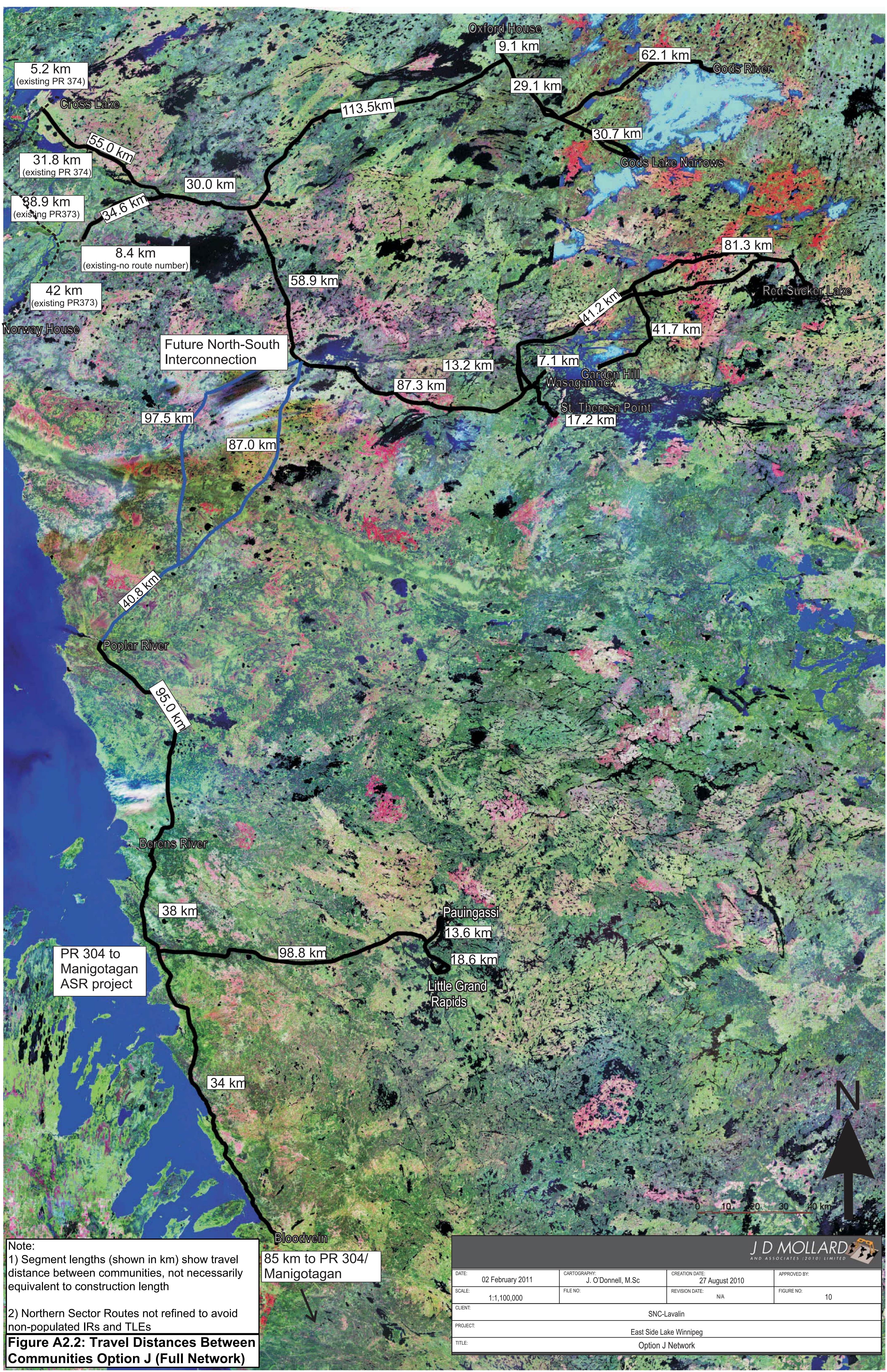
Figure A2.2:
Travel Distances between Communities
Option J (Full Network)



Note:
1) Segment lengths (shown in km) show travel distance between communities, not necessarily equivalent to construction length

2) Northern Sector Routes not refined to avoid non-populated IRs and TLEs

Figure A2.2: Travel Distances Between Communities Option J (Full Network)

Appendix 3:
Water Crossings over 30 m

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Figure A3.1:
Water Crossings over 30 m
Option J/Sub-option Ja
(Full Network)

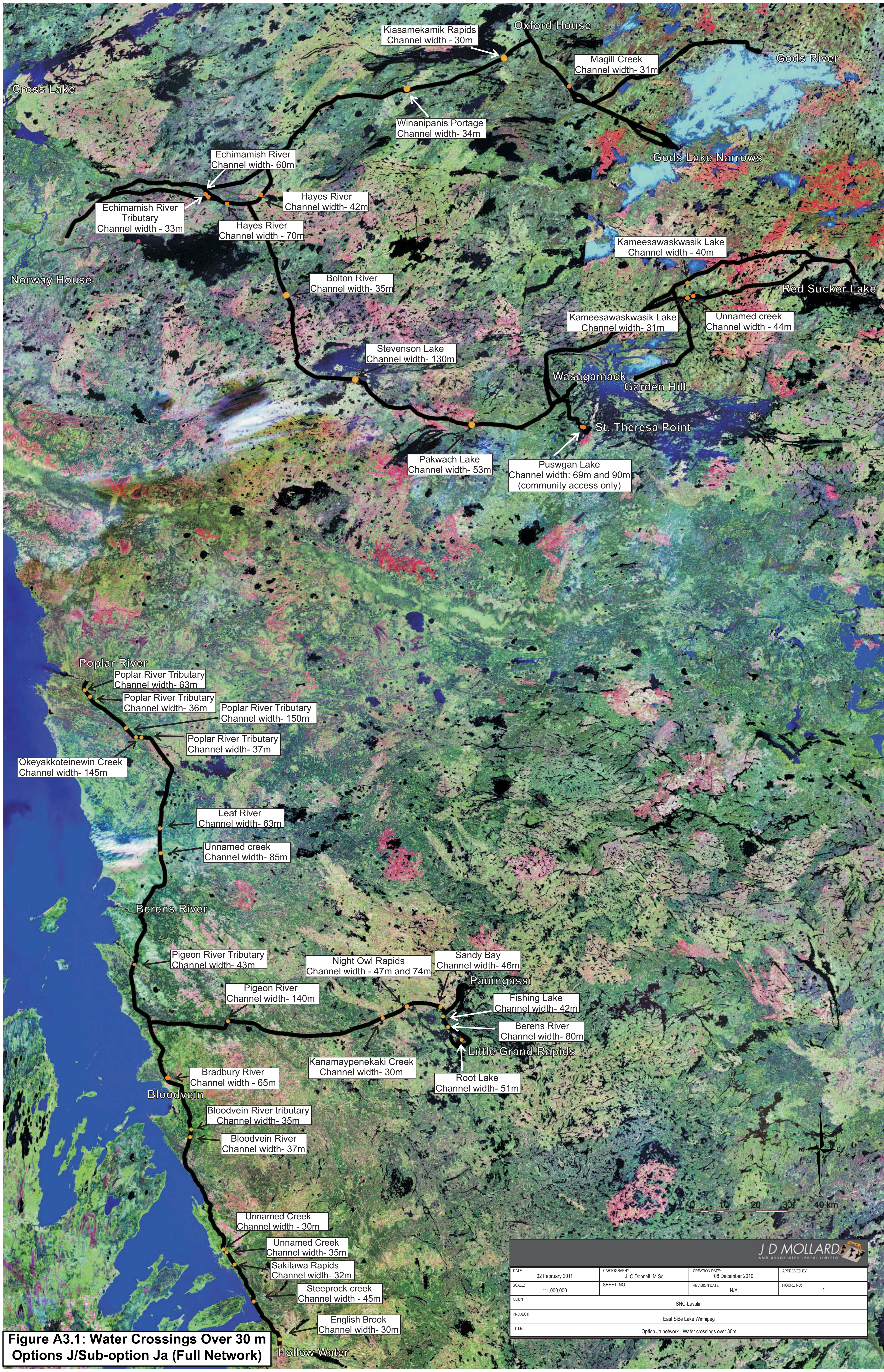

Figure A3.1: Water Crossings Over 30 m Options J/Sub-option Ja (Full Network)