CREE DEVELOPMENT CORPORATION

LA GRANDE ALLIANCE

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PRE-FEASIBILITY STUDY – PHASES II & III – TRANSPORTATION INFRASTRUCTURE

REPORT NO.5 - FINAL

Final Version

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REPORT NO.5 - FINAL

PRESENTED TO:

CREE DEVELOPMENT CORPORATION (CDC)

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BRIEF STATION EXPLANATION

A station indicates the relative position along the horizontal centerline of a linear structure. In our specific case, the linear structures are the roads. A starting station is set at a specific location and the linear distance along the centerline is added to that starting station. Stations are usually presented as follows:

KKK+MMM

Where:

- K: Kilometers
- M: Meters

For examples:

1. If the starting station was set at 000+000, station 000+001 would be located on the centerline 1 meter away from the starting station.
2. If the starting station was set at 000+000, station 000+020 would be located on the centerline 20 meters away from the starting station.
3. If the starting station was set at 000+000, station 000+300 would be located on the centerline 300 meters away from the starting station.
4. If the starting station was set at 000+000, station 004+000 would be located on the centerline 4 kilometers away from the starting station.
5. If the starting station was set at 000+000, station 050+000 would be located on the centerline 50 kilometers away from the starting station.
6. If the starting station was set at 000+000, station 600+000 would be located on the centerline 600 kilometers away from the starting station.
7. If the starting station was set at 000+000, station 324+678 would be located on the centerline 324 kilometers and 678 meters (324 678 m in total) away from the starting station.
8. If the starting station was set at 100+000, station 324+678 would be located on the centerline 224 kilometers and 678 meters (224 678 m in total) away from the starting station.

LIST OF ABBREVIATIONS AND ACRONYMS

ABBREVIATIONS/ ACRONYMS	DEFINITION
AADT	Annual Average Daily Traffic
AMIC	ArcelorMittal Mining Railway
ARALDS	Act Respecting Agricultural Lands in the Domain of the State
AREMA	American Railway Engineering and Maintenance-of-way association
ATGD	Abitibi-Témiscamingue General Directorate
CDC/SODAB	Cree Development Corporation/James Bay Native Development Corporation
CN	Canadian National Railway
HQ	Hydro-Québec
HSA	Highly Sensitive Areas (see Technical Note 3 for details)
HSC	Highway Safety Code
JBEC	James Bay Energy Corporation
JBNQA	James Bay and Northern Quebec Agreement
MERN	Ministère de l'Énergie et des Ressources Naturelles (Ministry of Energy and Natural Resources)
MFFP	Ministère des Forêts, de la Faune et des Parcs (Ministry of Forests, Wildlife and Parks)
MSP	Ministère de la Sécurité publique
MTQ	Ministère des Transports du Québec (Quebec Ministry of Transportation)
ONR	Ontario Northern railway
QNS&L	Quebec North Shore and Labrador Railway
RADF	Règlement sur l'Aménagement Durable des Forêts du domaine de l'État (Regulation Respecting the Sustainable Development of Forests in the Domain of the State)
SC	Service Centre
SCT	Secrétariat du Conseil du Trésor (Treasury Board Secretariat)
SDBJ	Société de développement de la Baie James (James Bay Development Corporation – JBDC)
SFDA	Sustainable Forest Development Act
TFT	Tshiuetin Rail Transport

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1 INTRODUCTION & CONTEXT

1.1 LA GRANDE ALLIANCE

La Grande Alliance refers to the *Memorandum of Understanding (MOU) on the Cree-Québec Sustainable Infrastructure Program in Eeyou Istchee Baie-James*, signed between the Cree Nation Government (CNG) and the Government of Québec on February 17, 2020. The purpose of the MOU is to provide a framework for Cree local and regional entities to work closely with relevant Québec government ministries to connect, develop and protect the territory of the Eeyou Istchee Baie-James region of northern Québec in an inclusive and participatory manner. The main objective of La Grande Alliance is to build a promising program for the strategic, predictable, and sustainable development of the territory over a 30-year time horizon.

La Grande Alliance consists of four avenues of future development – transportation infrastructure, communication, electrification, and protection – to devise a roadmap that takes into consideration innovative economic and technical opportunities and/or constraints, as defined by communities, land users and other relevant groups.

The Eeyou Istchee Baie-James region is rich in natural resources. However, historical development of these resources has resulted in projects often thrusted upon Indigenous and non-Indigenous communities alike, for whom the only option was to react. This scenario makes land use planning very challenging for communities and government officials, strategic transportation or energy infrastructure planning ambiguous for public services and government ministries, and investment by promoters of development projects risky and uncertain.

The link between transportation, communication and energy infrastructure and the potential for development is undeniable. The key, however, is to ensure that such infrastructure does not occur in environmentally or culturally sensitive areas. This is essential to avoid potential conflicts between development and the communities where this infrastructure is proposed to be built. Conversely, providing communities with the opportunity to contribute to the conception, planning, deliberation and evaluation of infrastructure, hand in hand with protection of some natural areas, has the potential for shaping the territory in an empowering way that brings long-term predictability to the region. In turn, this allows communities to plan their growth more easily, resources for protecting environment and wildlife to be deployed more efficiently, land use planners to work with more certainty, and investment by promoters and developers to be more secure.

The following report deals specifically with the transportation infrastructure component envisioned through the MOU.

1.1.1 THE CLIENT – CREE DEVELOPMENT CORPORATION

In conformity with the MOU, the CNG has mandated the Cree Development Corporation (CDC) to conduct a series of studies to examine the economic, technical, and socio-environmental aspects of a series of proposed large transportation infrastructures envisioned over three phases spread over 30 years.

The CDC is the modernization of the James Bay Native Development Corporation, created through the *James Bay and Northern Québec Agreement* (JBNQA) to "assist, promote and encourage the creation, diversification or development of businesses, resources, properties and industries within the territory with a view to stimulating maximum economic opportunities for Cree people and contributing to their general economic well-being". Following the signature of La Grande Alliance MOU, the CNG mandated the CDC to carry out the Infrastructure Studies, part of which are the subject of this report.

1.1.2 PRECURSORS TO LA GRANDE ALLIANCE

The Agreements presented below allow the reader to better situate the MOU within the current legal framework in place in the region.

THE JAMES BAY AND NORTHERN QUÉBEC AGREEMENT

The JBNQA was signed on November 11, 1975, by the Government of Québec, the Government of Canada, Hydro-Québec, the Grand Council of the Crees of Québec and the Northern Québec Inuit Association. Described by many as the "first modern treaty", the JBNQA created a new legal and, eventually, constitutional framework for, among other things, local self-governance, land management, protection of the traditional Cree way of life as well as for the relationship between Québec and the Indigenous peoples of the James Bay and Northern Québec region. It was the foundation on which Crees laid over 80 subsequent agreements, regarding Cree rights, communities' self-governance and subsequent development of the territory.

THE PAIX DES BRAVES

The *Agreement respecting a new relationship between the Cree Nation and the Government of* Québec (better known and herein referred to as *Paix des Braves),* signed in February 2002 is a Nation-to-Nation Agreement between the Government of Québec and the Crees of Québec. The Agreement is not meant to replace the JBNQA, but rather to build a "development model based on the principles of sustainable development, partnership and respect for the traditional way of life of the Crees, as well as on a long-term economic development strategy, principles which are in conformity with (its) provisions." The Agreement includes specific modalities with regards to mining, forestry, and hydroelectric development on the territory, seen as the three sectors driving the regional economy at the time of signing. Furthermore, the Agreement is meant to provide greater autonomy to the Crees in the manner in which communities will develop in the future. Henceforth, development occurring on Cree traditional lands requires meaningful participation of the Crees at multiple levels, as well as benefit sharing frameworks that see Crees as more than simple stakeholders.

OTHER GOVERNMENT POLICIES

In addition to the Agreements presented above, the Northern Action Plan, proposed by the Government of Québec in May 2011, is a 25-year economic development program for the northern regions of Québec based on "sustainable development" which is intended to focus on the construction of transportation infrastructure, mining, and the development of renewable energy projects.

1.2 TRANSPORTATION INFRASTRUCTURE STUDY

The following components were the initial transportation infrastructures considered as part of the studies:

PHASE I (1-5 YEARS)[1] (THE PHASE I IS STUDIED BY OTHERS)

- **Roadway: Upgrading and paving of the community access roads** for Waskaganish, Eastmain, Wemindji and Nemaska.
- **Railway: Matagami to Rupert**

  A proposed railway line following, as much as possible, the Billy-Diamond Highway (BDH) starting from the town of Matagami to the km 257 of the BDH (Rupert River Bridge).
- **Railway: Grevet to Chapais**

  A return to service for the decommissioned railway line between Grevet (Lebel-sur-Quévillon) and Chapais (approximate distance of 147 km).

PHASE II (6-15 YEARS)

- **Railway: Rupert to La Grande**
  - A proposed railway alignment following, as much as possible, that of the Billy-Diamond Highway (BDH) starting at km 257 (after the Rupert River Bridge, which is the junction point with the railway alignment developed by the Phase I consultant) all the way to La Grande River. The Phase II railway alignment extends over an approximate distance of 340 km.
- **Route 167: upgrading & extension to the Trans-Taiga Road**
  - Upgrading and paving of the section from the Mistissini community access road to the Stornoway Renard Mine access road over an approximate distance of 204 km;
  - Extension towards north to connect with the Trans-Taiga Road near km 408, over an approximate distance of 172 km.
- **Road: La Grande to Whapmagoostui/Kuujjuarapik**
  - A proposed road corridor connecting Chisasibi community access road and Whapmagoostui/Kuujjuarapik, over an approximate distance of 207 km.

PHASE III (16-30 YEARS)

- **Railway: La Grande to Whapmagoostui/Kuujjuarapik**
  - A railway which follows, as much as possible, the projected road leading to Whapmagoostui/Kuujjuarapik (from the junction with the Phase II railway alignment).. The Phase III railway alignment extends over an approximate distance of 219 km.
- **Port at Whapmagoostui/Kuujjuarapik**
  - A deep-water port along the Kuujjuarapik coastline between the Great Whale River's mouth and the entrance of the Manitounuk Strait.

[1] All dates indicated herein are hypothetical and would begin as of the start of the construction period. This therefore does not include all pre-project phases, most notably the Environmental and Social Impact Assessment that would be required if the infrastructures are pursued.

1.2.1 STUDY VISION AND APPROACH

The studies found herein have put **local communities at the centre of the transportation infrastructure development process. This way of working, initially proposed by the CDC, strives to shift the dominant paradigm away from natural resources as the main lever of development, towards community development. Natural resource development remains a vital element to this equation but is no longer the sole driver. In this sense, La Grande Alliance goes beyond a standard regional transportation plan but rather proposes a new model** for how the Cree and the Jamesian populations can work together to sustainably develop the existing network, thereby allowing the movement of natural resources in a manner that promotes the betterment of all.

The Feasibility Studies attempt to seek out and understand ways in which the proposed transportation infrastructures can improve the communities' quality of life. Transportation corridors are explored with the utmost respect for the land, its inhabitants, and Cree heritage. In this sense, the study fully embraces the concept of sustainable development, such that the infrastructures under study can only proceed if they are feasible from a technical, environmental, and economic perspective. Furthermore, it is understood that, to proceed, the proposed infrastructures will require the social acceptability of all communities in the region.

The Client's requirement to involve Cree and Jamesian communities at such an early stage of development reflects their requirement that local stakeholders be actively involved in the planning and management of land and economic development in Eeyou Istchee. The organization understands that Eeyou Istchee is extremely rich in natural resources, but firmly believes that it must not be seen simply as a source of raw materials for resource exploitation. The CDC is clear that development of the territory must be in accordance with traditional customs and founded on values of respect and gratitude to the land. Finally, it rejects the idea that infrastructure development and environmental protection are opposing, but rather are both key to harmonious development of a territory and its people.

1.2.2 STUDY OBJECTIVES

Understanding the value created through the development of an inclusive and comprehensive infrastructure program will generate stability and allow communities to better access opportunities associated with various aspects of regional development. The challenges and uncertainty created by climate change and geopolitical instability make community participation even more critical.

Therefore, several study objectives have been developed:

1. To better understand the implications, risks, and opportunities related to the various infrastructures contemplated in the study;
2. To maximize connections between communities and the main drivers of economic development in the region, throughout the territory;
3. To identify transportation corridors that concentrate the development footprint, so as to limit environmental impacts elsewhere, in a manner that is in harmony with other land use activities on the territory;
4. To minimize the emission of harmful greenhouse gases in the construction, operation and use of future infrastructure developments on the territory;
5. To identify opportunities to create meaningful jobs for the inhabitants;
6. To understand how to balance infrastructure development with environmental protection as well as the preservation and enhancement of Cree culture for the benefit of future generations.

Although an Opportunity Study was not previously carried out, CDC has included, as part of this mandate, the need to better define the purpose of the studied infrastructures in the three phases of the La Grande Alliance Study.

1.2.3 CONTEXT OF THE STUDY

For thousands of years, the Crees of Eeyou Istchee have lived off the land through hunting, fishing, and trapping. This large territory of 450,000 km² is now inhabited by around 22,000 people divided mostly in ten[2] Cree communities, five of which are located along the east coast of James and Hudson Bays: Waskaganish, Eastmain, Wemindji, Chisasibi and Whapmagoostui. The remaining five are inland communities: Waswanipi, Nemaska, Oujé-Bougoumou, Mistissini, and Washaw Sibi. Whapmagoostui is currently the only community not yet accessible by road.

The gap between the social and economic conditions of Indigenous and non-Indigenous people in Québec continues to be a major social problem. Issues continue to be insufficient housing, chronic unemployment and underemployment, low formal education levels and a flawed and heavily biased justice system. To combat these problems, many communities are implementing strategies that emphasize self-governance, autonomy, history, culture, spirituality, and identity. In this sense, many Crees believe that true economic development must grow from these elements and cannot be in opposition to them.

Changing climatic conditions, rapid demographic growth, and a growing interest in the resource potential in northern territories are all exerting pressure on Cree communities. Today's choices will no doubt influence the lives of future generations.

The Feasibility Studies are carried out in each community within the study area utilizing a network of Grande Alliance Community Information Officers (CIO). CIOs have been appointed by their communities to act as the local antennas of La Grande Alliance, to ensure participation and engagement in the studies, and to confirm that issues and concerns raised by Cree communities are heard and addressed in the studies. These positions are funded through the CDC.

Jamesian communities, for their part, are relatively newcomers to the territory. However, recent governance agreements signed between them and the Crees show that they form an integral part of the territory and have an important voice in its future development. Although the La Grande Alliance Transportation Infrastructure Feasibility Studies are a Cree initiative, the CDC has made it clear that any discussions about future programs need to include Jamesian communities and their concerns. The study therefore assumes that a successful program will require the active support of these communities as well. To this end, communications have been established with each of the Jamesian communities within the broad study area through their respective municipal administrations.

1.2.4 PHASES II AND III PRE-FEASIBILITY STUDY MANDATE

The CDC has mandated WSP in May 2021 to study the Whapmagoostui/Kuujjuarapik proposed road, the Route 167 upgrade and extension as well as the railway to be located along the Billy-Diamond Highway, from KM 257 to KM 544, then on to Whapmagoostui/Kuujjuarapik, following, as much as possible the same alignment of these roads. WSP and its Cree partners, Maamuu Consultants, Mishtuk Corporation and EnviroCree, share the vision of La Grande Alliance as the promise of a future shaped by the Crees for the Crees of the Eeyou Istchee Baie-James region.

This study aims to:

1. Consult previous analyses on the territory;
2. Document the current market conditions and forecast market for La Grande Alliance infrastructure program;
3. Initiate a sustained effort of communication, collaboration, and engagement;
4. Document the existing social and environmental aspects that could benefit and/or be impacted;
5. Developed proposed infrastructures in accordance with social and environmental aspects;
6. Assess the technical feasibility of the proposed infrastructure;

[2] An eleventh community, known as "MoCreebec" is composed of JBNQA Cree beneficiaries who live on the west side of James Bay, mostly in Moose Factory and Moosonee, Ontario.

7 Assess the risks and the financial viability of the proposed infrastructure;
8 Report and provide recommendations in a final report.

This Study will examine the possibility of implementing the specified transportation infrastructures to meet the needs of Cree and non-Indigenous residents in the short, medium, and long-term in the Eeyou Istchee territory.

1.2.5 STUDY AREA

As shown on Figure 1-2, the study area is located within the territory of the Eeyou Istchee James Bay region of northern Quebec. The study area is divided in three zones.

- Study Area 1 (SA1): Billy-Diamond Highway Railway – Rupert – La Grande;
- Study Area 2 (SA2): Road & Rail Extension, and Harbour – La Grande – Whapmagoostui/Kuujjuarapik;
- Study Area 3 (SA3): Route 167 - Renard Mine – Trans-Taiga Road.

It is to be noted that these study areas are slightly different that the ones described in La Grande Alliance MOU, thus, to suit the proposed infrastructures scope.

1.3 REPORT NO. 5 - OBJECTIVES

The purpose of Report 5 is to document and summarize the progress of all the major stages of the study, while presenting how the proposed transportation corridor alignments meet the major objectives of the study, including the advantages and the associated benefits. Report 5 is meant to provide an overview of the previous four main reports submitted for the Phases II and III Pre-Feasibility Study:

- Report 1 – Market Survey
- Report 2 – Socio-Environmental Survey
- Report 3 – Technical Survey
- Report 4 – Performance Analysis

This Final Report also includes recommendations intended to guide, over the next ten years, future stages of development and realization of La Grande Alliance, should the Cree Nation decide to move forward on any of the components under study.

The following topics are covered in the report:

- Study Methodology, including innovations to standard practice for studies of this nature;
- Summary of the main stages of the study:
    - Report 1: Market Survey;
    - Report 2: Socio-Environmental Survey;
    - Report 3: Technical Survey – Proposed Infrastructures;
    - Report 4: Performance Analysis.
- Summary of objectives met and recommendations for future phases.

The elements described on the following pages represent the recommended directions and rationale that led to the identification of the proposed optimal alignments. This includes further recommendations regarding the direction and orientation of any future studies, understanding that the foreseen infrastructures are still at an early stage such that new data will likely influence future directions.

This current report has been conceived to present and provide an overall view of the Study and all of its components. Note that for all information presented herein, more detailed descriptions and explanations can be accessed by the reader as follows:

- Reports 1-4 provide a summary of the relevant points and issues raised for each main Study component (economic, socio-environmental, technical and performance/risk analysis);
- Various Technical Notes accompanying Reports 1-4 provide a more detailed methodology according to each specific discipline, the results of data collection, calculations, regulatory references, etc., thereby providing a more detailed understanding of each of the subjects addressed. This is explained further in Figure 1-1 below.

The present study was divided into five main components :

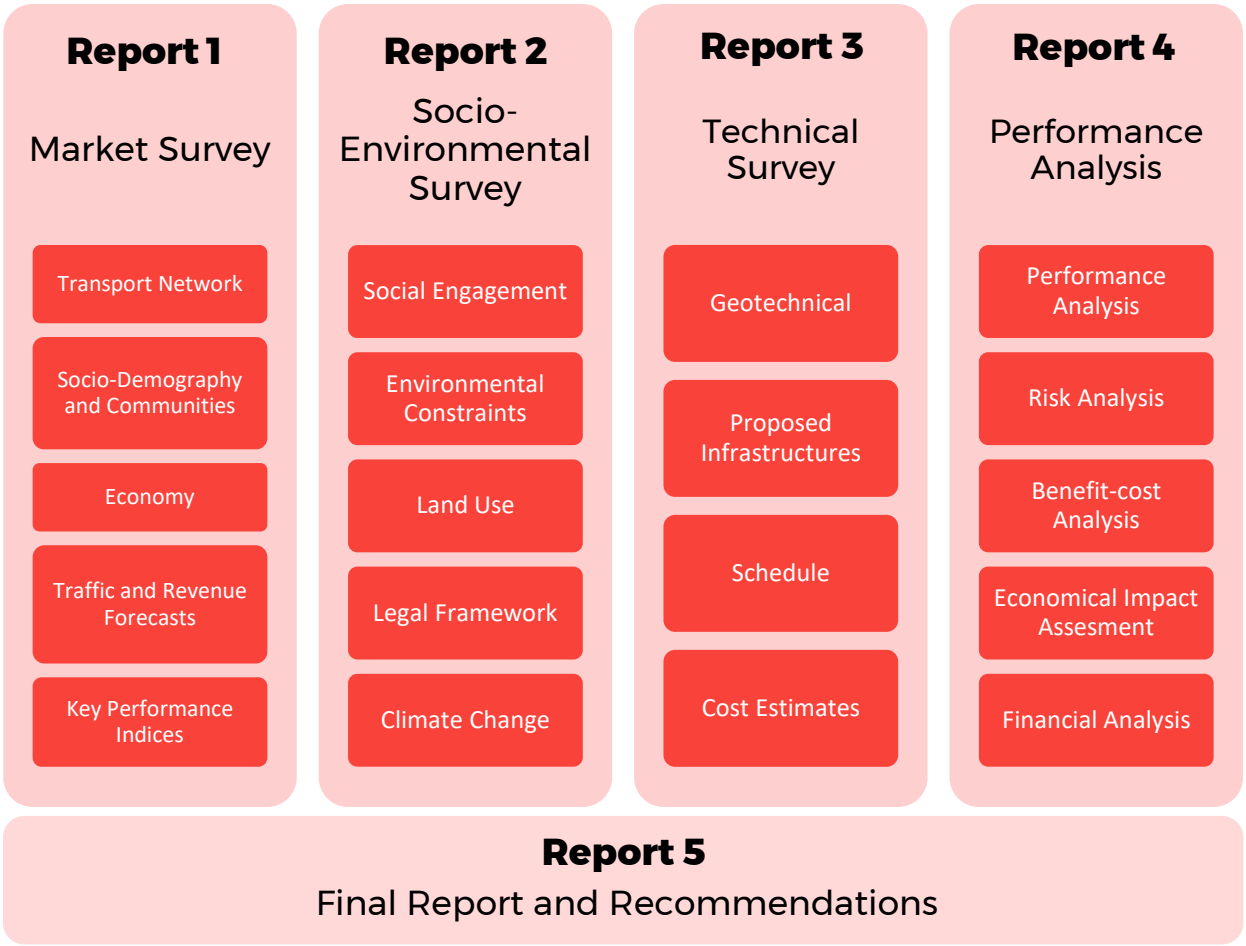

Figure 1-1 **Steps in the La Grande Alliance Transportation Infrastructures Study**

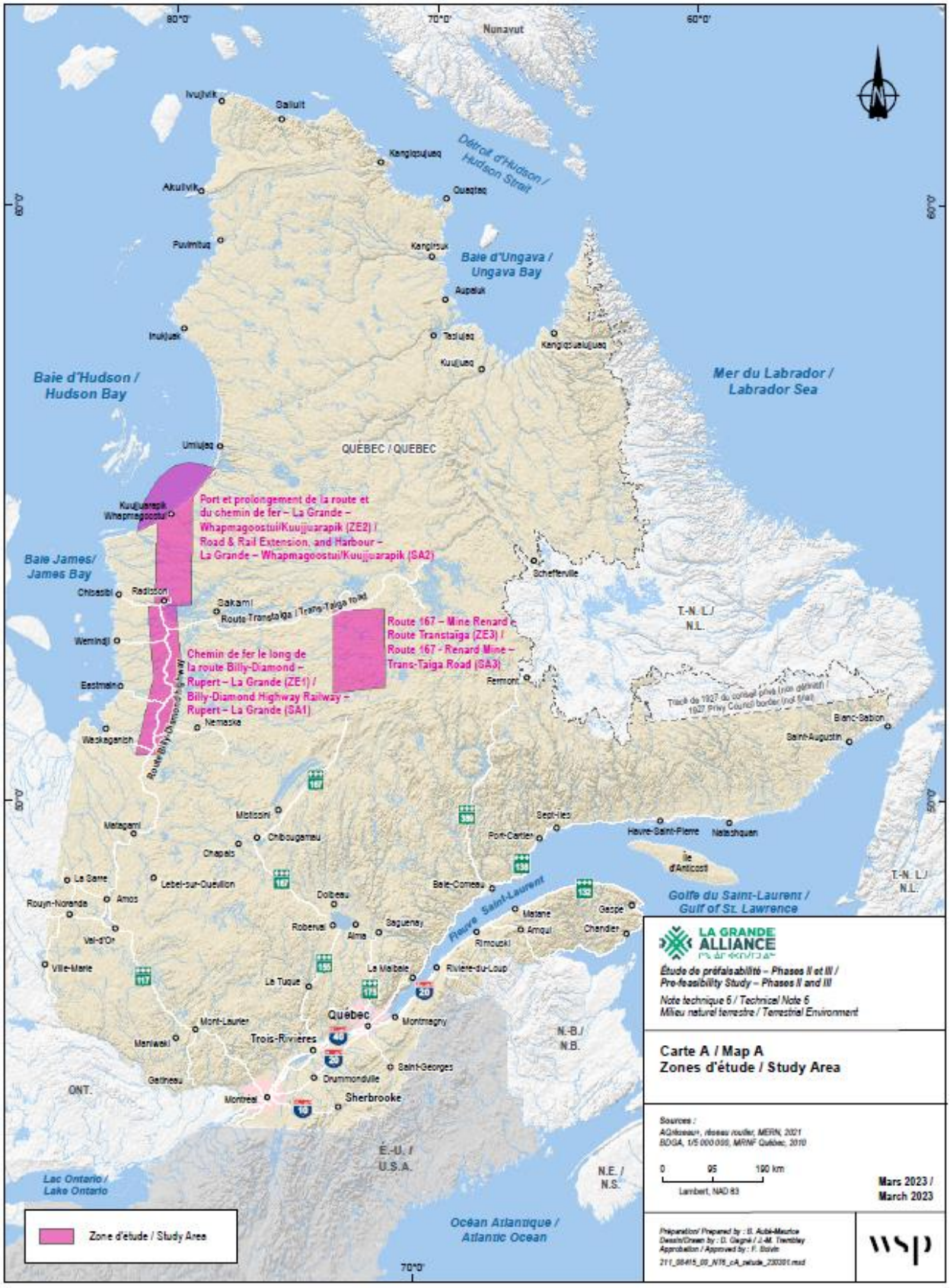

Figure 1-2 Study Area

2 REPORT NO. 1 - MARKET SURVEY

The Market Study was a joint exercice between WSP and phase I external consultant. The purpose of this Report 1 is to:

1. Document presents the market analysis;
2. Forecast market conditions for all components of La Grande Alliance proposed infrastructure program.

The more specific goals of the market study include:

- To assess the economic needs of the region relating to the proposed infrastructure, detailing regional economic sectors that could use the new infrastructure to foster economic growth;
- To provide a detailed socioeconomic profile of the Eeyou Istchee Baie-James region, including Cree and Jamesian communities, economic sectors, projects and outlook;
- To assess market potential and forecast freight, passenger traffic and revenue for the different transport infrastructures;
- To consult and interview potential users and communities to determine their current and future needs;
- To assess and propose means to enhance regional impacts given the expected demographic, social and economic growths with and without La Grande Alliance infrastructure program:
  - Analyze the strategic development opportunities related to La Grande Alliance infrastructure program, considering Protected Areas, culture, communications, energy, human resources;
  - Project population and economic growth on the territory over a given time horizon;
  - Project vehicle traffic of the status quo without La Grande Alliance proposed infrastructure, as well as the traffic of La Grande Allianceproposed infrastructure components.

The study area is a remote area in Northern Quebec. The territory of Eeyou Istchee Baie-James is vast, the climate is harsh and the distances between communities are significant, making the cost of transportation and therefore the cost of living very high.

Overall, most stakeholders have expressed the view that the existing transportation infrastructure is obsolete and needs to be upgraded, and that future socio-economic development in the Northern Quebec region relies greatly on the efficiency of the transportation infrastructure.

TRANSPORT NETWORK

In terms of road transportation, the Billy Diamond Highway and the Route du Nord constitute the road networks' backbone. From this backbone, the access roads are vital linkd that connect all communities except the northernmost communities in the study area (Whapmagoostui and Kuujjuarapik). These roads are used to provide supplies to the people living and working in the Eeyou Istchee James Bay region, to transport equipment and materials to Hydro-Québec power stations and to mining sites as well as to ship harvested lumber and exploited mining concentrates to the south.

Air transportation, for its part, plays an important role in serving the northernmost communities, particularly regarding perishable foodstuffs, as well as for emergency evacuation for patients requiring medical care, either to the hospital in Chisasibi or to the large urban centers in the south (Val d'Or or Montreal). Air transportation services to the region are mainly provided by Air Creebec and Air Inuit, but airfares for personal travel remain prohibitively high. Seven Cree communities currently have an airport nearby, but the lack of air support services coupled with limited length runways make the further development of air transportation difficult. Helicopters are usually used for activities related to exploration and development of forestry, mining, and hydroelectric resources, while a combination of helicopters and small seaplanes (beavers) are now used for the transportation of trappers to their trapping grounds, and of hunters and fishermen to the outfitters of the region.

Regarding rail transportation, Canadian National Railway (CN) provides services to Matagami and Chibougamau, but the quantity shipped by rail is relatively low compared to road, due in large part to higher cost of transportation. The multimodal transhipment recently built next to the town of Matagami is currently expanding, and another one is currently planned next to Chibougamau. Both are expected to increase volume of goods transported by rail to and from the region.

Maritime transportation is fundamental for supplying Nunavik communities further. Freight is transported to all of the ports in James Bay and Hudson Bay as much as four times per year from a base located in Moosonee. Full warehousing facilities located in Wemindji and Chisasibi facilitate connexions with various smaller-scale community port infrastructures located in the study area.

SOCIO-DEMOGRAPHY AND COMMUNITIES

The study area is home to approximately 32,000 inhabitants, more than half of which are Cree. The Cree population can be characterized as young and rapidly growing, in comparison with the non-Cree population that is significantly older and decreasing. It is believed that this trend will continue to hold over the next decades. The education level amongst Cree-aged 15 and over has improved considerably over the last few decades, with 49 % now holding a high-school diploma.

The creation of the Cree Board of Health and Social Services of James Bay (CBHSSJB) in 1978, as per Section 14 of the JBNQA, has led to a full range of healthcare services available to the Cree population, which has greatly increased their quality of life. Although full-time hunting and trapping remains a very important economic sector for a proportion of the Cree population, the overall participation of the active population in the labour market has risen significantly since the signing fo the JBNQA. Today, most working Crees are employed in the public services sector. As the economy of Northern Quebec relies mainly on the extraction of resources, whether these be hydroelectric production, mining or forestry, many Cree companies and entrepreneurs have been established to support these sectors, resulting in a Cree workforce that is more skilled today compared to 20 years ago. However, the cyclical nature of mining and the boom-bust nature of hydroelectricity (i.e. many jobs in construction and comparably little in operations) have had undesirable negative impacts on the sustainability of Cree businesses in these sectors.

The lack of housing development projects is probably the greatest economic issue facing both Cree and Non-Cree communities in the study area. On the one hand, this has resulted in overcrowding in many Cree homes, while on the other hand it has been a clear constraint to attracting new residents to the region. Insufficient funding and high transportation costs, particularly for the northernmost communities, are the key factors limiting housing developments in the region.

With a young, growing and more skilled labour force, it is expected that over the next few years the Crees will have an increasing impact on the the economic dynamics of the region. In particular, the strong development of capacity in the construction and transportation sectors, will result in their playing a major role in future infrastructure development projects.

ECONOMY

Hydroelectricity, mining and forestry form the backbone of the Eeyou Istchee economy. These sectors create a significant number of jobs and economic opportunities for both Cree and Non-Cree communities in the study area. The demand for increased and improved transportation infrastructure will therefore continue to grow in the future. Hydro-Quebec's existing infrastructure, most notably their power-generating turbines, are expected to reach the end of their useful life in the coming decades, resulting in a need to ensure that the existing network, built largely for this sector, is able to accommodate the resulting increase in demand.

The region is also rich in mineral deposits, of which several are currently at the project appraisal phase, with a large number of exploration projects that has grown significantly in recent years, and this more specifically related to lithium deposits.

Finally, the forestry sector is an export-oriented manufacturing industry, with many companies located in the southern part of the study area. Exploitation activities are expected to remain relatively low but stable due to numerous factors such as travel costs, difficult environmental conditions and existing regulations.

Construction is a very important and stable sector for the local economy in all communities in the region, and tends to grow in periods of high growth from the mining and electricity sectors, in terms of labour, equipment and materials. Housing development remains important in communities but small relative to the regional economy. Access roads prevent local housing economy to be integrated with regional projects. Cree workers, entrepreneurs and companies have a strong and proven record in the construction sector.

In particular, the Cree Construction and Development Corporation (CCDC) has a strong reputation in numerous fields such as civil engineering, roads, and buildings. However, the Eeyou Istchee territory is large and communities remain far apart and poorly served by the existing network. This severely limits economic integration, limiting the number of companies providing goods and services crucial for procurement for this industry, resulting in a large amount of financial capital leaving the region. Nevertheless, some important exceptions include Gestion ADC, which provides food services and logistics to many businesses operating in the region, Kepa Transport, which provides transportation services of goods, equipment and materials and Petronor, which specializes in the transport of petroleum products. Goods procurement for the communities of Whapmagoostui and Kuujjuarapik is coordinated by Fédération des coopératives du Nouveau-Québec.

The tourism sector in the study area is small but growing. For many years, Hydro-Québec's LG-1 and LG-2 power stations located near Chisasibi have attracted many visitors in the summer. Cree cultural tourism is a growing sector, with each community offering visitors a wide range of unique traditional activities to experience. Nevertheless, this sector continues to be limited due to the poor transportation network and the high price of flying up from the south.

TRAFFIC AND REVENUE FORECASTS

The demographic projections indicate that a sustained increase in local travel needs for both passenger and freight demand will be substantial over the next 20 years and beyond. The results of the Market Survey reveal that the medium-term development of several lithium-related mining sites within the study area, the intensity of passenger and freight transportation related to several Hydro-Québec installations as part of La Grande Complex would justify upgrading the transportation infrastructures.

Traffic forecasts tend to show that the freight traffic would amount realistically to a bracket between 600,000 and 900,000 Metric Tonnes Per Annum (MTPA). If the Duncan Lake major iron ore project came on line, potential traffic on the Billy-Diamond Highway along the Phase II corridor (Rupert-La-Grande) and the Phase I corridor (Matagami-Rupert River) will increase nearly ten-fold. Furthermore, such a large project would greatly affect the economics of the potential road (Phase I) and rail (Phase III) corridor northwards to Whapmagoostui/Kuujjuarapik, as well as the potential seaport in that community (Phase III).

Future traffic forecasts on the proposed infrastructure are subject to uncertainty and unpredictability, notably because of the difficulty to predict future international economic conditions. For sectors such as mining and, to a lesser extent, forestry, regional and national actors have little to no control over these conditions which tend to determine the financial feasibility of major projects. The feasibility of these projects are therefore both influenced by and can be an influence to the justification for infrastructure such as a railway or a deep-sea port in the region.

LA GRANDE ALLIANCE OPPORTUNITY

The demand for transportation can take the form of individuals' need to travel for school, work, leisure, or services. It also takes the form of businesses and companies offering services or goods in the region. Infrastructure improvements will likely stimulate activity and induce demand by increasing an area's attractiveness as well as improving connectivity between communities. This, in turn, induces investment that subsequently stimulates increased productivity.

The proposed infrastructures are an opportunity to position the Cree population by creating targeted programs to ensure the growing population has access to job opportunities these would create. These opportunities will originate firstly from the construction of the La Grande Alliance infrastructure and then from the induced construction projects associated with the augmented attractiveness of the area. Secondly, opportunities will be associated with the operations and maintenance of the infrastructure as well as the other induced developed activities. Lastly, benefits will come from secondary induced activities associated with the increased attractiveness of an area better serviced by an improved transportation network. Both employees and employers can develop highly skilled competencies through increased economic integration and hence a cumulative causation effect.

Hence, the La Grande Allianceprogram with its multiple components will not only address the current issues related to transportation such as decreased greenhouse gas emissions, improved road safety and accessibility as well as a reduction in transportation costs, but can also induce many latent opportunities for both the population living in the area and the companies offering goods and services. Clearly, the proposed La Grande Alliance program will increase the supply side of transportation to a great extent.

Although the evaluation of potential demand as part of this study was found to be weak relative to the foreseen costs of such infrastructure, La Grande Alliance the development could be seen as a strategic investment to position the Cree population in the management of their land and the resources they hold.

If a proposed infrastructure is approved to be developed, the key will no doubt be for it to be done in a manner that closely involves local communities, entities, entrepreneurs and companies, in conformity with the JBNQA, thus making the proposed infrastructures socially, economically, and culturally viable both during the construction and operation phases.

3 REPORT NO. 2 - SOCIO-ENVIRONMENTAL SURVEY

In addition to presenting a wide variety of social and environmental parameters that will influence the design as well as being potentially impacted by the project, La Grande Alliance Phases II and III Pre-Feasibility includes an *innovative approach* of engaging with the territory users prior to the technical design phase of the proposed infrastructures. This allows their input into the project as early as possible, whilst benefiting from their tremendous knowledge of the territory, its resources, and additional environmental considerations.

The purpose of the Socio-Environmental Survey is:

1. To initiate a sustained effort of communication, collaboration, engagement and responsiveness to the concerns and expectations of the population;
2. To document the existing social and environmental aspects that could influence, benefit and/or be impacted by the development of the proposed transportation infrastructures by:
   - Compiling and validating existing data with stakeholders through direct engagement with the Community Information Officers (CIOs). Information is systematically reviewed to evaluate both their veracity and relevance to the current context;
   - Identifying all areas for which there is currently insufficient data and published information to inform recommendations for additional site sampling campaign and future community engagement strategies.

These objectives need to specifically take into consideration protected areas on the territory (Figure 3-1).

The assessment of social acceptability is a fundamental objective of La Grande Alliance. Previous developments in the territory of Eeyou Istchee Bay James have all given rise to debates that have led to some divisions within or between Cree and Jamesian communities. That division has left its mark, both physically on the territory and emotionally in the collective memory of individuals and communities, as well as cumulative impacts that interact with each other at various scales. Before contemplating new projects, people are anxious to learn from the past, and to avoid past errors. It is this concern to do things differently that is sought in the framework of this study, the importance of documenting and considering the social, cultural, and historical context of the communities with regard to the developments envisaged in the framework of La Grande Alliance.

The notion of social acceptability must consider the idea that building consensus takes time, and is unlikely to be achieved. Rather, the goal must be a sustained effort of communication, collaboration, engagement and responsiveness to the concerns and expectations of the population. It requires privileging dialogue to build a relationship of trust and mutual respect between all stakeholders. The Community Information Officers (CIOs) of the Cree communities, the resource persons in each Jamesian municipality or locality, the study Liaison Officers, and the rest of the WSP/Maamuu consulting team are key to the assessment of social acceptability which, it should be noted, is in constant evolution.

The Pre-Feasibility Study is a preliminary stage and therefore represents a crucial opportunity to lay the foundations of this relationship, as well as a recognition that the population can influence the design decisions in a positive manner, through the process of sharing their local reality (needs, knowledge, opportunities, concerns, etc.).

WSP and its Liaison Officer implemented the following processes as part of the study:

- Sustained communication and coordination with Cree communities, via the CIO, as well as engagement in each Jamesian municipality or locality;
- Engagement that is politically neutral, impartial and transparent at all stages (e.g., data collection tools, data compilation, data analysis, data validation and sharing of results);
- Participation of local experts in discussions and integration of shared knowledge in the development of recommendations and measures, which in turn was shared with technical teams;

- Consideration and integration of concerns and expectations in the development of possible mitigation measures as well as modifications to proposed corridors;
- Communications between the client and stakeholders based on mechanisms of neutrality, impartiality and transparency throughout the studies, in plain and accessible language to meet public expectations of being informed and listened to without judgement;
- Validation and feedback on information shared and its incorporation into project design;
- Rigorous record keeping for all exchanges and incorporation of comments from Cree experts and CIOs in an effort to strengthen the relationship of trust with communities;

The methodology implemented by the WSP social team and the Liaison Officer consisted of a literature review and data collection with Cree and Jamesian residents of the region.

Regarding data collection with Cree communities, three subgroups were targeted:

- Cree land users (tallymen and other Cree experts) of the traplines located within the corridors under study;
- Specific groups or associations, both locally and regionally, such as the Elders' Council, the Youth Council and the Cree Trappers' Association;
- The general public.

In the Jamesian municipalities or localities, two subgroups were targeted:

- The public;
- Stakeholder groups and associations.

The WSP social team and the liaison officer implemented specific engagement and consultation activities for the different groups engaged. WSP would like to acknowledge and thank the outstanding collaboration of the CIOs who greatly contributed to the successful completion of engagement activities listed below, as well as the various Maamuu Cree associates mobilized in each of the Cree communities visited. Representatives of the Jamesian municipalities or localities also greatly contributed to the successful completion of engagement activities.

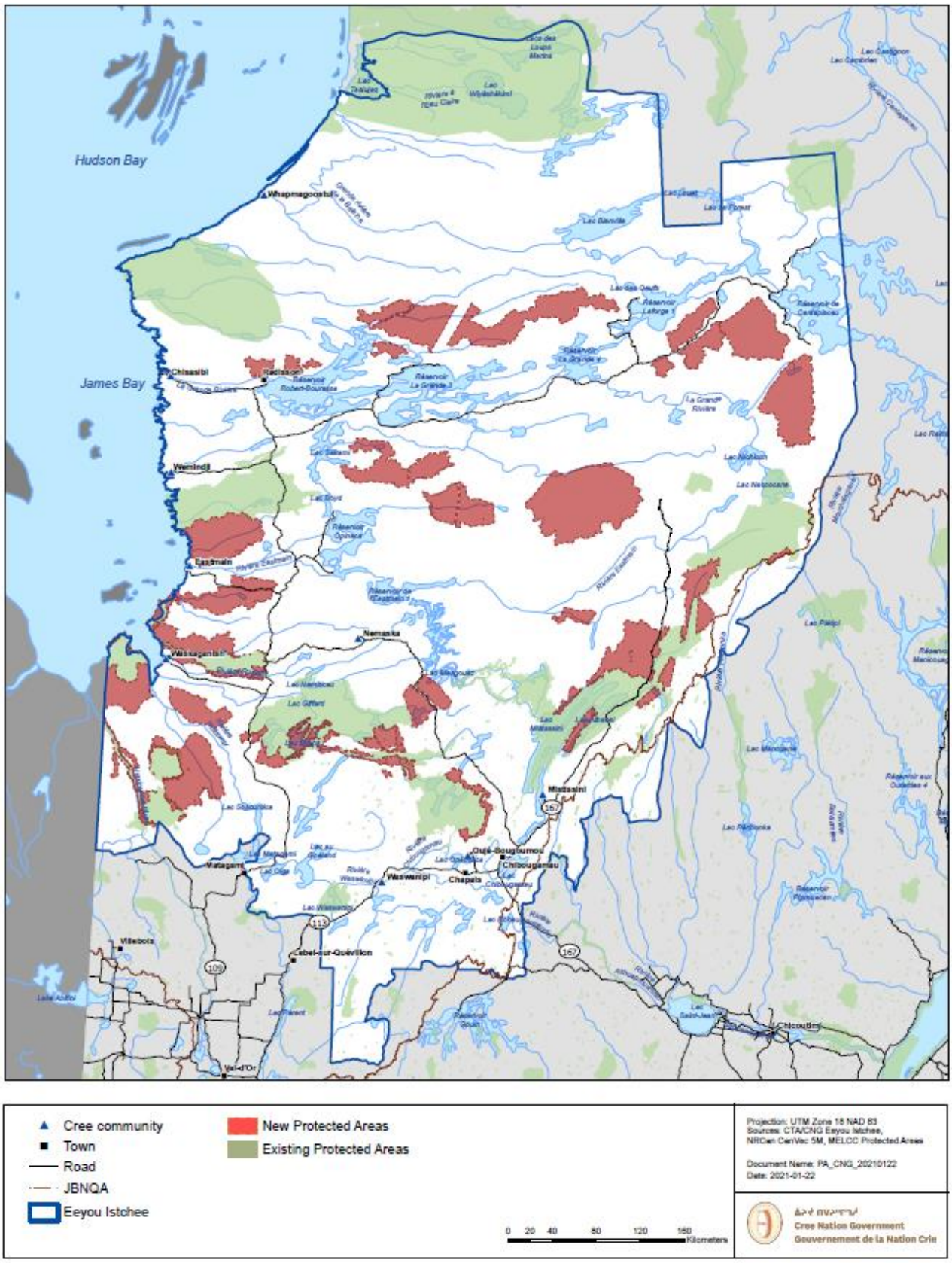

Figure 3-1 Protected areas

3.1 COMPARABLE PROJECTS

The objective of identifying comparable projects is to set up a database that will serve as a benchmark for the upcoming various project components that will be developed as part of this pre-feasibility study.

Comparable infrastructure projects were selected based on the similarity/relevance to those criteria:

- Design Parameters;
- Construction Cost and Financing;
- Operations and Maintenance;
- Impact on the Environment;
- Economic and Land Use Impact;
- Other.

The following sections are organized based on the three infrastructure types such as Road project, Railway project, and Port infrastructure project. The intention is to build the database including the following key elements:

- Availability of information;
- Project development and schedule;
- Elements of interest.

3.1.1 ROAD PROJECTS

A compiled a list of roads was developed based on already existing or under development projects that serve the northern isolated areas. Since the Grande Alliance Project already includes serving land users and existing communities, we have disregarded projects that are roads solely serving mining and forestry industries functional vehicle transportation needs.

Therefore, the retained projects are in Canada, on First Nations lands and meant to accommodate both passenger and commercial vehicles.

1. Inuvik to Tuktoyaktuk Highway;
2. Billy Diamond Highway Road Rehabilitation;
3. Route 167 Extension to the Otish Mountains.

3.1.2 RAILWAY PROJECTS

The retained projects are from a list of railways that already exist or are under development to serve the northern isolated areas serving mainly industrial needs:

1. Tshiuetin Rail Transport;
2. Quebec North Shore and Labrador Railway (Qns&L);
3. Arcelor Mittal Mining Railway;
4. Alaska – Alberta Railway.

3.1.3 PORT PROJECTS

We have compiled a list of facilities that already exist in different parts of the world (mainly in the North). Since it is also part of the pre-feasibility study to define the type of the future port facility, we have compiled a list of 29 projects that have different vocations to provide perspectives on the type and scope of facilities that can be developed within the framework of La Grande Alliance.

- Deception Bay Port (Northern Quebec)
- Voisey's Bay Mine Wharf (Newfoundland and Labrador)
- Milne Inlet Ore Dock (Nunavut)
- Steensby Bay (Proposed) (Nunavut)
- Yamal LNG (Sabetta Seaport, Russia)
- Arctic LNG 2 (2023) (Russia)
- Varandey (Russia)
- Ikerasaarsuk Wharf (Greenland)
- Hay River Wharf (Northwest Territories)
- Moraine Bay Wharf (Northwest Territories)
- Simpson Islands (Northwest Territories)
- Pond Inlet (Nunavut)
- Pangnirtung Wharf (Northwest Territories)
- Salluit (Proposed) (Nunavik)
- Port of Churchill (Manitoba)
- Port of Murmansk (Russia)
- Nuuk Port and Harbour (Greenland)
- Port of Ilulissat (Greenland)
- Pevek (Russia)
- Tiksi (Russia)
- Igarka (Russia)
- Dudinka (Russia)
- Seaport of Vitino (Russia)
- Port of Arkhangelsk (Russia)
- Novy Port (Russia)
- Port of Tuktoyaktuk (Proposed) (Northwest Territories)
- Iqaluit Port (2022) (Nunavut)
- Port of Kirkenes (Norway)
- Nanisivik Naval Facility (Nunavut)

3.2 LEGAL AND REGULATORY CONTEXT

The legal and regulatory context applicable to the territory of Phases II and III of La Grande Alliance proposed transportation infrastructure is defined by the James Bay and Northern Quebec Agreement (JBNQA) (sections 22 and 23), which specifies the environmental and social evaluation process, specifically to protect the environment as well as the natural resources culturally valued by the Cree and Inuit people, their societies, and communities in relation to development activities affecting the territory. The land regime is a determining element of land use. It provides for the division of the territory into Category I, II and III lands. The management of the State's domain in the James Bay territory stems from the application of the Agreement and determines the applicable regulations.

If the proposed infrastructures (all or separately) are deemed valuable by the communities, then the project would, in the next stage, be subject to the environmental assessment procedures set out in the provincial *Environment Quality Act* (EQA) and those set out in the federal *Impact Assessment Act* (IAA). In fact, the environmental and social impact assessment procedure responds to the premises of the JBNQA (sections 22 and 23) and the EQA at the provincial level, while the impact assessment process at the federal level responds to those of the EIA in terms of federal jurisdiction. Although the two procedures are similar, there are specific features to each.

In addition to the environmental assessment, provincial laws and regulations require authorizations and permits for the disturbance of wetlands and waterways, threatened or vulnerable species, wildlife habitats, work in State-owned forests or interventions in protected areas. Several of the applicable regulations also dictate the standards to be respected. The same applies to laws and regulations under federal jurisdiction. They apply to endangered species, fish and fish habitat, migratory birds, and the protection of the navigable character of water bodies or rivers.

The simultaneous application of federal and provincial environmental procedures in the territory of Eeyou Istchee - James Bay for transportation infrastructure projects complicates project planning and extends the time required for environmental impact assessment and permits procedures. In addition, the components are part of various territorial realities and involve the necessary participation and consideration of Cree, Inuit and non-Indigenous communities. In this regard, the design of the components must, from the outset, consider this diversity by respecting all territorial realities and minimize the loss of natural areas, wildlife and plant species, or fish habitat.

3.3 COLLECTED SOCIO-ENVIRONMENTAL DATA

To understand the various forms of land use in the vicinity of the transportation infrastructure proposed as part of Phases II and III of La Grande Alliance, engagement sessions were held with Cree land users for traplines found within a defined corridor around the various components, as well as group sessions with Jamesians[3]. In addition, a compilation of all titles and servitudes within the study area was completed.

Information presented herein highlights the results of documentary research and interviews, as well as other considerations and recommendations. It should be noted that some information compiled is not presented in this report, due to its sensitive nature (e.g. harvesting areas) or to protect the privacy of individuals (e.g. family camps). This information is subject to confidentiality agreements, which will be passed on to the Client, the Cree Development Corporation (CDC), to be used in future phases if this is deemed desirable. Furthermore, due to the short timelines of the study and the complexity required to finalize a Nation-to-Nation collaboration framework required by CDC, no engagement was conducted with Inuit communities yet. This remains an essential step to be carried out in future phases.

This specific approach of involving consultations with the territory users prior to the design phase is innovative. The objective is to feed the technical team with all the information gathered through this engagement process in order that the development of the proposed infrastructures alignment is done in respect with the territory (refer to Report 3). This innovative approach also includes to re-engage with Cree land users to collect and document their feedback on the proposed technical alignments (refer to Report 4).

The engagement exercise was completed within the study area. As shown on the Figure 3-2, the study area is located within the territory of the Eeyou Istchee Baie-James region of northern Québec.

The study area is divided in three zones:

- Study Area 1 (SA1): Billy-Diamond Highway Railway – Rupert – La Grande;
- Study Area 2 (SA2): Road & Rail Extension, and Harbour – La Grande – Whapmagoostui/Kuujjuarapik;
- Study Area 3 (SA3): Route 167 - Renard Mine – Trans-Taiga Road.

It is to be noted that these study areas are slightly different that the ones described in La Grande Alliance MOU, thus, to suit the proposed infrastructures scope.

[3] In addition to the Land Users, Cree and Jamesian stakeholders have also been met; please refer to appendices for detailed list.

3.3.1 OVERALL STUDY AREA - MAIN FINDINGS

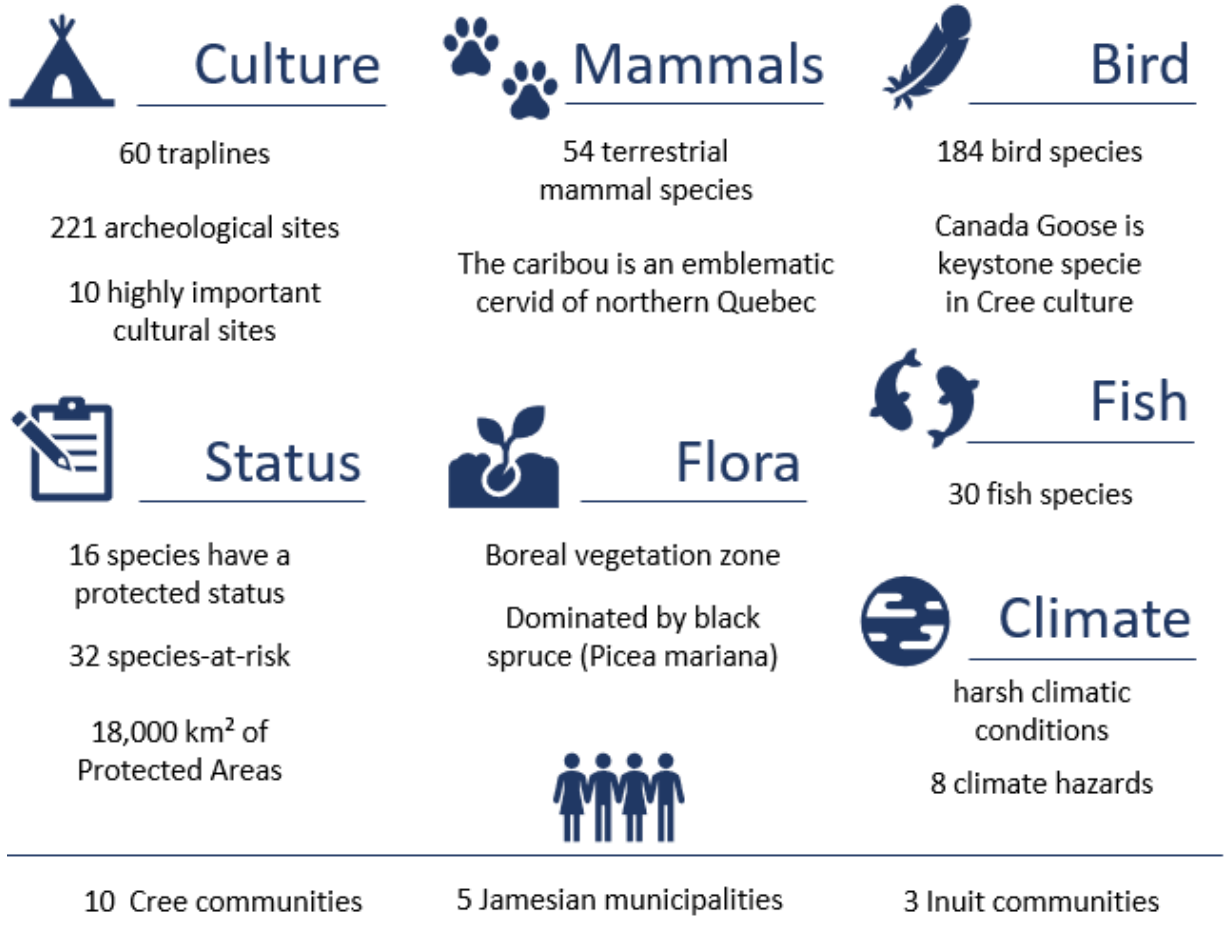

Figure 3-2 Phase II and III Overall Study Area Collected Data Results

3.3.2 SPECIFIC FINDINGS - STUDY AREA 1 (SA1)

This Study Area is composed of 33 traplines, namely eight traplines from Waskaganish, one from Nemaska, nine from Eastmain, ten from Wemindji and five from Chisasibi. Except for one trapline in Wemindj, all the tallymen (or main user of traplines) were interviewed. Within Study Area SA1, the Study Team recorded the following information:

- Category I and II lands cover nearly 30% of this area;
- This study Area zone 1 is located within La Grande River Low Hills Natural Province, which slopes gently towards James and Hudson Bays to the west (MERN, 2022a). It is characterized by an undulating plain;
- This area is included in the Superior Geological Province of the Canadian Shield (MERN, 2022b);
- A large part of the area is composed of undifferentiated organic sediments (26.04%), undifferentiated till and bedrock (17.74% and 16.54%), and littoral and prelittoral glaciomarine (14.44%). In addition, 13.93% of the area is covered by fine deep-water glaciomarine sediments;
- The entire area is covered with glacial markers and tapered forms developed during the last glaciation;

- This area is located within the Hudson Bay watershed and includes several large rivers (lakes water bodies are generally less abundant), the main ones being the westward-flowing Pontax, Eastmain and Beaver rivers (MERN, 2022e);
- This area has the highest diversity of freshwater fish species (27 confirmed or highly probable);
- Due to its more southerly location and the particularly high abundance of wetlands, often of considerable sizes , this area has the best potential for herpetofauna. Nine species of amphibians are potentially present, while only one species of reptile was found.
- Land use along the railroad corridor is extensive, particularly for spring and fall hunts;
- A total of five Protected Areas (three existing and two projected located in the Waskaganish, Eastmain and Wemindji traditional territories);
- Most of the three projected biodiversity reserves and eight territorial reserves for protected area purposes (RTFAP) are found in this study area SA1
- 85 occupation leases (40 vacation leases and two outfitting leases, located mostly in the northern part of the Study Area, on Chisasibi traplines);
- Almost 9000 mining claims distributed along the alignment, but mainly concentrated in the centre, around the Eastmain traditional territory;
- A total of 182 (93 main camps, 67 old camps, 18 secondary camps, three planned camps and one cultural camp);
- Large concentrations of camps on the shores of culturally significant lakes are located near the projected railway between km 282 and 296 of the Billy-Diamond Highway;
- Three large concentrations of camps on the shores of culturally significant lakes are located near the projected railway between km 282 and 296 of the Billy-Diamond Highway;
- Numerous goose and moose hunting areas; beaver streams and lodges; spawning and fishing sites, black bear and caribou (the Assinica, Nottaway and Reconnaissance herds - coordination with the Quebec governement's strategy regarding the caribou is required);
- Numerous water sources;
- Presence of Snowmobile trails;
- High value commercial mushroom harvesting sites.
- 35 heritage sites were identified out of which 28 have moderate to high value;
- Small Areas of Heritage Interest (AHI) have been defined, all are associated to Wemindji hunting territories;

This area is the foreseen location for the proposed 340 km railway infrastructures Rupert to La Grande. We also documented the Cree land users concerns and comments that were raised during interviews such as that the proposed railway infrastructure could potentially:

- Facilitate access to land use by non-Natives and would be of little benefit to the Crees themselves in terms of traditional activities;
- Increased pollution, dust and noise from construction of the railway and operations of the train;
- Have impacts on wildlife and Cree harvesting activities;
- Have impacts on Cree camps;

3.3.3 SPECIFIC FINDINGS - STUDY AREA 2 (SA2)

This Study Area is composed of 19 traplines, 11 from Chisasibi and eight from Whapmagoostui. All trapline representatives, except one from Chisasibi were met. It should be noted that the overall understanding of the study among land users was minimal, such that it took a good amount of time to brief participants on the objectives and desired outcomes prior to collecting information. Within Study area 2, the Study Team recorded the following information:

- Category I and II lands cover nearly 65% of this area;
- This Study Area zone (SA2) is the further north portion of the Study area, north way of the Hydro-Québec power stations up to the communities of Whapmagoostui and Kuujjuarapik, located at the mouth of the Great Whale River on Hudson Bay;
- This area is located within the Hudson Bay watershed and included in the 173,000 km Grande Riviere Low Hills Natural Province2 (MERN, 2022a). It is characterized by a platform that slopes gently towards James and Hudson Bays to the west. The relief forms an undulating plain whose topography is mainly controlled by the abundant bedrock outcrops;
- This area is mainly characterized by undifferentiated bedrock, which covers 36.01% of the territory). In fact, bedrock outcrops almost everywhere in the study area. Undifferentiated till covers 31.65% of the study area and is uniformly distributed throughout the sector;
- Several landforms mark the deglaciation of this study area. The most important of these is the Sakami Moraine, which forms an arc stretching approximately 630 km from Lake Mistassini to Kuujjuarapik (Hardy, 1982);
- Several lake and river systems running east-west are also crossed by the study transect. The main bodies of water covering the sector are the Robert-Bourassa reservoir located at the southern limit of the area and Lake Julian, Craven Lake and Roggan Lake, which are mainly located in the center of the area (MERN, 2022e).
- Wetlands are scattered throughout the study area
- The east coast of the Hudson Bay is generally exposed to waves, wind and ice, and the substrate is mainly coarse sand.
- Hudson Bay is an oligotrophic inland sea with low nutritive salts.
- Hudson Bay area is of particular interest for rare or endangered plant species because of its characteristics (calcareous soils, maritime influence, shores, unstable rocky hills)
- Coastal vegetation is dominated by minerotrophic bogs (50%), while salt marshes and eelgrass beds are more frequent and larger in the Manitounuk Sound area;
- At this time, there are no marine invasive species documented in the study area;
- This study area SA2 has a high diversity of fish species (26 are marine and 21 are freshwater species);
- River estuaries are important for diadromous fish and belugas.
- Polar bears are also present in this area (on the Hudson Bay ice durinh winter and along the coast during summer);

- The largest number of bird species (159 species) was found in this area, likely due to the presence of marine species in this area reaching Hudson Bay. It is also the only area that has an Important Bird Areas (IBAs)
- Because no transportation infrastructure was ever developed in most of this area, interviews identified with land users the presence of Highly Sensitive Areas (HSA) on their traplines. These areas are particularly sensitive to environmental impacts, according to participants, and therefore should be avoided as much as possible when developing the corridor alignment;
  - A total of eighteen HAS were identified within that area
- Two "Territorial Reserves for Protected Area Purposes"[4] (Chisasibi and Whapmagoostui community territories);
- There are no federal Marine Protected Areas
- High level of activities pursued at the mouth of the Great Whale River including goose hunting in the northern area;
- The Hudson Bay near the community of Whapmagoostui is also intensively used for hunting, fishing, and recreational activities by community members;
- 25 leases, mostly for commercial purposes and residences near Radisson as well as one outfitting lease;
- Relatively few mining claims were found;
- Nunavik Inuit Marine Land Claim area with a Protected Area representing an Ecological Interest Zone;
- A total of 49 camps (28 main camps, 10 old camps, seven secondary camps, one planned camp and one cultural camp);
- Three large concentrations of Cree camps and one area planned for future concentration of camps were identified. One such concentration is located along the Hudson Bay and counts Cree camp and non-Cree camps, notably Inuit camps;
- Soil instability, leading to increased landslides as a result of climate change becoming increasingly hazardous;
- Numerous fishing and hunting areas were identified as HSAs along the Hudson Bay shoreline;
- Presence of navigation routes and snowmobile trails;
- Goose, caribou, bear and beaver hunting areas;
- Important caribou migration corridors and porcupine habitat.
- This area is heritage-rich, with 102 heritage sites identified out of which 87 have moderate to high heritage value;
- Six Areas of Heritage Interest (AHI), one within the Chisasibi territory and five in Whapmagoostui territory which are particularly sensitive;
- A total of 1,422 zones of archaeological potential has been identified within the planned road corridor. This area bears considerable interest regarding Indigenous occupation, with the Crees and their ancestors living throughout the study area, and the Inuit and Paleoinuit living at the northern end.

This area is the foreseen location for the proposed 219 km extension of the railway infrastructures from La Grande, the 207 roadway infrastructures extension as well from La Grande and a deep-water port along the Kuujjuarapik coastline (which was then redefined to a seasonal harbour). We also documented the Cree land users concerns and comments that were raised during interviews such as that the proposed infrastructures could potentially:

- Open the territory caused by the proposed transportation corridor;
- Increase pollution, dust and noise from construction of the railway and operations of the train;
- Have impacts on wildlife and Cree harvesting activities;
- Further aggravate the soil instability;

[4] Territories that have received specific recognition while awaiting legal protected status to be assigned to them. Their priority objective is the conservation of nature (MELCFP, 2022).

- Limit interest in the rail project for land users, resulting in a high level of resistance to accommodate this corridor in the vicinity of existing land use areas;
- Have impacts of the construction of the harbour on wildlife, most notably fish and birds;
- Increase economic opportunities related to tourism development with the harbour;
- Have impacts on Cree camps;
- Discussions included any potential road alignments passing through the LG-1 dam and spillway. Interviews confirmed that land users were very resistant to the idea of a road crossing their land and opening up this area, namely due to a high concentration of HSAs as well as a large protected area further north;
- The proposed road infrastructure tended to be more favourably received and considered more useful than the railroad. The overall familiarity among interviewees of rail was low relative to roads;
- Availability of passenger rail service for land users as a means to build broader social acceptance;
- A northern harbour location seems to be the most appropriate for most land users, although several community members practice goose hunting in the area, such that this impact will require appropriate mitigation.

3.3.4 SPECIFIC FINDINGS - STUDY AREA 3 (SA3)

This Study Area SA3 is composed of 12 traplines, namely 11 traplines from Mistissini and one trapline from Chisasibi. Interviews were conducted with all tallymen. Within Study area SA3, the Study Team recorded the following information:

- Category I and II lands are absent in this area;
- This study Area is included in the natural province of the Central Plateau of Northern Quebec, which covers an area of 159,000 km2 and forms a high plateau sloping to the north and west (MERN, 2022d);
- The area is characterized by a platform punctuated by hills (Topographic Map, 2022);
- This area is included in the Superior Geological Province of the Canadian Shield (MERN, 2022b);
- Most of this area is composed of glacial sediments, i.e., undifferentiated till (84.78%);
- The entire study area is included in the level 1 catchment area of La Grande River and includes numerous watercourses and water bodies evenly distributed over the study area. This area is largely devoid of large rivers except for the upstream portion of La Grande River that flows through it. However, lakes are abundant throughout the area.
- This area has the lowest diversity of freshwater fish species (19 species);
- Because no transportation infrastructure was ever developed in the northern part of this area, interviews identified with land users the presence of Highly Sensitive Areas (HSA) on their traplines. These areas are particularly sensitive to environmental impacts, according to participants, and therefore should be avoided as much as possible when developing the corridor alignment;
  - A total of 6 HAS were identified within that area
- Three Protected Areas have been identified
- Few leases related to the Stornoway mine and two (2) outfitting leases.
- Several mining claims are located in the Study Area, mainly in the areas of Stornoway Mine and Delmas Lake
- A total of 36 camps (17 old camps, 13 main camps, three planned camps, one secondary camp and two other not categorized camps)
- Presence of navigation routes and snowmobile trails
- Numerous hunting areas; moose habitat and both woodland and migratory caribou (the Caniapiscau, Témiscamie and Reconnaissance herds - coordination with the Quebec governement's strategy regarding the caribou is required);

- Six heritage sites were identified on Chisasibi hunting grounds. They are limited to its north-western corner, on lac des Voeux, 6 km north of the Trans-Taiga Road;
- No Areas of Heritage Interest (AHI) was identified;

This area is the foreseen location for the proposed 204 km existing Route 167 upgrade and the 172km road extension from the Stornoway Renard Mine access road to the Trans-Taiga. We also documented the Cree land users concerns and comments that were raised during interviews towards the proposed infrastructure:

- Users are generally supportive of the potential extension project, mainly due to the ease of access to their territory that the road would provide
- Potential impacts to wildlife: the presence of caribou herds and habitat (both woodland and migratory) as well as moose habitat
- Potential impacts to Cree camps
- Potential impacts to existing land use, in particular along existing road to the Renard Mine.
- Potential impact to moose hunting areas
- Potential disturbance to existing navigation routes and snowmobile trails.

3.4 IMPACTS ON THE COMMUNITIES IN STUDY AREA

The Study includes to identify the various impacts that La Grande Alliance proposed infrastructures could have on the Cree or Jamesian communities, other than those related to land use, which are addressed in Techincal Note 3. It addresses noise, water quality, air quality, health and social, employment and waste management impacts.

Construction activities will possibly be perceptible from a great distance depending on the topography and the presence of waterways having an influence on the sound propagation. During the operational period, the noise levels will vary greatly with the passage of vehicles and trains. The main sensitive areas identified regarding noise impacts are the communities of Kuujjuarapik/Whapmagoostui and Radisson. However, dwellings, camps, and other sensitive receptors will have to be further identified once the alignment and the construction and operation activities under study are defined.

The quality of drinking water could also be affected by the proposed infrastructures. All nine Cree communities in Eeyou Istchee - James Bay have drinking water systems. Pollutants associated with the construction and operation activities of roads and railways are primarily fine particles and other substances capable of affecting water turbidity. The potential for the quality of water bodies used as a source of drinking water to be affected is influenced by the distance between the activity site (including the operating roads) and a water body. Good construction practices and design techniques can mitigate or avoid these impacts.

Air quality would be affected in some areas due to the various air pollutants emitted during the construction and operation phases of the proposed infrastructures. Motorized machinery (land, marine or rail), the use of explosives, and traffic on unpaved roads are sources of air emissions that are likely to alter air quality over time. The storage and handling of petroleum products can also be a source of volatile organic compound emissions. GHGs and global warming potentials (GWPs) are also considered in this assessment.

The health and social component could otherwise be affected by La Grande Alliance infrastructures. The literature on comparable infrastructures has identified nine impact categories, with both positive and negative effects for the Crees and Jamesians. Among these are opening of the territory and increased mobility, destabilization of local traditions and culture, and tensions in social and family relations. Actions or follow-ups related to these impacts in order to mitigate, avoid or improve them have been identified. The engagement sessions carried out in Cree and Jamesian communities, within the framework of La Grande Alliance study, have made it possible to complete this table, both for the anticipated impacts and the actions or follow-ups to be considered.

La Grande Alliance infrastructures are also likely to lead to job or contract opportunities for the Crees. However, in order to maximize the benefits, a preliminary effort must be made to provide adequate training, in particular through the creation of a training committee involving local organizations.

Finally, as these proposed infrastructures would generate significant residual waste in a northern context, optimal management is recommended, such as integrating waste management considerations at the design stage through eco-design practices; appointing a waste management manager responsible for results to ensure that objectives are met, and installing clearly identified containers for the different types of waste generated on site. In fact, the waste management hierarchy, the waste segregation, the Envision certification and the leading practices will reduce the impact of waste on the land.

3.5 CLIMATE CHANGE

La Grande Alliance Study Area lies within a subarctic environment, which is rugged, forested, and glaciated (WWF, 2022; Agriculture and Agri-food Canada, 1995). The study area has:

- Cold winters and cool summers, which are projected to increase in temperatures;
- Sporadic permafrost that are projected to degrade due to increasing temperatures and liquid precipitation regimes;
- Moderately dry conditions, which are projected to become wetter with increases in extreme precipitation events;
- Substantial snow accumulation, which is projected to remain relatively unchanged in the near future;
- Days with freezing rain, which are projected to nearly double;
- High wind gusts and sustained wind velocities, which are projected to nearly triple in some cases;
- A moderate number of fire spread days (i.e., days when weather conditions are favorable to the spread of wildfires), which are projected to increase up to three days per year in the more northern Eastern Subarctic zone of the study area;
- Riverine flooding, which requires further characterization but may potentially increase in the future;
- Coastal flooding, which is a short-term consideration but projected to ultimately decrease in the future due to land uplift.

These 8 climate hazards have the potential to interact with La Grande Alliance proposed infrastructures and should be further studied. Three data gaps are identified (linked to riverine flooding, geotechnical knowledge, permafrost distribution and melt, and wind). In addition to remedying the data gaps, proposed next steps include a climate resilience assessment following the applicable provincial laws, while being aligned with ISO 31000 and ISO 14091 standards for risk management and climate change adaptation to better quantify the level of risk for each climate-infrastructure interaction.

1. Extreme Cold
2. Extreme Precipitation
3. Freezing Rain
4. Land Instability
5. High Winds
6. Wildfires
7. Riverine Flooding
8. Coastal Flooding

4 REPORT NO. 3 - TECHNICAL SURVEY

The objective of Report 3 is to assess the technical feasibility of the proposed infrastructure applying a concept engineering design based on applicable laws, regulations, technical parameters and specific parameters designed at the outset by the client in the spirit of the overall approach of La Grande Alliance studies, outlined in the introductory sections of this report. Most notably, the concept design must fully consider significant socio-environmental data, compiled in Report 2, including knowledge and perspectives gathered directly from Cree land users engaged prior to the design stage.

It is important to note that an important proportion of the infrastructures proposed in Phases II and III are planned in undeveloped areas. For these areas, we have identified additional processes to limit environmental impacts, with a view of accounting for the sensitivity of planning new corridors in previously inaccessible areas (and entire regions), in line with the main sustainable development objectives of the overall program. Thus, for these areas the goal of the Pre-Feasibility Study is to identify and propose alignments that present the least risk.

Based on our results, we have determined that it is possible to develop the proposed transportation infrastructures in a manner that co-exists with and respects community concerns and traditional activities, such that achieving social acceptability is possible.

Below is the summary of the proposed phase II and III La Grande Alliance infrastructures components (refer to Figure 4-1 for concept alignments).

Table 4-1 La Grande Alliance's Phase II and III Infrastructures Summary Description

PHASE II & III INFRASTRUCTURE		SCHEDULE	SCOPE	COST ESTIMATE		COST RANGE
Route 167	Upgrading MTQ section from Mistissini to km 411	2035-2040	106 km	$271M	$1,053M	$1.5M-$2.5M per km
	Maintaining MTQ unpaved section from km 411 to km 553		141 km	-		
	Upgrading Mine road from km 553 to Stornoway Renard mine		97 km	$100M		
	Extension Stornoway Renard mine to Trans-Taiga Road		172 km	$685M		
Roadway: La Grande to Whapmagoostui/Kuujjuarapik		2035-2040	207 km	$1,428M		$6M to $8M per km
Railway: Rupert to La Grande		2035-2040	340 km	$3,958M		$10M to $14M per km
Railway: La Grande to Whapmagoostui/Kuujjuarapik		2040-2045	219 km	$4,899M		$20M to $25M per km
Harbour at Whapmagoostui/Kuujjuarapik		2040-2045	20 vessels	$57M		-

Note 1: To simplify the presentation, each item amount has been rounded

Note 2: Class D Estimate -20% to +100% margin of error.

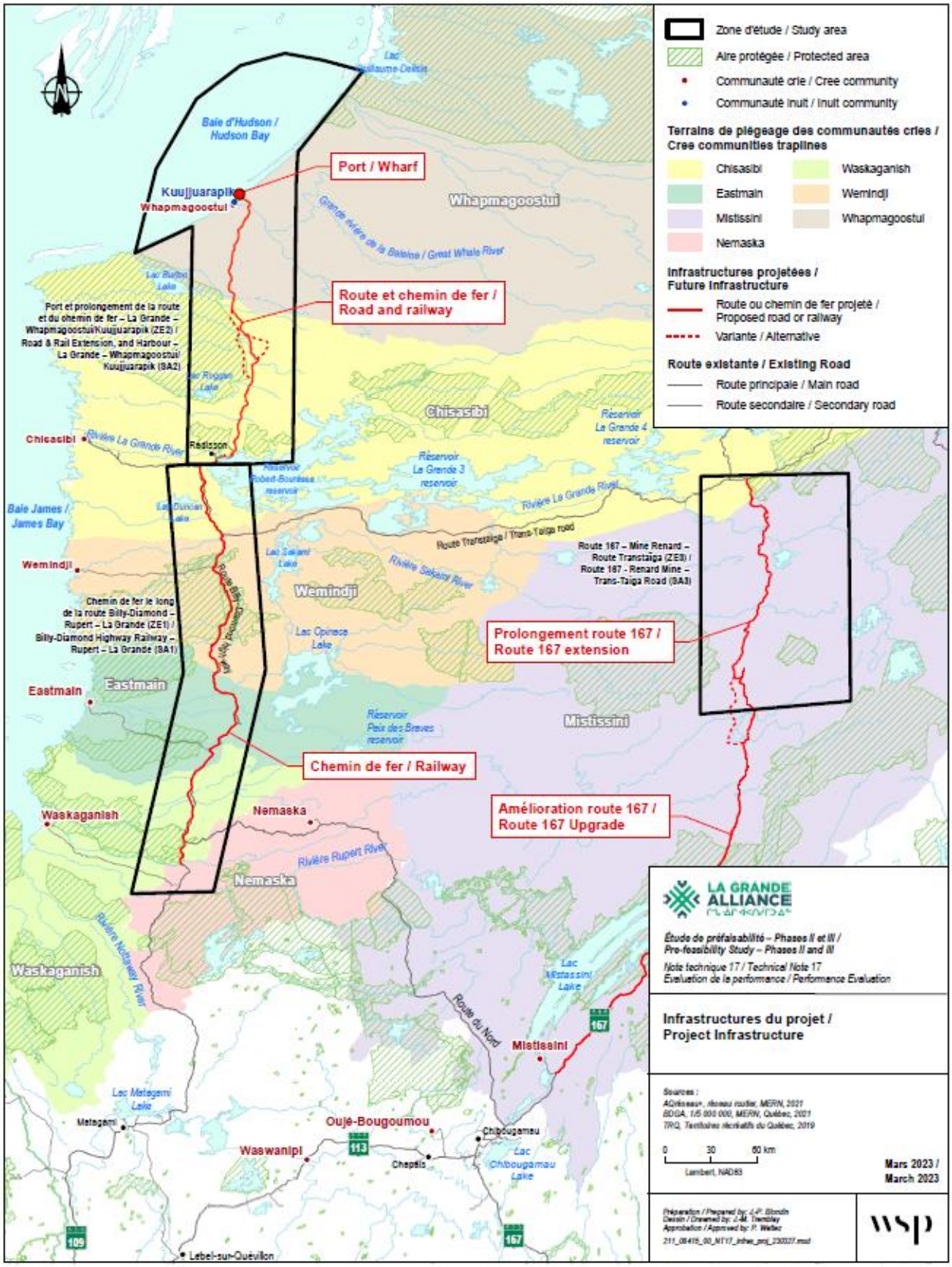

Figure 4-1 Map of La Grande Alliance Phases II and III Proposed Infrastructures

The design of any linear infrastructure is an iterative process to maximize the opportunities for improvement as more detailed information becomes available with the project development. Therefore, the alignments presented at the Pre-Feasibility stage is somewhat limited by to the accuracy of information available at the time, as the collection of field data shall be carried out at future stages. Nevertheless, the various alignments presented in this report should be considered as potential corridors that require further optimization in the future.

While it is recognized that building new corridors in previously inaccessible areas in the north needs to be done with extreme care for the environment and those who still practice traditional activities in these areas, not to mention the uncertainty created by climate change and the potential social impacts of opening up the territory, we have nevertheless determined that it is possible to develop the proposed transportation infrastructures in a manner consistent with sustainable development.

4.1 DESIGN CRITERIA

The identification and selection of Design Criteria is a prerequisite task to the technical development of any alignment in plan, and then in profile..

4.1.1 TECHNICAL ROADWAY DESIGN STANDARD

The roadway infrastructures under study present important challenges, as they cross a vast territory with a high number of lakes and rivers as well as the presence of permafrost in many areas. The following general design parameters were utilized by the technical team:

- The MTQ road design standard cross section and details as per Regional Collector Roads described in *Tome 1 - Conception routière Ministère des Transports du Québec, Edition June 2021* (Volume 1 - Road design Quebec Ministry of Transport, Edition June 2021) is recommended. More specifically, the proposed cross-section is a modified type E;
- The MTQ road and bridge design standards and CSA-S6-19 regulations and criteria for all required civil structures.
- It is strongly recommended to define the user-payer structure for both construction and operations (e.g., private vs. Cree-Quebec joint agreement) as this will have a direct impact on the financial analysis.

4.1.2 TECHNICAL RAILWAY DESIGN STANDARD

Design Criteria used for the Phases II/III railway alignment was the same as that used for the Phase I rail concept design, deemed appropriate for the anticipated “Heavy Rail” nature component. Table 4-2 below summarizes the principal railway Design Criteria used.

The railway in the Eeyou Istchee – Baie-James territory presents several challenges, as it crosses a territory with a strong presence of permafrost as well as several lakes and rivers. The railway platform must therefore be adapted to the ground conditions. At this stage of Pre-Feasibility, no typical section was specifically developed. The track infrastructure section and material used for this study are in the standard plan TS 2204 and TS 2205 of the Canadian National. In subsequent phases of the project, the proponent will need to verify the applicability of this section and its detailed components.

It is strongly recommended to define the ownership structure for both construction and operations (e.g., private vs. Cree-Quebec joint ownership; leased, contracted out or stand-alone/fully self-staffed entity) as this will have a direct impact on the financial analysis.

Table 4-2 Principal Railway Design Criteria – Railway Mainline

DESIGN CRITERIA	VALUE
Design Speed	80 mph passenger, 60 mph freight
Axle Loads	Locomotives 32.4 tonnes per axle Wagons 286 000 lbs: 30 tonnes per axle
Minimum Horizontal Curve Radius	1150 m or 800 m with speed restriction
Maximum Gradient	1.5% (compensated), 2.0% (over maximum length of 500 m)
Rail	136 lb RE
Rail Joints	Welded into Continuous Welded Rail (CWR)
Ties	Hardwood
Fasteners	Elastic Fasteners
Ballast Depth Under Tie	300 mm Minimum
Bridge Design Load	AREMA E90 Cooper

4.1.3 TECHNICAL HARBOUR DESIGN STANDARD

Because current market survey and cargo forecast study results show that expected demand in the near and intermediate future is not sufficient to sustain a deep-water port investment, the study team has developed a conceptual design of a "Small Craft Harbour" (herein referred to as a Harbour) that would immediately answer community needs, accommodating fishing vessels and transporting goods from sealift vessels to the shore, but which could be scaled up to a "Deep-Water Port" at the same location in the future should conditions change. As such, the following design standards were applied for this infrastructure:

- "Harbour Accommodations Guidelines for Small Craft Harbours Branch Fisheries and Oceans Canada" by Public Works and Government Services Canada, 2015, herein referred to as the "Canadian SCH Design Guideline," was used as the primary standard/guideline for developing the harbour conceptual design.
- The proposed design life of the harbour facility is 20 years for the floats and 50 years for the breakwaters;
- US Army Corps of Engineers, "Coastal Engineering Manual", 2002;
- Unified Facilities Criteria (UFC), "Small Craft Berthing Facilities", 2009;
- The following vessels (Table 4-3) are used for the design based on obtained information from the region and Canadian SCH Design Guideline. The "Barge" listed in Table 4-3 will be used for transportation of the goods and commodities from Sealift vessels to shore and its dimensions has been scaled using available pictures.

Table 4-3 Design Vessels

TYPE	REGION	FISHERY	TYPICAL VESSEL WIDTH	TYPICAL VESSEL LENGTH	VESSEL DRAFT (Assumed based on external data)
Fishery Boats	Central & Arctic	Gill Net – Western	2.4 m	6.7 m Skiffs	1.2 m
Barge	-	-	7 m	20 m	<1.2 m

4.1.4 LA GRANDE ALLIANCE INNOVATIVE APPROACH

Additional to applicable laws, regulations and technical parameters, specific parameters were designed at the outset by the client for La Grande Alliance studies, outlined in the introductory sections of this report. Most notably, the concept design must fully consider significant socio-environmental data, compiled in Report 2 prior to the design stage, including knowledge and perspectives gathered directly from Cree land users engaged.

The list below details the constraints imposed on the design approach:

- Respect, as much as possible, the natural site topography (mountains and plains);
- Consider the overall geology of the study area, including the locations of aggregate material deposits;
- Avoid, as much as possible, lakes and rivers; minimize the length of crossings and bridges where these are unavoidable.
- Avoid, as much as possible, existing and projected Protected Areas; minimize encroachment and/or provide mitigation measures where these are unavoidable.
- Minimize crossing and impacts on caribou migration corridors.
- Avoid, as much as possible, areas of cultural significance such as areas currently used by Cree land users, archeological sites, etc.; minimize encroachment and/or provide mitigation measures where these are unavoidable.
- Propose, wherever applicable, alignment variants that could offer added value, such as:
  - Locations that minimize environmental footprint;
  - Locations that minimize construction cost;
  - Locations that minimize the impacts on existing camps and facilities;
- Railway alignments to remain, as much as possible, in close proximity to the Billy-Diamond Highway and the feasibility road alignment proposed for Phase III ;
- Railway alignments to remain within 1 km corridor centered on the Billy-Diamond Highway and the feasibility road alignment proposed for Phase III when surrounded by recognized Protected Areas on both sides;
- Minimize the number of times the proposed railway alignment crosses the BDH and the feasibility road alignment proposed for Phase III

4.2 RAILWAY: RUPERT TO LA GRANDE (STUDY AREA 1)

As illustrated on the Figure 4-2 below, the Phase II pre-feasibility railway alignment developed is located within the study area 1 (SA1) of the Study area.

The proposed alignment was developed based on the design criteria listed in section 4.1. It begins just west of the Rupert River bridge, as a continuation of the Phase I railway alignment, and ends at approximately 3 km south of the La Grande River. The overall length of the Phase II alignment is 340.3 km, and its sinuous nature reflects the many lakes and the varied topography crossed.

As requested, to minimize the environmental impacts, the railway alignment generally follows the Billy-Diamond Highway (approximately 70% of the total length). This remaining 30% located at a distance greater than 100 metres from the studied road is due mainly to the railway design criteria that is unable follow the existing highway curves and to respect as much as possible any socio-environmental constraints compiled in Report 2.

A total of 47.7 km were designed with reduced speed of 65 mph for passenger trains to allow the alignment to be closer to the BDH and to avoid waterways. This represents 14% of the railway's total length.

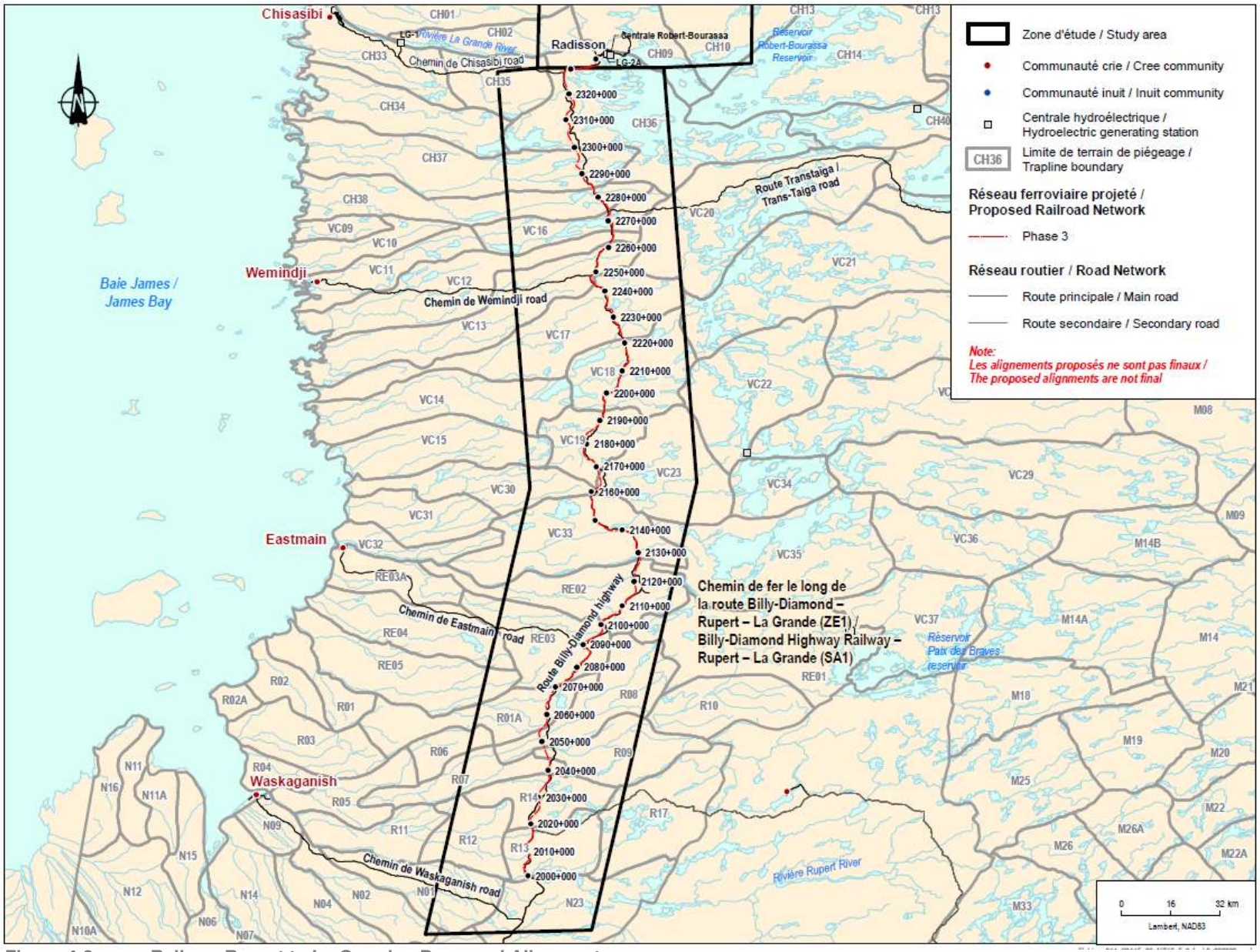

Figure 4-2 Railway Rupert to La Grande - Proposed Alignment

4.2.1 DESCRIPTION

The Phase II railway is broken down into segments for which more detailed information is provided with station information in Table 4-4 below (see introductory section for explanation on station). Please note that the Phase II alignment has its independent stationing from Phases I and III alignments, it starts at km 2000+000 and ends atkm 2339+000. Billy-Diamond highway stations are also provided for reference.

Table 4-4 Phase II - Railway Rupert to La Grande - Detailed Planned Work in this Study

KM 2000+000 to KM 2060+000 (BDH km 258 to km 320)
– Impacted traplines: R13, R14, R07, R09, R08 and R01A. – Generally follows to the BDH, but certain stretches, such as between km 2044 and km 2056 run one to three kilometres away from the BDH; – There is existing or proposed Protected Areas to the west side that area avoided; – Two notable river crossings occur in this segment: the Pontax River is crossed near km 2048, and the Enistuwach River is crossed at km 2051.5.
KM 2060+000 to KM 2120+000 (BDH km 320 to km 384)
– Impacted traplines: R01A, RE03, RE02. – Generally follows the BDH – According to available mapping, there are no existing or proposed Protected Areas in this segment – There are no major river crossings in this segment
KM 2120+000 to KM 2180+000 (BDH km 384 to km 449)
– Impacted traplines: RE02, VC33, VC30, VC23 and VC19. – Generally follows the Billy-Diamond Highway but certain stretches such as between km 2159 and km 2169, a 10 km segment, run one to three kilometres west from the Billy-Diamond Highway.According to available mapping, there are no existing or proposed Protected Areas in this segment – There are two notable river crossings (Eastmain River and Opinaca River). Considering the width of the Eastmain River at the planned crossing, an significant arch bridge may be considered for this site. Note that the proposed railway bridge at Eastmain River is located to the east of the roadway bridge and the proposed railway bridge at Opinaca River is located to the west of the roadway bridge.
KM 2180+000 to KM 2240+000 (BDH km 449 to km 511)
– Impacted traplines: VC19, VC18 and VC17. – Generally follows the BDH – There are existing or proposed protected areas to the east and west of the railway alignment over most of this segment: starting at km 2189, these areas extend on the west side from this point to beyond the end of this segment, and on the east side to km 2232. As such, these areas extend over 51 kilometres of this 60 km segment. – There are no major river crossings in this segment. However, 735 metres of track are proposed to be on bridges due to the presence of many small rivers and the topography.
KM 2240+000 to KM 2300+000 (BDH km 511 to km 571)
– Impacted traplines: VC17, VC13, VC12, VC16, VC06/CH38 and VC05/CH37. – Generally follows the BDH – The protected areas west of the railway alignment encountered for most of the previous segment extend into this segment until km 2256 (16 km) while east of the alignment, a protected area extends from km 2251 to km 2257 (6 km). – Two waterways are crossed in this segment: the Yasinki lake is crossed near km 2271, and the Ekomiak lake is crossed near km 2282.

KM 2300+000 to KM 2340+300 (BDH km 571 to km 614)
– Impacted traplines: VC04/CH36. – Generally close to the BDH until the Phase II termination point at approximately 3 km south of La Grande River – There are no existing or proposed Protected Areas in this segment – There are no major river crossings in this segment, but one major bridge is proposed due to important valleys.
Level Crossings
– There 23 level crossings on this proposed railway either with the BDH, Route du Nord or unpaved access roads – The projected daily traffic flow on each of the proposed road and railway are not sufficient to require barriers at crossings. However, based on the anticipated road and railway speeds, lights and bells will be minimally required. Therefore, each crossing will require electric power.
Power lines Crossings
– A few power lines are present along the proposed alignment. Out of the 16 crossing, most are in its northern section. Crossings with power lines will require investigation early in the detailed design for height clearance and potential pylon conflict.
Passenger Stations
– In coordination with Phase I traffic study, three potential passenger stations were identified between Rupert and La Grande: Eastmain, Wemindji, La-Grande. – Their characteristics are not yet defined but since passengers per trip is estimated to be low, the proposed stations are currently considered to be minimalist, i.e., mainly composed of a platform adjacent to main railway track for passenger boarding, a small building, and a parking lot.
Civil structures
– This proposed alignment requires 36 bridges, ten stream Culvert (over 4.5m in diameter) and 680 drainage culverts (less than 4.5m in diameter) – There are three major bridge: Eastmain River at km 2128+100 (480m long), Opinaca River at km 2144+600 (500m long) and Vieux Comptoir River at km 2195+400 (600m long)

GEOTECHNICAL

The soil types within a one-kilometre corridor on each side of the railway alignment are presented in Table 4-5. The high percentage of organic and clay soils does represent a challenge for the construction (very low to low geotechnical resistance, susceptibility to freezing, long-term settlements and need in excavation of large slopes). However, the southern portion and the northern end of the study area have a good potential for borrow pits to help for the required granular material supply.

Table 4-5 Type of Soils – Study Area SA1

TYPES OF SOIL	% OF RAILWAY CORRIDOR ON THIS TYPE OF SOIL
Organic soils	26%
Silt and clay	15%
Sand and gravel	28%
Till	16%
Rock	15%

ANTICIPATED SCHEDULE

Among the major factors that will impact the schedule, the procurement mode selection to award the various contracts to execute the work is critical. However, since the project is such at an early stage, procurement analysis decisions are not yet available. We therefore considered a conservative approach based on a traditional delivery mode for this preliminary review. The selected implementation and procurement option could significantly influence the total delay as well as the scheduling/overlapping of some of the activities related to the realization of a project.

To achieve this objective, we recommend dividing the construction of the railway infrastructure platform into four (4) separate construction lots covering an approximate length of 85 km to be completed over four (4) construction seasons, i.e. 2035 to 2038. The railway infrastructure platform work could be done with general contractors not specialized in railway track. The railway's specific materials are long delivery items that could take up to 3 years, so procurement should be planned accordingly.

The timeline herein is realistic but remains theoretical as many contingencies, real or imagined, cannot be considered at such an early stage in the evaluation due to such a high level of uncertainty. Appropriate risk and sensitivity analyses will be required at future phases to evaluate timelines adequately.

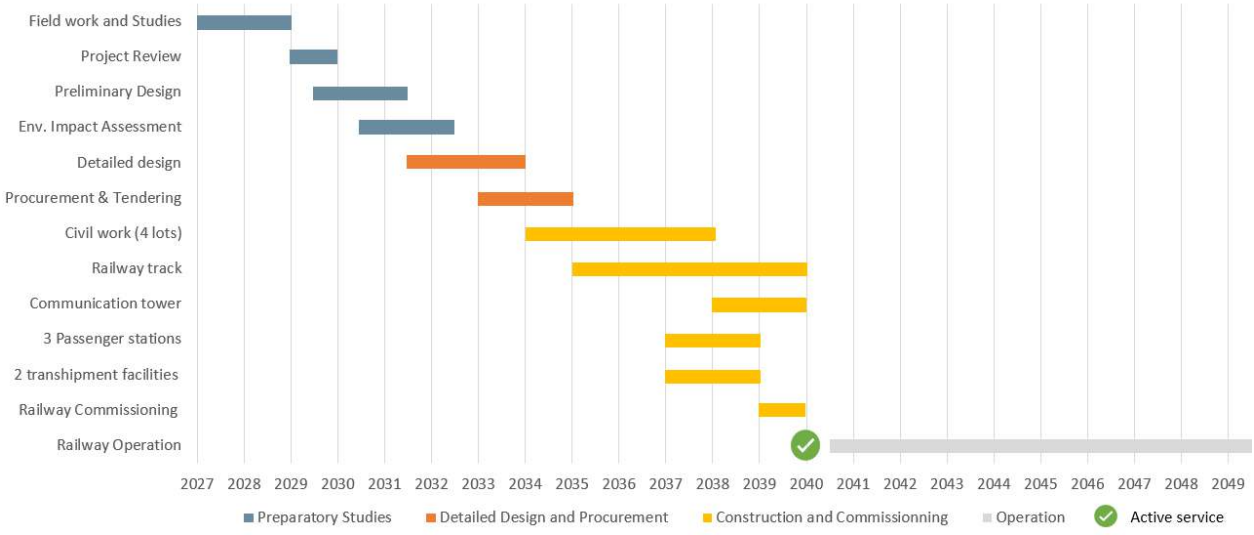

Figure 4-3 Phase II - Railway Rupert to La Grande - Schedule Overview

CONSTRUCTION COST ESTIMATE

Table 4-6 Railway: Phase II Rupert to La Grande - Detailed Capital Cost Estimate

Railway: Phase II Item		NOTE	SUB-TOTAL
1	Civil and Earthworks	Cut	$381M
		Fill	$375M
2	Civil Structures	Bridges over 10m	$260M
		Culverts under 10m	$2.5M
3	Drainage	Culvert 900 mm diam.	$34M
4	Track Works	Mainline	$680M
		Siding (La Grande)	$3.5M
5	Level Crossing		$11.5M
6	Signaling &Telecommunications		$85M
7	Buildings & Passengers Stations	Not included	-
8	Depot and Storage Areas	Not included	-
9	Environmental Protection	20 %	$366.5M
Construction Costs Sub-Total (without contingencies and risk)			**$2,199M**
Contingencies (30 %)			$659.7M
Risk (20 %)			$439.8M
Construction Costs Sub-Total			**$3,298.5M**
Professional Fees (study, design, site supervision, etc.) (15 %)			$494.8M
Owner's Fees and Project Office Costs (5 %)			$164.9M
Total Capital Cost Estimate			**$3,958.2M**

Note 1: To simplify the presentation, each item amount has been rounded to tenths, according to the detailed data in the source cost estimate file.
Note 2: Costs are quoted in CAD $2022
Note 3: Capital costs do not include right-of-way acquisition, applicable taxes, and financing costs.
Note 4: Class D Estimate -20% to +100% margin of error.

4.2.2 PERFORMANCE ANALYSIS

The Phase II railway would better serve lithium mines likely to come on line in the coming years, as these are all located on or near this alignment. However, the anticipated increase in traffic from these projects alone would make a difficult case for the Phase II railway segment.

The Duncan Lake iron ore mine project, with an annual evaluated traffic of 12 M tons per year, would provide a much stronger justification for undertaking a high-capacity transport infrastructure for the Rupert-La-Grande corridor.

The proposed alignment was designed applying the constraints defined at the outset, such as avoiding lakes, areas of Cree land use, areas of cultural importance, Protected Areas and fauna habitats. As such,, the proposed railroad alignment is for 70% of the overall lenght as close as possible to the Billy-Diamond Highway (BDH) which is optimal from an environmental point of view (preserving untouched territory and minimizing impacts on woodland caribou herds). The remaining 30% ,which is more than 100 meters from the BDH and some small and local encroachement in the Paakumshumwaau-Maatuskaau Biodiversity Reserve are unavoidable to respect necessary curve radius inherent to railway infrastructures.

La Grande Alliance proposed Railway Corridor for Phase II counts with 35 Heritage Sites, out of which 28 have moderate to high value. All sites are affiliated to the Crees and their ancestors. They are located on Wemindji hunting grounds, except for three sites pertaining to Eastmain, Waskaganish, and Nemaska territories. Four Areas of Heritage Interest (AHI) of small superficies have been defined. All are associated to Wemindji hunting territories.

As described earlier in the engagement process, it was planned from the start to re-engage with Cree land users to collect and document their feedback on the proposed technical alignments.

- Some indicated the need for more information to have a better picture of the potential impacts
- Some were not against the proposed infrastructure, although they expressed some concerns for wildlife, water, their harvesting, and their health. They would be more likely to be in favor of the proposed infrastructure if there were tangible benefits (lower cost of goods and passenger transportation).
- Users of three traplines indicated that a road along the coast would be better to serve the communities.
- The R12 tallyman believes that the train could be useful if it provided a passenger service, which could reduce travel costs.
- Lastly, users of four traplines indicated that they were opposed to the proposed infrastructure.

4.2.2.1 SPECIFIC LAND USERS COMMENTS TOWARDS PROPOSED ALIGNMENT

The proposed alignment was established in respect with the socio-environmental data, compiled in Report 2 prior to the design stage, including knowledge and perspectives gathered directly from Cree land users. However, if this proposed infrastructure is deemed valuable, detailed design work will have to be optimized and appropriate mitigation and/or compensation measures defined to ensure the environment is preserved as much as possible. As such, the following noted comments during the validation stage should be considered:

- R01A: a significant beaver trapping area should be avoided in the next revision
- R07: mitigation measures should be planned for the year-around used camp
- R08: mitigation measures should be planned to protect subterranean river system flows eastward (watershed), staging area for migratory birds and potential woodland caribou range
- R09: suggestion to cross the Pontax River more to the west (better stable soil conditions), this would also help to better protect his goose hunting area.
- R13: proposed alignment should be realigned to avoid a highly valued drinking water source used by both Waskaganish and Nemaska residents, and to remain 2km away from goose hunting site to protecxt it properly.
- R14: Transportation corridors should be concentrated on areas that have suffered from forest fires are they are less valued by users. Alignment should be kept at least 500 metres from camp and main harvesting areas.

- RE02: Suggestion to realign towards the east of the trapline to avoid harvesting areas, their main camp located near BDH km 371.5, streams and the very sensitive sturgeon spawning ground
- RE03: Suggestion to realign the proposed railway towards the east of the access road to avoid crossing. Suggestion to replace this proposed rail by a truck dedicated road parallel to the existing BDH
- VC33: Suggestion to realign towards the east of the trapline to benefit from a less rugged topography that would reduce the blasting requirements.That would allow to cross the Opinaca River at a narrow point, as they say there is no space for a second bridge at the actual crossing of this river.
- VC14: Materials used to build bridges or culverts should be chosen carefully to protect wetlands and major rivers such as the Vieux-Comptoir River.
- VC16: Concerns raised regarding the high presence of swamps which is not suitable for rail construction. He disagreed with the proposed infrastructure as he finds the impacts are too important on harvesting areas (hunting, fishing, trapping, gathering) and spawning ground
- VC17: Suggestion to realign on the west side of the BDH to avoid impacts on three main camps located (km 496, km 504 and km 510), three highly valued drinking water sources (km 496, km 511 and km 515) and a non-native camp (km 507).VC18: Distance to their camp area and two water source (500m) appears to close.
- VC19: Distance to a lake used as a drinking water source (250m) appears to close.
- VC23: Concerns raised regarding the high presence of swamps which is not suitable for rail construction.
- VC02/CH34: Concerns raised about potential contamination to a protected area (source of the watershed) located 20 km west of the proposed alignment.
- VC04/CH36:Concerns raised regarding two highly valued drinking water sources (km 580 and km 592.and two fishing areas (km 586 and km 591).
- VC05/CH37: Concerns raised regarding the proximity with several camp sites (about 10). Suggestion to reduce the frequency of train travel during the spring goose hunt as a mitigation measure.
- VC06/CH38: Suggestions to remain at minimum 2km away from existing camp and surrounding area that includes a burial site.

4.3 ROUTE 167: UPGRADE & EXTENSION TO TRANS-TAIGA (STUDY AREA 3)

As shown on Table 4-7 and Figure 4-4 below, this Phase II planned road infrastructure includes upgrading, maintaining and extending the Route 167.

- Section 1 (106.7 km): Upgrading and paving the existing section from Mistissini community access road to Albanel Lake access road;
- Section 2 (141.7 km): No projected work other than MTQ's 5-year programmed projects since the road is fairly recent (opened in 2014);
- Section 3 (89.3 km): Upgrading the existing Stornoway Renard mining road;
- Section 4 (172 km): Proposed extension, in an undeveloped area, up to Trans-Taiga Road.

Table 4-7 Route 167 – Segment definition

SECTION	STATION (START)	STATION (END)	LENGTH (km)
Existing road			
Existing gravel road upgrade and paving	305+000	411+700	106.7
Existing unpaved MTQ road to remain	411+700	553+370	141.7
Existing mine road upgrade	553+370	642+640	89.3
Extension to Trans-Taiga			
Proposed road extension	642+640	814+710	172
Total proposed infrastructure	305+000	822+564	509.7

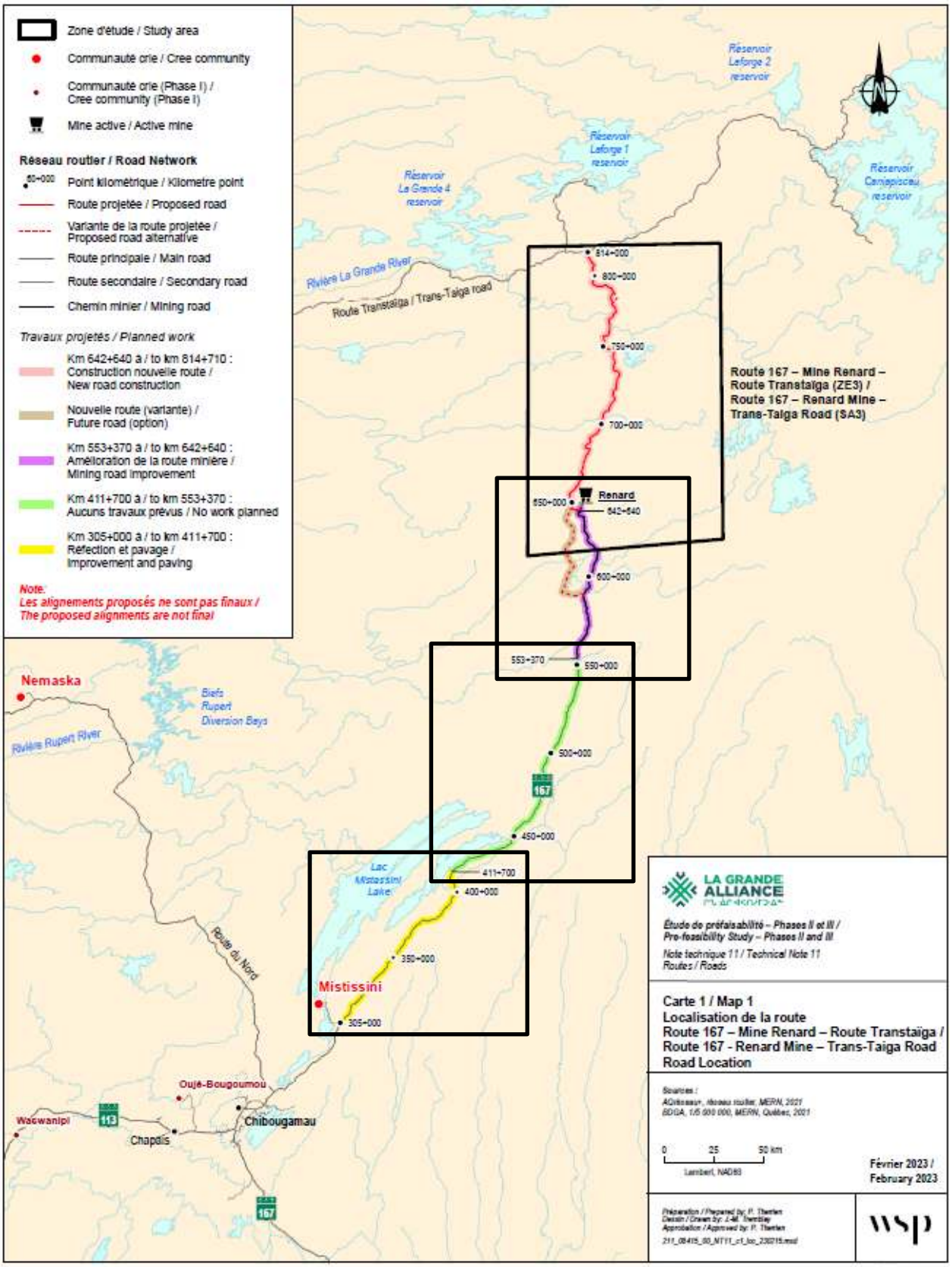

Figure 4-4 Route 167: Upgrade & Extension to Trans-Taiga – Proposed Alignment

4.3.1 INFRASTRUCTURE DESCRIPTION

As described earlier, this Phase II roadway is broken down into four sections for which more detailed information is provided in Table 4-8 below (see introductory section for explanation on station).

Table 4-8 Route 167: Upgrade & Extension to Trans-Taiga – Detailed Planned Work in this Study

SECTION
Section 1: Existing gravel road upgrade and paving : station 305+000 to 411+700
— Impacted traplines: M50, M46D, M46, M42B and M42A — This existing 106.7 km section was not built as per the MT regional collector road standards, as such the following upgrade work is required before paving: • Clearing of roadside bush; • Ditch cleaning (if required); • Culvert repairs and replacement (as per inventories provided by the MTQ); • Reinforcement of certain sections of the road for forestry use; • Replacement of an old forestry bridge at km 351.9(as per planned work by the MTQ); • General repairs (as per five-year program provided by the MTQ)
Section 2: Existing unpaved MTQ road to remain : station 411+700 to 553+370
- Traplines: M42, M37, M36, M17C, M24A and M16. - This section is fairly recent ((opened in 2014); - Road are bridges are deemed in a good condition - Other than general maintenance already covered by the MTQ, there is no specific work proposed as part of La Grande Alliance Study
Section 3: Existing mine road upgrade : station 553+370 to 642+640
— Impacted trapline: M11 — This existing 89.3 km section was built as resource access road and not as per the MT regional collector road standards, as such the following upgrade work is required: • Widening of the roadway by approximately 1.5 m; • Lengthening existing culverts and other drainage structures; • Horizontal curves correction; • Vertical curves correction; • Installation of guardrails. - Considering that bridges are relatively new, they assumed to be in good condition
Section 4: Proposed road extension to Trans-Taiga: station 642+640 to 814+710
- Impacted traplines: CH26, M01, M01A, M04 and M11 - Extension as per MTQ regional collector road standards - Proposed alignment is highly sinuous to respect and avoid the existing land use, Protected Areas, and Highly Sensitive Areas (HSA) including the Aawiitakuch, Pipunishiwin-Saahkamiishtikw and Hirondelle protected areas, and three woodland caribou herds habitat. - As much as possible, the alignment follows the ridges and avoids water bodies - As much as possible, valleys and waterbodies are crossed at the narrowest point, there are 23 bridges required out of which La Grande River crossing is a major structures.

GEOTECHNICAL

The soil condition, within a two-kilometre-wide corridor along the proposed alignment, presents some challenges. As shown in the table below, the high proportion of till tends to complicate the road construction since fills and spoil must be managed with caution. The presence of boulders, sometimes, makes till difficult to excavate. Furthermore, when poorly drained, the bearing capacity of the till can be significantly weakened.

Table 4-9 Types of Soil – Route 167: Upgrade & Extension to Trans-Taiga

TYPES OF SOIL	% OF ROADWAY ON THIS TYPE OF SOIL
Organic soils	< 1%
Sand and gravel	3%
Till	96%
Rock	< 1%

The use of crushed granular material will be required to build this road. It should be noted that there are no active borrow pit leases or quarry leases along the length of the section. The concept design is based on quarrying/graveling sites at every 60 km.

ANTICIPATED SCHEDULE

Among the major factors that will impact the schedule, the procurement mode selection to award the various contracts to execute the work is critical. However, since the project is such at an early stage, procurement analysis decisions are not yet available. We therefore considered a conservative approach based on a traditional delivery mode for this preliminary review. The selected implementation and procurement option could significantly influence the total delay as well as the scheduling/overlapping of some of the activities related to the realization of a project.

We also assume that the rehabilitation (i.e. between Mistissini and the most recent addition) and extension section (the new road) will be carried out jointly and divided in a total of five different construction contracts to promote competition.

The timeline herein is realistic but remains theoretical as many contingencies, real or imagined, cannot be considered at such an early stage in the evaluation due to such a high level of uncertainty. Appropriate risk and sensitivity analyses will be required at future phases to evaluate timelines adequately

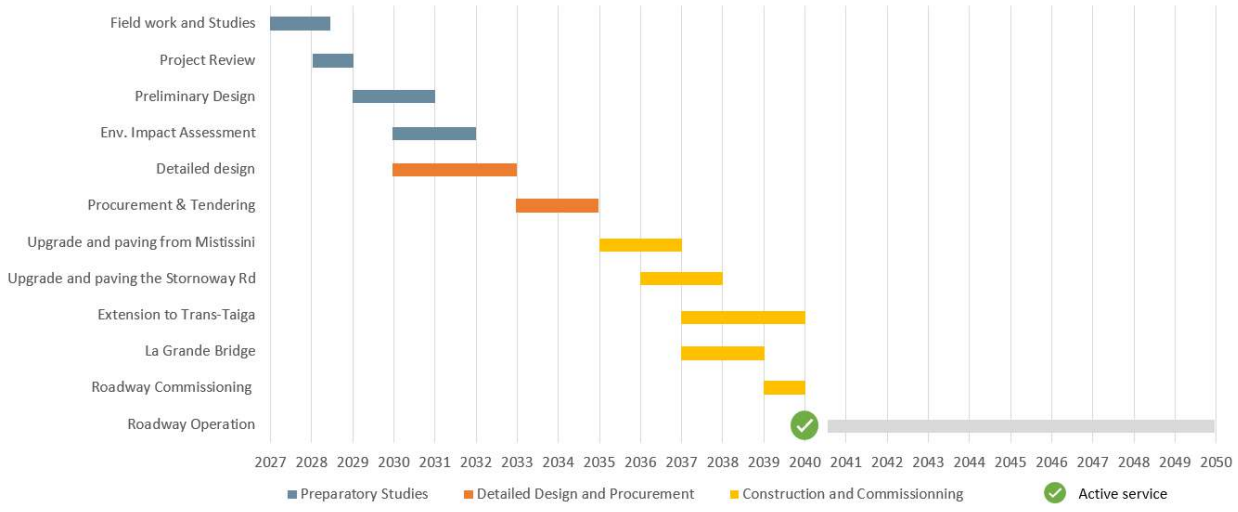

Figure 4-5 Phase II – Route167: Upgrade & Extension to Trans-Taiga - Schedule Overview

CONSTRUCTION COST ESTIMATE

Table 4-10 Route 167 –Overall Planned Work – Detailed Capital Cost Estimate

Route 167: Phase II Item	STATION (START)	STATION (END)	LENGTH	COST ESTIMATE
Existing Road				
Existing Gravel Road Upgrade and Paving	305+000	411+700	106.7 km	$271M
Existing Unpaved MTQ Road to remain	411+700	553+370	141.7 km	$0
Existing Mine Road Upgrade	553+370	642+640	89.3 km	$100M
Extension to Trans-Taiga				
Proposed new Road	650+000	822+564	172 km	$658M
			Total Capital Cost Estimate	**$1,053M**

Note 1: To simplify the presentation, each item amount has been rounded to tenths, according to the detailed data in the source cost estimate file.
Note 2: Costs are quoted in CAD $2022
Note 3: Capital costs do not include right-of-way acquisition, applicable taxes, and financing costs.
Note 4: Class D Estimate -20% to +100% margin of error.

4.3.2 PERFORMANCE ANALYSIS

The proposed infrastructure to connect the Route 167 to the Trans-Taiga represents an important opportunity to develop the regional economy of the Eeyou Istchee/Baie-James region. Namely:

1. The completion of an east-west/north-south roadway network loop
   - The proposed road would provide a second north-south transportation corridor to serve the eastern part of the territory;
   - It creates opportunities for regional economic integration for the forest industry and hydroelectric facilities located along the Trans Taiga Road;
   - It optimizes inter-regional goods delivery for Eeyou Istchee/Baie-James region with the Abitibi-Témiscamingue region, to the southwest, and Saguenay-Lac-Saint-Jean region to the southeast.
2. Effeciently connecting the two most populous areas of the territory.
   - This proposed road would significantly reduce travel time between Mistissini/Chibougamau to Chisasibi.
3. Improving roadway safety by providing constant MTQ standards
   - The existing low general and winter maintenance of the existing Route 167 is causing procurement issues for the Stornaway Mining Company with transportation companies due to the state of the mining road.
4. Improving access to isolated areas
   - The road would facilitate access to traplines (more specifically for elders of limited mobility and younger land users). Note that, according to land users, certain parts of the study area have not been used in nearly 20 years.
5. Increasing economic interest from the main local industry (Stornoway)
   - Major environmental and economic gains with the possibility for HQ to build a high-voltage transmission line along the Route 167 (Stornoway currently produces its own electricity using liquified natural gas)

Major stakeholders (MTQ and Stornoway Mine) were consulted and appear to be in favor of the proposed infrastructures.

The great sinuosity of the preliminary route reflects the effort devoted to avoid the many lakes in the territory. The presence of a projected Biodiversity Reserve and two Land Reserves as Protected Areas are other elements avoided by the designed route. Finally, due to the presence of three herds of woodland caribou, the alignment is in the western half of the Study Area to minimize the impact on this species but further coordination with Quebec government's strategy regarding the caribou is required

Six heritage sites are reported for SA3, on Chisasibi hunting grounds. They are limited to its north-western corner, on lac des Voeux, 6 km north of the Trans-Taiga Road. All date back to the 20th century. This territory has been the object of very limited research, hence this low number of sites. No Areas of Heritage Interest (AHI) was identified within that area.

As described earlier in the engagement process, it was planned from the start to re-engage with Cree land users to collect and document their feedback on the proposed technical alignments.

- Users are generally satisfied with the proposed route, which would allow access to the territory more easily.
- Some are planning to build camps along the proposed road. The overexploitation of resources in connection with the opening of the territory remains a concern.
- Users expect to benefit from economic opportunities and that the environment will be preserved as much as possible.

4.3.2.1 *SPECIFIC LAND USERS COMMENTS TOWARDS PROPOSED ALIGNMENT*

The proposed alignment was established in respect with the socio-environmental data, compiled in Report 2 prior to the design stage, including knowledge and perspectives gathered directly from Cree land users, Protected Areas, important habitat and Highly Sensitive Areas. However, if this proposed infrastructure is deemed valuable, detailed design work will have to be optimized and appropriate mitigation and/or compensation measures defined to ensure the environment is preserved as much as possible. As such, the following noted comments during the validation stage should be considered:

- M01A: Suggestion to install signs along the road at the boundaries of the land to indicate which trapline is crossed to avoid poaching.
- M03: Suggestion to install barriers to delimit access land boundaries that would allow for better control of non-Native activities on the land, particularly during construction work.
- M06: Suggestion to install barriers to control or prevent access by unwanted visitors.
- M11: Concerns are raised about crossing of moose habitat and a large trapping area, snowmobile trail, historic and valued navigation road, and two large HSAs for fishing. Concerns also raised toward the brook trout population has decreased in the water bodies near the road to the mine due to the vibration caused by the traffic.
- FG26/CH26: Reservation expressed about thelocation of the junction of the proposed road and the Trans-Taiga, suggestion to realign so the proposed road ends at to the junction of the Trans-Taiga and Laforge-1 Road.

4.4 ROADWAY: LA GRANDE TO WHAPMAGOOSTUI/KUUJJUARAPIK (STUDY AREA 2)

This proposed road alignment is located entirely within the traditional territories of the Cree communities of Chisasibi and Whapmagoostui and the Inuit community of Kuujjuarapik.

Previously to La Grande Alliance transportation infrastructure study, road alignment studies were completed by Hydro-Québec and Poly-Géo. Figure 4-6 below shows both the coastal and the inland road alignments proposed by Poly-Géo in 2013. As of today, the inland proposed alignment has the highest potential:

- it is the most direct link to the Billy-Diamond Highway;
- it has the lowest impact on protected and significant areas;
- it is the shortest in length and time travel (most cost efficient);
- it has the narrowest water crossings;
- it has the lowest potential of service interruption since the crossing of the La Grande River is on the spillway of LG-2 and not the dam which is prone to maintenance work.

The current proposed road alignment, shown on Figure 4-1, is very similar to the inland proposed concept from 2013, but more respectful of protected and highly sensitive areas such as the *Réserve de territoire aux fins d'aire protégée du Lac-Burton-Rivière-Rogan-et-la-Pointe-Louis-XIV* and the Rivière-Kanaaupscow-et-Lac-Kukamaw one. The section between approximate stations 60+000 and 118+000 includes some alternatives that could be further studied in the next stage as each includes different benefits and impacts.

It should be noted that, during the Study, this proposed roadway infrastructure was moved to the feasibility stage and thus led to a helicopter-based site reconnaissance carried out from July 15th to 20th 2022 by a team composed of a hydraulic engineer (crossing structures sizing), a structural engineer (crossing structures design) and a civil engineer (road design) along the path envisioned for the proposed road.

This field work main objective was to confirm the desk-review analyses with helicopter flyovers, site visits and visual inspections. Design concept of the proposed road alignment is based and influenced by all the information gathered from this field campaign.

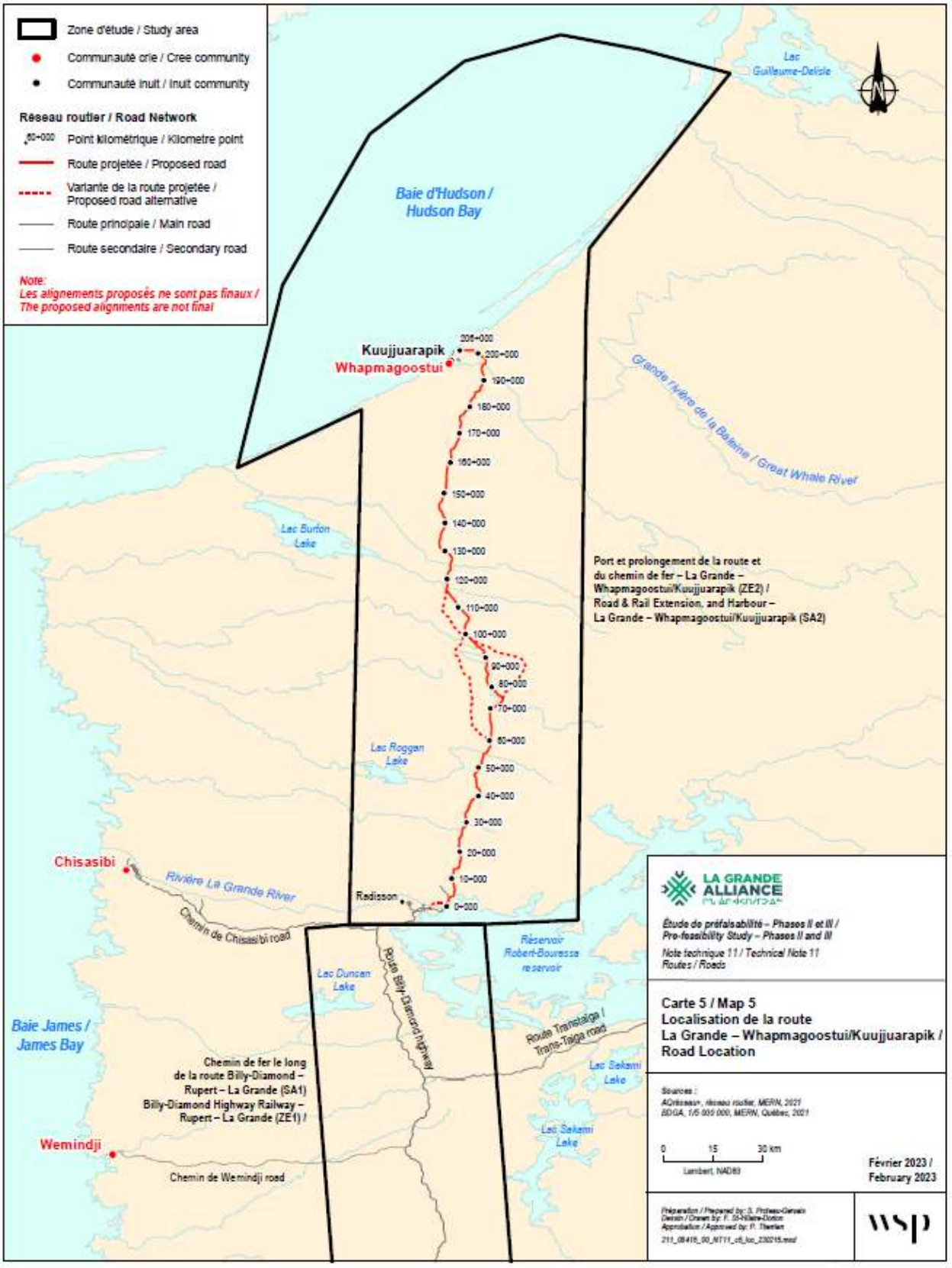

Figure 4-6 **Roadway La Grande to Whapmagoostui/Kuujjuarapik - Proposed Alignment**

4.4.1 DESCRIPTION

ROADWAY AND CIVIL STRUCTURES

As shown on Figure 4-1,the proposed road begins as an extension of the existing Billy-Diamond Highway, north of the La Grande River (station 000+000), and ends 207 km northwards at the communities of Whapmagoostui and Kuujjuarapik. In general, the proposed alignment is is sinuous to avoid waterbodies or to allow for their crossings to be at their narrower point to limit the bridge length.

The proposed road alignment is broken down into segments for which more detailed information is provided in the next sections (see introductory section for explanation on station).

Table 4-11 Roadway La Grande to Whapmagoostui/Kuujjuarapik – Detailed Planned Work in this Study

SECTION
KM 0+000 TO KM 18+000
— Impacted traplines: CH09 — Use the existing roads up to La Grande River spillway's deck on the Route de l'Évacuateur The first 4.5 km will require an upgrade of the existing roads to address the foreseen traffic increase. — Km 7.5 to km 16.0: the proposed road alignment is sinuous to allow for the two major river crossings to be at their narrower point and thus limit the bridge length. — There is a total of 4 civil structures required in this segment.
KM 18+000 TO KM 37+000
- Traplines: CH09 and CH10. - Proposed road alignment is sinuous to avoid waterbodies or to allow for their crossings to be at their narrower point and thus limit the bridge lengthProposed road alignment is located between two caribou migration corridors, whichis the shortest route but this should be investigated more closely with the tallymen to identify if the best option. - Trapline CH10's entire territory is considered as a highly sensitive area (between km 29.0 and 37.0) - There is a total of 7 civil structures required in this segment and one of which is considered a major one
KM 37+000 TO KM 58+000
— Impacted trapline: CH10 and CH11 — Km 37.0 to km 44.0: proposed roadway alignment deviates eastwards to avoid a lake that is identified as a highly sensitive area for fishing and to cross the lake at its narrower point. If the second lake located east is confirmed as a highly sensitive area, a bypass could be required to avoid both lakes. This would add approximately 4.5 km to the proposed road length. — Km 46.5 to km 51.0: hunting and fishing areas are crossed as trapline CH10's entire territory is considered as a highly sensitive area. The shortest route has been retained for now, but this should be investigated more closely with the tallymen to identify if a eastward or westward bypass would be preferable — There is a total of 8 civil structures required in this segment and three are considered major ones
KM 58+000 TO KM 80+000
- Impacted traplines: CH11 and CH08Proposed alignment avoids the *Réserve de territoire aux fins d'aire protégée du Lac-Burton-Rivière-Rogan-et-la-Pointe-Louis-XIV*. - At km 69.0 it moves eastwards to avoid waterbodies or to allow for their crossings to be at their narrower point to limit the bridge length. - There is a total of 5 civil structures required in this segment.

KM 80+000 TO KM 102+000
– Impacted traplines: CH08, CH11 and CH12 – Km 91.5 to km 98.0: proposed alignment avoids the ptarmigan hunting area but crosses an HSA (lake and fishing area), a known spawning area and a bear hunting area. Alternatives were studied, as an eastwards bypass, but the impacts are similar except on different sensible areas, such as moose & ptarmigan hunting area and a known spawning area, while adding an extra 10 km to the proposed roadway length. – There is a total of 6 civil structures required in this segment and one is considered as a major one.
KM 102+000 TO KM 122+000
– Impacted traplines: CH12 and CH07 – It was noted, during the validation interviews (refer to Technical Note 17) that the proposed alignment impacts a beaver trapping area between km 111.0 and km 117.0 and crosses a caribou migration corridor around km 116.0. That segment should therefore be optimized with an approximately 2.0 km eastward detour to bypass the beaver trapping area and a 2.5 km deviation to remain parallel to the caribou migration corridor and avoid the crossing. – There is a total of 4 civil structures required in this segment and one is considered as a major one.
KM 122+000 TO KM 142+000
– Impacted traplines: CH07, GW05 and GW20 – Km 127.0 to km 134.0: proposed alignment deviates westwards to avoid an HSA fishing area and to cross the lake at its narrower point. Two crossings occur near km 129.0 and 129.5, a caribou migration corridor and a significant First Nations path. – There is a total of 6 civil structures required in this segment and one is considered as a major one.
KM 142+000 TO KM 160+000
– Impacted traplines: GW20 and GW03 – Km 149.5 to km 151.5: proposed alignment crosses an aquatic bird concentration area for diving ducks – Km 142.5 to km 147.0 and km 152.2 to km 155.5: proposed alignment crosses two porcupine habitat areas – Km 158.0: proposed alignment perpendicularlycrosses a snowmobile trail – There is a total of 7 civil structures required in this segment.
KM 160+000 TO KM 178+000
– Impacted traplines: GW03 – Near km 167.5: proposed alignment is in proximity with an Areas of Heritage Interest (AHI), a deviation could be investigated more closely with the tallymen to identify if a greater clearance distance is deemed required. – The proposed alignment crosses a quad trail and two snowmobile trails towards the end of this segment. – There is a total of 8 civil structures required in this segment and two are considered as major ones.
KM 178+000 TO KM 207+000
– Impacted traplines: GW03 and GW01 – The vastness of the sensitive areas and the need to cross Great Whale River at a feasible location makes it impossible to avoids impacts in that segment. – The proposed alignment crosses a canoe route, a dabbling duck area, two diving duck areas, an Important Bird Area (IBA), a golden eagle area, three caribou migration areas and a possible polar bear area. – There is a total of 8 civil structures required in this segment out of which the Great Whale River is the major one considering the width and the depth of the river at the projected crossing. – The proposed alignment ends at its junction to the Rue Kanajuk, approximately 450 m south of the intersection between the 33N05-6 gravel pit access road and the Rue Kanajuk.

GEOTECHNICAL

The proposed road is located on sporadic permafrost (198 km) and discontinuous and dispersed permafrost (5 km). Sporadic permafrost means that less than 2% of the area is actual permafrost. Discontinuous and dispersed permafrost means that less than 50% of the area is actual permafrost. Based on these distances and percentages, the preliminary design considers permafrost on 6.5 km.

Overall, the soil condition within a two-kilometre-wide corridor along the proposed road alignment is composed of the types of soil indicated in Table 4-12.

Table 4-12 Types of Soil – Roadway La Grande to Whapmagoostui/Kuujjuarapik

TYPES OF SOIL	% OF ROADWAY ON THIS TYPE OF SOIL
Organic soils	5%
Silt and Clay	9%
Sand and gravel	10%
Till	29%
Rock	47%

The mitigation measures considered at this stage consist of a "fill only" pavement structure (1.5 m minimum above the natural terrain) with very gradual slopes (6H:1V).

As shown on Table 4-13, the conceptual road design is based on an all-fill pavement foundation using three different road structures depending on the type of soil encountered. A specific road structure is determined based on the different soil conditions at each location.

Table 4-13 Roadway La Grande to Whapmagoostui/Kuujjuarapik – Road structures

AVERAGE BEARING CAPACITY SOILS		BEDROCK		LOW BEARING CAPACITY SOILS	
GRANULAR MATERIALS	THICKNESS (MM)	GRANULAR MATERIALS	THICKNESS (MM)	GRANULAR MATERIALS	THICKNESS (MM)
MG 20	200	MG 20	200	MG 20	200
MG 56	250	MG 56	250	MG 56	250
MG 112	300	0-150 rock fragments	300	MG 112	1050
Fill	var.	Fill 0-1000 rock fragments	var.	Fill	var.

The use of crushed granular material will be required to build this road. It should be noted that there are no active borrow pit leases and/or quarry leases along the length of the section. Thus, new quarries and/or gravel pits will have to be identified and developed to build the road. The conceptual design is based on quarries/borrow pits every 60 km. Please refer to Technical Note 10 for more detailed information.

ANTICIPATED SCHEDULE

Among the major factors that will impact the schedule, the procurement mode selection to award the various contracts to execute the work is critical. However, since the project is such at an early stage, procurement analysis decisions are not yet available. We therefore considered a conservative approach based on a traditional delivery mode for this preliminary review. The selected implementation and procurement option could significantly influence the total delay as well as the scheduling/overlapping of some of the activities related to the realization of a project.

Based on our experience on similar northern road projects, the proposed road could be divided in two different construction contracts, each to be completed over a schedule of 3 years of construction, i.e., approximately 35 km per construction season. We also anticipate a specific construction contract for the construction of major bridges during this period. This contract division is intended to promote competition and avoid large-scale contracts that will limit the pool of bidders. In this case, this represents 3 different construction contracts that will last 4 to 5 years and will be completed around 2040. Figure 4-7 below illustrates each phase of the proposed schedule breakdown.

The timeline herein is realistic but remains theoretical as many contingencies, real or imagined, cannot be considered at such an early stage in the evaluation due to such a high level of uncertainty. Appropriate risk and sensitivity analyses will be required at future phases to evaluate timelines adequately.

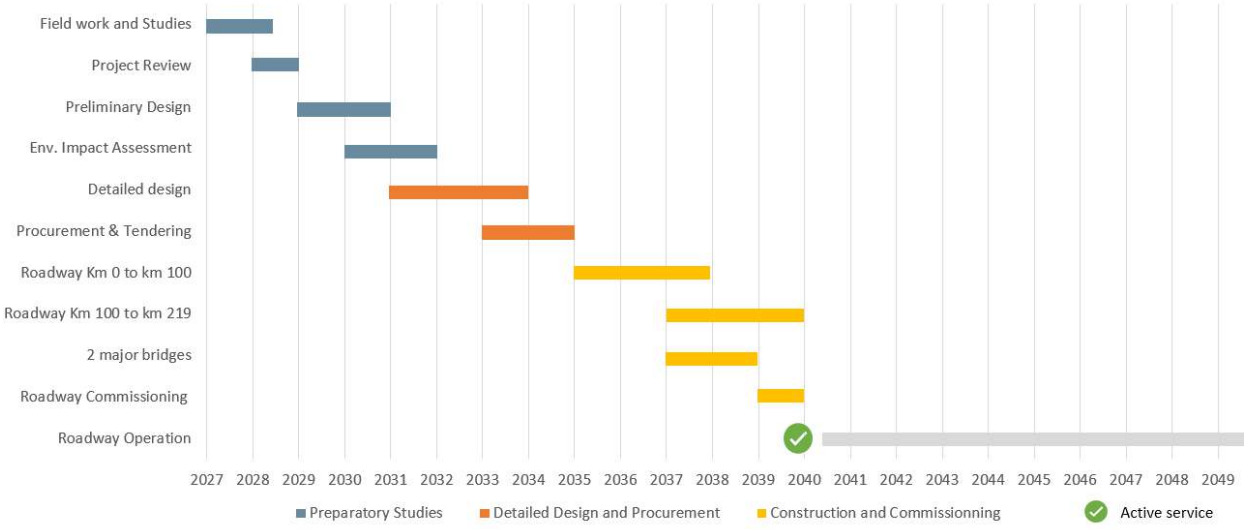

Figure 4-7 Phase II – Roadway La Grande to Whapmagoostui/Kuujjuarapik - Schedule Overview

CONSTRUCTION COST ESTIMATE

Table 4-14 Roadway: La Grande to Whapmagoostui/Kuujjuarapik - Detailed Capital Cost Estimate

ITEM		NOTE	UNIT COST	QUANTITY	SUB-TOTAL
Proposed Road Extension: 650+000 to 822+564					
1	Civil and Earthworks	Cut	$29/m³	3,209,000 m³	$93.1M
		Fill	$28/m³	5,894,000 m³	$165.0M
2	Civil Structures	Bridges over 4.5m	$80k/l.m	1,850 l.m	$148.0M
		Culverts under 4.5m	$245k/unit	81 units	$19.8M
3	Drainage	Drainage Culvert	$202k/unit	374 units	$75.5M
4	Roadway Works		$771k/l.km	207 l.km	$159.6M
9	Environmental Protection	20 %	-	-	$132.2M
Construction Costs Sub-Total (without contingencies and risk)					**$793.3M**
Contingencies (30 %)					$238.0M
Risk (20 %)					$158.7M
Construction Costs Sub-Total					**$1,190.0M**
Professional Fees (study, design, site supervision, etc.) (15 %)					$178.5M
Owner's Fees and Project Office Costs (5 %)					$59.5M
Total Capital Cost Estimate					**$1,427.9M**

Note 1: To simplify the presentation, each item amount has been rounded to tenths, according to the detailed data in the source cost estimate file.
Note 2: Costs are quoted in CAD $2022
Note 3: Capital costs do not include right-of-way acquisition, applicable taxes, and financing costs.
Note 4: Class D Estimate -20% to +100% margin of error.

4.4.2 PERFORMANCE ANALYSIS

This proposed road infrastructure is aiming to foster their economic and social development by connecting those communities with the existing road network.The extension of the Billy Diamond Highway to the Whapmagoostui and Kuujjuarapik communities answers a regional transportation need and represents an opportunity to the Eeyou Istchee/Baie-James region regional economy, in particular Cree communities, as follows:

1 Road access to previously isolated communities.

— Facilitating year-round travel for Whapmagoostui and Kuujjuarapik community-members (note that the Kuujjuarapik Inuit community was not engaged as part of this study);

— Facilitating access to traplines;

— Facilitating access to services.

2 Savings on transport costs

— The economic benefit of transporting goods by truck rather than by ship will reduce the cost of living (food, materials, and other goods).

The presence of several very elongated lakes is a particularity of this study area, implying a relatively sinuous projected road alignment. In addition, due to the large number of wetlands, encroachments are inevitable. Protected Areas are avoided. Only migratory caribous, which are less vulnerable to the project than woodland caribou, frequent the Study Area. However, concerns have been raised regarding the disturbance of migratory species' migration routes by the infrastructures.

The corridor of the proposed extension of the roadway is heritage-rich, with 102 sites out of which 87 have a moderate to high heritage value. All sites attest to the Indigenous occupation of the territory, including Inuit, Paleoinuit, Crees and their ancestors. Many sites have only been cursorily investigated so that their exact cultural affiliation remains uncertain. Sixty-six are located within Whapmagoostui hunting territories and 36 are on Chisasibi hunting grounds. Six Areas of Heritage Interest (AHI) have been defined within SA2. CHI01 is the only AHI within the Chisasibi territory, with two neighbouring paleohistorical sites (0.1 km²). The other five are in Whapmagoostui territory.

As described earlier in the engagement process, it was planned from the start to re-engage with Cree land users to collect and document their feedback on the proposed technical alignments.

- The interviewed users of the Whapmagoostui traplines were in favour of the proposed infrastructures, although some concerns were noted. On the other hand, some indicated physical specificities to be considered, such as landslides and permafrost (see also Technical Note 3) and were not against the use of quarries on their land.
- As for the users of the Chisasibi traplines, the results are more mixed, four of them suggested certain alternatives (FG08/CH08, FG09/CH09, FG10/CH10 and FG12/CH12), and some said they were against the proposed infrastructures (FG05/CH05, FG06/CH06, FG07/CH07) or against the alternative starting from La Grande-1 (FG01/CH01 and FG02/CH02).
- Detailed design work to optimize the alignment and identify mitigation and/or compensation measures will be required to minimize environmental impacts will be essential during the next stages of this proposed infrastructure. This was a major concern identified by Chisasibi community-members during engagement work with them. Furthermore, the proposed detailed roadway design will need to be communicated, analyzed, developed, and refined in close collaboration with the relevant communities to ensure their support for this road in the future.

4.4.2.1 *SPECIFIC LAND USERS COMMENTS TOWARDS PROPOSED ALIGNMENT*

The proposed alignment was established in respect with the socio-environmental data, compiled in Report 2 prior to the design stage, including knowledge and perspectives gathered directly from Cree land users, Protected Areas, important habitat and Highly Sensitive Areas. However, if this proposed infrastructure is deemed valuable, detailed design work will have to be optimized and appropriate mitigation and/or compensation measures defined to ensure the environment is preserved as much as possible. As such, the following noted comments during the validation stage should be considered:

- FG08/CH08: The tallyman of this trapline believes that ideally, the alignment should run west of Julian Lake, to protect this lake and avoid any risk of spills flowing into it. He also advises to use aluminium instead of steel for the culverts as he considers steel more armful for watercourses.
- FG10/CH10:The users reiterated their request to try to move the alignment to the west of their trapline, in order to avoid their main harvesting area of Lake Pamigamachi, even if it means encroaching on the boundary of the protected area. In the event that this request cannot be met, they propose a realignment to the west, at the northern boundary of their trapline, in order to avoid the road crossing the outlet (which is actually fairly wide) of a highly valued lake. They claim that their proposed alternative alignment would cross fewer streams and would also run through the potential quarry shown on the map. According to their calculations, this detour would represent less than one additional kilometer of road compared to the current proposed alignment.
- FG12/CH12: The tallyman of this trapline recommend to run west of the lake and that mitigation measures be put in place so that people travelling on the road would not be able to fish in this lake. Two spawning areas lake trout were identified in the validation process, alignment should be revised to avoid these spawning grounds.

- GW01: Concerns raised about the construction period, mitigation measures should be planned and enforced to minimize disruption for land users.
- GW03: Suggestion that a checkpoint should be set up to monitor what is entering the community to prevent abusive and disrespectful hunting of animals, drug and alcohol trafficking and garbage management. Where the road alignment crosses the navigation road, a bridge should be built since the watercourse is quite wide, making it possible to pass under it. The bridge across the Great Whale River should be built as close to the community as possible to allow easier access to the south side of the river for community members throughout the year.

  Permafrost is changeable and this must be taken into consideration because of the risk of landslides. The tallyman reminds us that the harshness of the environment. The best season for construction (especially for bridges) would be after freeze-up.
- GW05: Suggestion to plan for an access road to his new camp as a mitigation measure (3.5km from the proposed alignment). The tallyman is particularly concerned about melting permafrost, which can lead to ground instability, and imply dangers for infrastructure construction. Landslides are becoming more and more frequent.
- GW06: The tallyman would have liked the proposed alignment to be closer to his harvesting area. However, he suggest to plan for a snowmobile trail a mitigation measure to access his harvesting area.
- GW20: The tallyman raised concern about the noise impacts on wildlife that is sensitive to noise, such as beavers and hibernating bears, if possible mitigation measures should be considered. Controlling measures should also be considered to prevent increase of illegal accesses and activities. Sites affected by construction must be rehabilitated after the work is completed.

4.5 RAILWAY: LA GRANDE TO WHAPMAGOOSTUI/KUUJJUARAPIK (STUDY AREA 2)

The proposed Phase III railway alignment is located entirely within Study Area 2. It connects to the Phase II alignment, approximately 3 km south of La Grande River and progresses northwards to the Kuujjuarapik coastline between the mouth of Great Whale River and the location for the proposed harbour infrastructure. This is shown on Figure 4-9 below.

The proposed Phase III railway is 219 km long, and its sinuous nature is a consequence of avoiding many lakes as well as the varied topography in the Study Area. To minimize environmental impacts, the railway alignment generally follows the proposed road to Whapmagoostui/Kuujjuarapik over approximately 75% of its length. The remaining 25% that is not within 100 meters from the studied road is a result of larger radius curves compared to what is permissible for roadways. However, it is believed that this percentage could be further reduced with refined detailed engineering via a combination of adjustments to the railway design criteria as well as road optimization to suit the railway. However, such adjustments will likely result in higher road infrastructure costs.

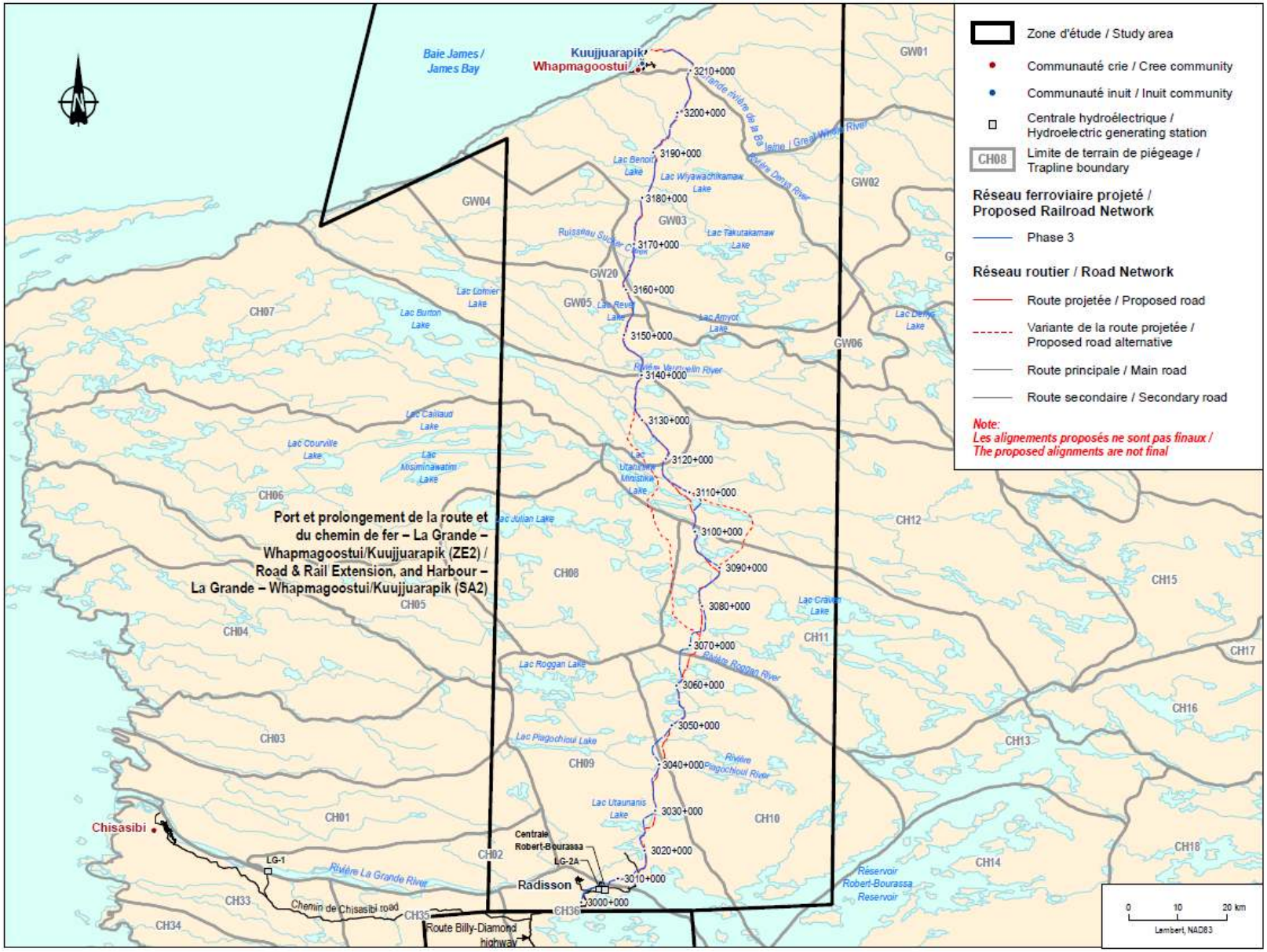

Figure 4-9 Railway La Grande to Whapmagoostui/Kuujjuarapik - Proposed Alignment

4.5.1 DESCRIPTION

The Phase III railway is broken down into segments for which more detailed information is provided with station information in Table 4-15 below (see introductory section for explanation on station). Please note that the Phase III alignment has its independent stationing from Phases I and II alignments, it starts at km 3000+000 and ends atkm 3218+900.

Table 4-15 Railway: La Grande to Whapmagoostui/Kuujjuarapik - Detailed Planned Work in this Study

SECTION
KM 3000+000 to KM 3030+000 (BDH km 614 to proposed road extension km 18)
– Chisasibi community area – Impacted traplines: VC04/CH36 and FG09/CH09. – Generally close to the proposed road except at the La Grande River crossing for which the optimal topographic location is at approximately 5.3 km east of Robert Bourassa Spillway (to be noted that the existing spillway cannot be used by the railway due to the heavy axle load and vibration issues). – The horizontal alignment is very sinuous to avoid the several lakes and streams. The decision was made to reduce the design speed where the rail does not respect the minimum 50 m offset from the proposed road. – Seven bridges will be required, out of which three are considered major structures.
KM 3030+000 to KM 3050+000 (proposed road extension km 18 to km 37)
– Chisasibi community area – Impacted traplines: CH-09 and CH-10 – Due to the relatively mountainous area, the horizontal alignment was deviated from the proposed road alignment due to the railroad slope limits that are much more restrictive than those for roads. – There are no major water crossings on this segment although some bridges are required due to the rugged ground morphology, of which three are considered major structures.
KM 3050+000 to KM 3080+000 (proposed road extension km 37 to km 66)
– Chisasibi community area – Impacted traplines: FG10/CH10 and FG11/CH11. – Along the first 10 km of this segment, the proposed rail alignment follows the proposed road alignment until km 3062, where the rail alignment begins to move further west from the road alignment until km 3080. – At km 74+150, the railway intersects with the proposed road alignment from west to east – Due to the presence of numerous waterbodies, this segment requires many bridges, of which nine are considered major structures.
KM 3080+000 to KM 3110+000 (proposed road extension km 66 to km 94)
– Chisasibi community area – Impacted traplines: FG11/CH11 and FG12/CH12. – This segment is less sinuous and remains relatively flat with no major earthworks. – The proposed rail and road alignments diverge over approximately 10 km due to a major waterbody crossing – Due to the presence of numerous waterbodies, this segment requires many bridges, out of which three are considered major structures.

KM 3110+000 to KM 3140+000 (proposed road extension km 94 to km 124)
– Chisasibi community area – Impacted traplines: FG12/CH12 and FG07/CH07. – This segment generally follows the proposed road to Whapmagoostui/Kuujjuarapik – This proposed aligment remains generally straight but considerable earthworks will be required due to the very rugged ground. Bridges will be required, of which seven are considered major structures.
KM 3140+000 to KM 3180+000 (proposed road extension km 124 to km 164)
– Whapmagoostui community area – Impacted traplines: GW05, GW20 and GW03. – This segment remains generally straight usually follows the proposed road to Whapmagoostui/Kuujjuarapik – Two major crossing over the Vaquelin and Sicker rivers will be required and five other major water crossings are also required along this segment
KM 3180+000 to KM 3218+900 (proposed road extension km 164 to km 207)
– Whapmagoostui community area – Impacted traplines: GW03 and GW01. – This segment generally follows the proposed road to Whapmagoostui/Kuujjuarapik but in a more sinuous alignment that previous segment – Considerable earthworks will be required due to the very rugged terrain. – A major crossing over the Great Whale River will be required around km 3210+200 and three other major water crossings are also required along this segment.
Level Crossings
– There 12 level crossings on this proposed railway either with the proposed road extension. – The projected daily traffic flow on each of the proposed road and railway are not sufficient to require barriers at crossings. However, based on the anticipated road and railway speeds, lights and bells will be minimally required. Therefore, each crossing will require electric power.
Power lines Crossings
– Two power lines are present along the proposed alignment in its southern section. Crossings with power lines will require investigation early in the detailed design for height clearance and potential pylon conflict.
Passenger Stations
– In coordination with Phase I traffic study, one potential passenger station was identified at Whpamagoostui – Its characteristics are not yet defined but since passengers per trip is estimated to be low, the proposed stations are currently considered to be minimalist, i.e., mainly composed of a platform adjacent to main railway track for passenger boarding, a small building, and a parking lot.
Civil structures
– This proposed alignment requires 66 bridges, 12 stream Culvert (over 4.5m in diameter) and 438 drainage culverts (less than 4.5m in diameter) – The major bridges are at La Grande River (1.1km), Vauqulin River (400m), Sucker River (800m), two important valleys (600m and 1.9km) and Great Whale River (1.1km).

GEOTECHNICAL

The proposed road is located on sporadic permafrost (198 km) and discontinuous and dispersed permafrost (5 km). The ground condition within a one-kilometre corridor on each side of the railway alignment is composed of the following type of soils:

Table 4-16 Types of Soil – Railway La Grande to Whapmagoostui/Kuujjuarapik

TYPES OF SOIL	% OF RAILWAY CORRIDOR ON THIS TYPE OF SOIL
Organic soils	5%
Silt and clay	17%
Sand and gravel	10%
Till	44%
Rock	24%

ANTICIPATED SCHEDULE

Among the major factors that will impact the schedule, the procurement mode selection to award the various contracts to execute the work is critical. However, since the project is such at an early stage, procurement analysis decisions are not yet available. We therefore considered a conservative approach based on a traditional delivery mode for this preliminary review. The selected implementation and procurement option could significantly influence the total delay as well as the scheduling/overlapping of some of the activities related to the realization of a project.

We recommend dividing the construction of the railway platform into two (2) separate construction lots covering an approximate length of 110 km to be completed over four (4) construction seasons, i.e. 2040 and 2043 (this is based on the new road construction to be completed and operational by 2038). Then, the railway construction and the laying of the tracks will need to be carried out by a specialized contractor. The beginning of rail laying will not be possible before 2042, since a length of more than 40 km of railway platform is necessary before starting the laying of the rail if we want to avoid stopping / demobilizing the rail installation team. We recommend dividing the laying of the rails into two separate lots of 110 km in length to be laid down between 2042 and 2045. .

The timeline herein is realistic but remains theoretical as many contingencies, real or imagined, cannot be considered at such an early stage in the evaluation due to such a high level of uncertainty. Appropriate risk and sensitivity analyses will be required at future phases to evaluate timelines adequately.

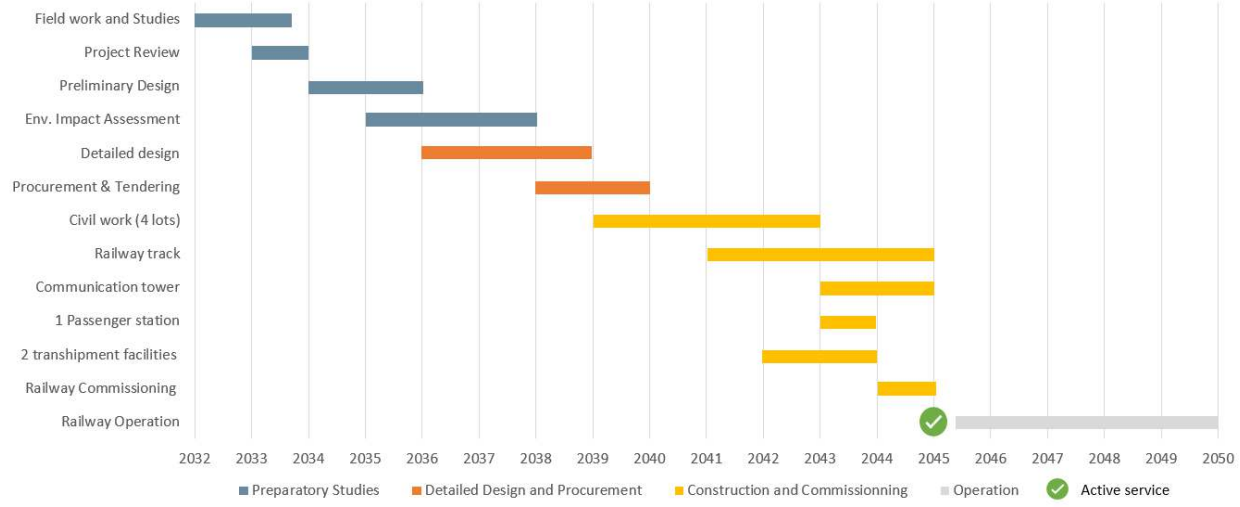

Figure 4-11 Railway: La Grande to Whapmagoostui/Kuujjuarapik - Implementation Schedule

CONSTRUCTION COST ESTIMATE

Table 4-17 Railway: Phase III La Grande to Whapmagoostui/Kuujjuarapik - Detailed Capital Cost Estimate

Railway: Phase III Item		NOTE	UNIT COST	QUANTITY	SUB-TOTAL
1	Civil and Earthworks	Cut	$30/m³	12,700,000 m³	$381M
		Fill	$30/m³	14,000,000 m³	$420M
2	Civil Structures	Bridges over 10m	$100k/l.m	9,400 l.m	$940M
		Culverts under 10m	$250k/unit	12 units	$3M
3	Drainage	Culvert 900 mm diam.	$50k/unit	438 units	$21.9M
4	Track Works	Mainline	$2M/l.km	219 l.km	$438M
		Siding (Whapmagoostui)	$3.5M/unit	1 unit	$3.5M
5	Level Crossing		$500k/unit	12 units	$6M
6	Signaling &Telecommunications		$250k/l.km	219 l.km	$54.8M
7	Buildings & Passengers Stations	Not included	-	-	-
8	Depot and Storage Areas	Not included	-	-	-
9	Environmental Protection	20 %	-	-	$453.6M
Construction Costs Sub-Total (without contingencies and risk)					**$2,721.8M**
Contingencies (30 %)					$816.5M
Risk (20 %)					$544.4M
Construction Costs Sub-Total					**$4,082.7M**
Professional Fees (study, design, site supervision, etc.) (15 %)					$612.4M
Owner's Fees and Project Office Costs (5 %)					$204.1M
Total Capital Cost Estimate					**$4,899.2M**

Note 1: To simplify the presentation, each item amount has been rounded to tenths, according to the detailed data in the source cost estimate file.
Note 2: Costs are quoted in CAD $2022
Note 3: Capital costs do not include right-of-way acquisition, applicable taxes, and financing costs.
Note 4: Class D Estimate -20% to +100% margin of error.

4.5.2 PERFORMANCE ANALYSIS

According to projections, the proposed railway would result in a marginal traffic of less than 100 000 Tonnes Per year. This takes the form mainly of consumption goods and construction material for the Whapmagoostui and Kuujjuarapik communities. This represents a modal shift from trucks and vessels to rail. As rail transportation is generally preferred over water transportation, our projections reveal no additional demand for the Whapmagoostui port by 2040. The potential Great Whale iron ore mine project could, however, significantly increase the demand.

The presence of several very elongated lakes is a particularity of this study area, implying a relatively sinuous projected road alignment. In addition, due to the large number of wetlands, encroachments are inevitable. Protected Areas are avoided. Only migratory caribous, which are less vulnerable to the project than woodland caribou, frequent the Study Area. However, concerns have been raised regarding the disturbance of migratory species' migration routes by the infrastructures.

The corridor of the proposed railway is heritage-rich, with 102 sites out of which 87 have a moderate to high heritage value. All sites attest to the Indigenous occupation of the territory, including Inuit, Paleoinuit, Crees and their ancestors. Many sites have only been cursorily investigated so that their exact cultural affiliation remains uncertain. Sixty-six are located within Whapmagoostui hunting territories and 36 are on Chisasibi hunting grounds. Six Areas of Heritage Interest (AHI) have been defined within SA2. CHI01 is the only AHI within the Chisasibi territory, with two neighbouring paleohistorical sites (0.1 km²). The other five are in Whapmagoostui territory.

As described earlier in the engagement process, it was planned from the start to re-engage with Cree land users to collect and document their feedback on the proposed technical alignments.

- The interviewed users of the Whapmagoostui traplines were in favour of the proposed infrastructures, although some concerns were noted. On the other hand, some indicated physical specificities to be considered, such as landslides and permafrost (see also Technical Note 3) and were not against the use of quarries on their land.
- As for the users of the Chisasibi traplines, the results are more mixed, four of them suggested certain alternatives (FG08/CH08, FG09/CH09, FG10/CH10 and FG12/CH12), and some said they were against the proposed infrastructures (FG05/CH05, FG06/CH06, FG07/CH07) or against the alternative starting from La Grande-1 (FG01/CH01 and FG02/CH02).
- Detailed design work to optimize the alignment and identify mitigation and/or compensation measures will be required to minimize environmental impacts will be essential during the next stages of this proposed infrastructure. This was a major concern identified by Chisasibi community-members during engagement work with them. Furthermore, the proposed detailed roadway design will need to be communicated, analyzed, developed, and refined in close collaboration with the relevant communities to ensure their support for this road in the future.

4.5.2.1 SPECIFIC LAND USERS COMMENTS TOWARDS PROPOSED ALIGNMENT

The proposed alignment was established in respect with the socio-environmental data, compiled in Report 2 prior to the design stage, including knowledge and perspectives gathered directly from Cree land users, Protected Areas, important habitat and Highly Sensitive Areas. However, if this proposed infrastructure is deemed valuable, detailed design work will have to be optimized and appropriate mitigation and/or compensation measures defined to ensure the environment is preserved as much as possible. As such, the following noted comments during the validation stage should be considered:

- FG08/CH08: The tallyman of this trapline believes that ideally, the alignment should run west of Julian Lake, to protect this lake and avoid any risk of spills flowing into it. He also advises to use aluminium instead of steel for the culverts as he considers steel more armful for watercourses.
- FG10/CH10:The users reiterated their request to try to move the alignment to the west of their trapline, in order to avoid their main harvesting area of Lake Pamigamachi, even if it means encroaching on the boundary of the protected area. In the event that this request cannot be met, they propose a realignment to the west, at the northern boundary of their trapline, in order to avoid the road crossing the outlet (which is actually fairly wide)

of a highly valued lake. They claim that their proposed alternative alignment would cross fewer streams and would also run through the potential quarry shown on the map. According to their calculations, this detour would represent less than one additional kilometer of road compared to the current proposed alignment.

- FG12/CH12: The tallyman of this trapline recommend to run west of the lake and that mitigation measures be put in place so that people travelling on the road would not be able to fish in this lake. Two spawning areas lake trout were identified in the validation process, alignment should be revised to avoid these spawning grounds.
- GW01: Concerns raised about the construction period, mitigation measures should be planned and enforced to minimize disruption for land users.
- GW03: Suggestion that a checkpoint should be set up to monitor what is entering the community to prevent abusive and disrespectful hunting of animals, drug and alcohol trafficking and garbage management. Where the road alignment crosses the navigation road, a bridge should be built since the watercourse is quite wide, making it possible to pass under it. The bridge across the Great Whale River should be built as close to the community as possible to allow easier access to the south side of the river for community members throughout the year.

  Permafrost is changeable and this must be taken into consideration because of the risk of landslides. The tallyman reminds us that the harshness of the environment. The best season for construction (especially for bridges) would be after freeze-up.
- GW05: Suggestion to plan for an access road to his new camp as a mitigation measure (3.5km from the proposed alignment). The tallyman is particularly concerned about melting permafrost, which can lead to ground instability, and imply dangers for infrastructure construction. Landslides are becoming more and more frequent.
- GW06: The tallyman would have liked the proposed alignment to be closer to his harvesting area. However, he suggest to plan for a snowmobile trail a mitigation measure to access his harvesting area.
- GW20: The tallyman raised concern about the noise impacts on wildlife that is sensitive to noise, such as beavers and hibernating bears, if possible mitigation measures should be considered. Controlling measures should also be considered to prevent increase of illegal accesses and activities. Sites affected by construction must be rehabilitated after the work is completed.

4.6 HARBOUR AT WHAPMAGOOSTUI/KUUJJUARAPIK (STUDY AREA 3)

Because current market survey and cargo forecast study results show that expected demand in the near and intermediate future is not sufficient to sustain a deep-water port investment, the study team has developed a conceptual design of a "Small Craft Harbour" (herein referred to as a Harbour) that would immediately answer community needs, accommodating fishing vessels and transporting goods from sealift vessels to the shore, but which could be scaled up to a "Deep-Water Port" at the same location in the future should conditions change.

Considering the recent landslide upstream from the mouth of Great Whale River and the perceived risk of excessive sedimentation at the mouth, the proposed Harbour could be considered as a mitigation measure that provides an alternative to the community if the existing natural beach harbour does indeed become unusable.

Four potential areas for a port were identified in the Whapmagoostui/Kuujjuarapik area. Applying a Multi Criteria Analysis applying available physical and environmental conditions including ice conditions, coastal geomorphology, coastal processes and accessibility along the Hudson Bay coastline from the mouth of Great Whale River northwards, the northern option was retained. It is located at approximately 7km from Kuujjuarapik near, as shown on the figure below, the entrance of the Manitounuk Strait, and in the vicinity of Îles Qikirtaaruit. This site is also the favored one by the tallymen of the area.

Moreover, that location has the great advantage to allow for an eventual conversion to a deep-water port, if this is ever required. That would reduce the impacts compare to building a second facility to replace the harbour.

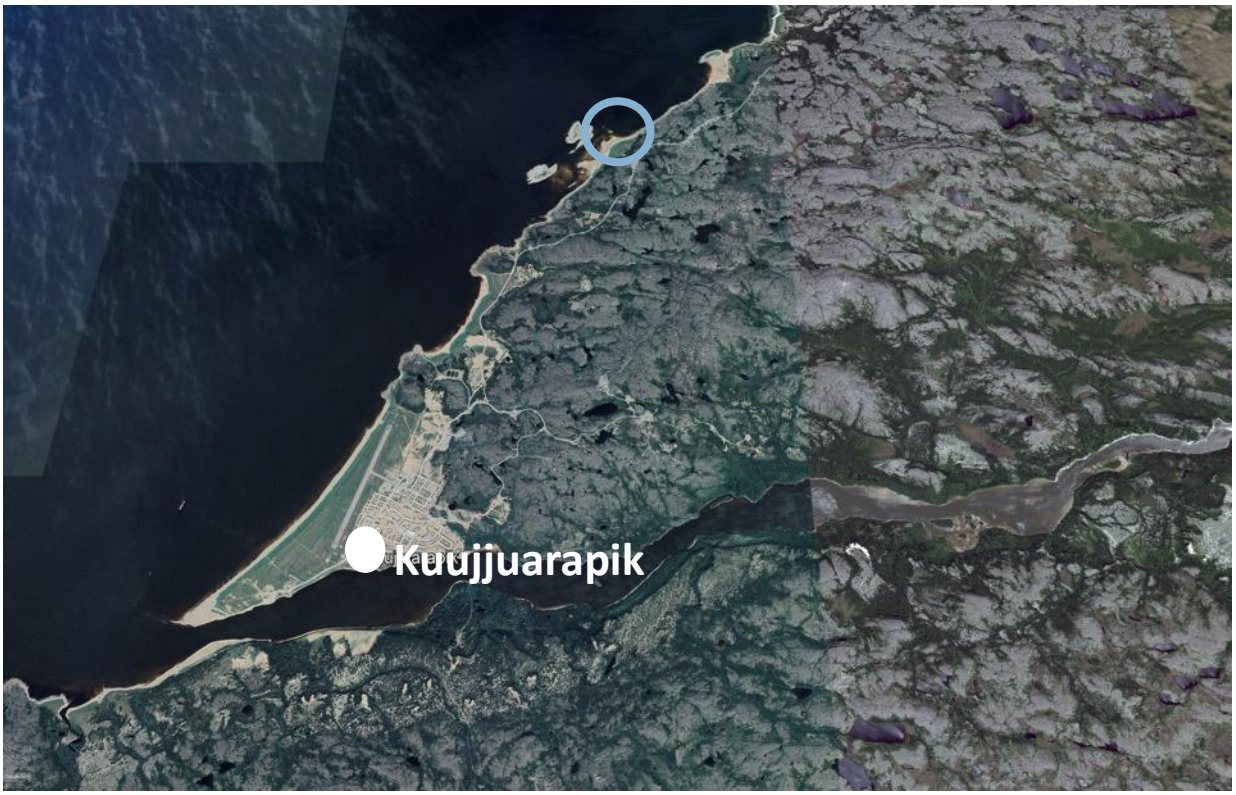

Figure 4-12 Proposed Harbour Location

The same technical criteria used to select the site fhave a positive effect on the environment, as these site conditions reduce the risks of pollution and contamination and the frequency of dredging operations. According to available information, this site is outside of important areas for beluga whales, polar bears, and migratory birds, and no conservation or protected areas are in the vicinity of the proposed site.

The conceptual design proposed for the Whapmagoostui/Kuujjuarapik Harbour includes a description of the specific requirements (harbour space, fishing fleet berthing/support zones and onshore facilities), layout (shown below) and conceptual design elements, including:

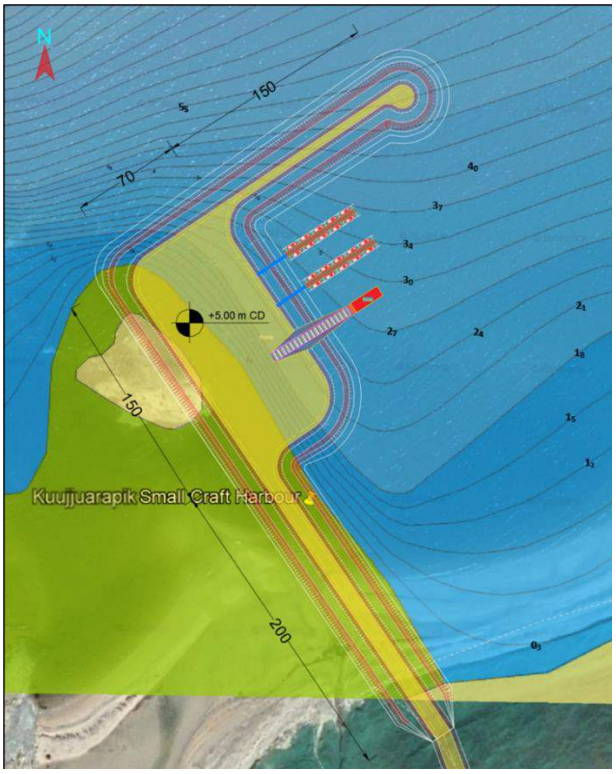

Figure 4-13 Proposed Small Craft Harbour at Whapmagoostui/Kuujjuarapik

- Floating wharves/docks that provide relatively dense berthing space for 20 small vessels (fishing boats) and easy access on and off the boats.
- A boat ramp located within the area of the harbour, protected from storms, which can be used for loading/offloading of goods and commodities from a Sealift provider via dedicated barges.
- A shore-connected breakwater to shelter berths/floats from incident waves.
- A reclaimed onshore area to accommodate potential onshore operations and functions.
- An access causeway connecting the onshore area to the local roads.

The environmental and coastal geomorphological impacts of constructing the proposed SCH will need to be investigated in the next phases.

It should also be noted that the Inuit were not engaged in this process. As a result, several structures located in the vicinity of the harbour were not identified. Further discussion with communities and leadership is a mandatory next step for this component.

ANTICIPATED SCHEDULE

A conservative approach to the project schedule assumes that the construction of this harbour would be built via a traditional project delivery method. Based on our experience on similar harbour projects, the construction of this infrastructures would be feasible within a two-year window (2042 and 2043) during ice-free season (July-November). Appropriate risk and sensitivity analyses will be required at future phases to evaluate timelines adequately. Figure 4-14 below illustrates each phase of the proposed schedule breakdown.

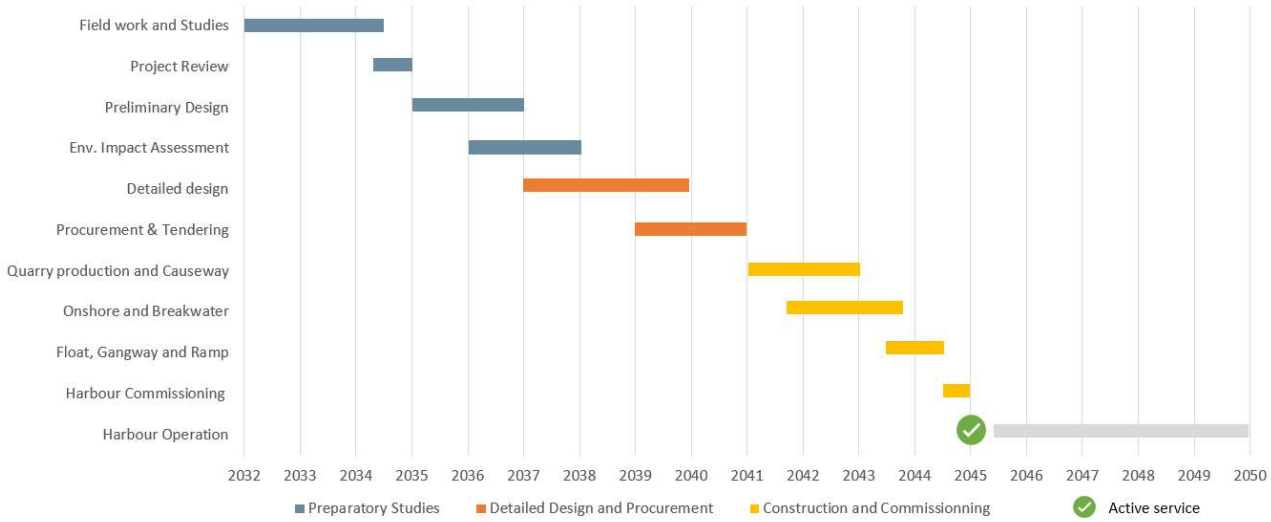

Figure 4-14 Phase III – Harbour in Whapmagoostui/Kuujjuarapik - Schedule Overview

It is important to note that this proposed schedule is subject to modifications based on an external study currently being conducted by MSP and MTQ regarding a large landslide event that occurred in 2021 on the Great Whale River, 8 km upstream from Whapmagoostui. If this study final report (expected in summer 2023) validates that this event could be the catalyst for future landslides downstream of the river, particularly on the banks of the communities of Whapmagoostui and Kuujjuarapik, the construction of a new port facilities may need to be brought forward.

CONSTRUCTION COST ESTIMATE

Table 4-18 Harbour at Whapmagoostui/Kuujjuarapik - Detailed Capital Cost Estimate

	COST CATEGORY	COST ESTIMATE (TOTAL M$)
1	Preparatory work and site operation	$2.3M
2	Harbour construction work	$29.2M
	Construction Costs Sub-Total (without contingencies and risk)	**$31.4M**
	Contingencies (30 %)	$9.5M
	Risk (20 %)	$6.3M
	Construction Costs Sub-Total	**$47.2M**
	Professional Fees (study, design, site supervision, etc.) (15 %)	$7.1M
	Owner's Fees and Project Office Costs (5 %)	$2.4M
	Total Capital Cost Estimate	**$56.6M**

Note 1: To simplify the presentation, each item amount has been rounded to tenths, according to the detailed data in the source cost estimate file.
Note 2: Costs are quoted in CAD $2022
Note 3: Capital costs do not include right-of-way acquisition, applicable taxes, and financing costs.
Note 4: Class D Estimate -20% to +100% margin of error.

4.6.1 PERFORMANCE ANALYSIS

From exchanges with Whapmagoostui land users, it emerged that the northerly options are most suitable for the harbour locations. However, goose hunting and other activities, such as fishing, are practised in these areas in the spring and fall by many community members. Additional consultations with the Crees and Inuit will allow a better definition of the activities conducted in the area and any specificities for this sector.

The preferred harbour option touches on Category II lands and is near Category IA lands. In addition, the affected maritime territory is covered by a Nunavik Inuit and Eeyou Marine Land Claim Agreement, as well as an ecological interest area that runs along the entire coast of Hudson Bay over a width of approximately 10 km in the maritime zone. Further discussion with authorities on these issues will be required.

Despite the presence of these few valued natural components, the retained harbour site seems to offer several advantages from a technical and environmental point of view. Maintaining the port location south of the entrance to Manitounuk Passage would be beneficial as, according to available information, the port would be outside of important areas for beluga whales, polar bears, and migratory birds. Furthermore, no conservation or Protected Areas are in the vicinity of the selected site.

Finally, the selected site will allow for a conversion to a deep-water port in the future should market conditions change in the future, which would greatly reduce the impacts of building a second facility to replace the smaller harbour.

5 REPORT NO. 4 – RISKS & FINANCIAL ANALYSIS

The purpose of those analysis is to determine whether the proposed La Grande Alliance infrastructure components consist of a net gain for society when compared to the status quo, both from the perspective of the Northern Québec economy as well as that of Québec as a whole.

Different parameters were analyzed to determine whether the proposed La Grande Alliance infrastructure components bring a real added value to the community. These analyses provide different indicators to guide the client decision process. Those parameters include:

1 Risks and Mitigation measures:

— Overall risks and mitigation measures towards the potential implementation of the proposed infrastructures, as well as opportunities that can be generated.

2 Financial Review:

— Benefit Cost analysis (BCA)

— Economic Impact Analysis

— Financial Sustainability Analysis

5.1.1 RISKS AND MITIGATION MEASURES

Considering the Pre-Feasibility Study stage, a qualitative analysis was performed to identify key risks and mitigation measures based on the current stage of development. The quantitative risk analysis and analysis will need to be completed with additional information (procurement models) in a subsequent stage.

The analysis is based on the approach developed in the context of the planning and implementation of major public infrastructure projects in Quebec. It allows to highlight the most important risks among those that have been identified in order to allow their consideration upstream of the proposed infrastructures development process.

A Risk Analysis Workshop was held in November 2022 between the WSP team and members of the study's Technical Committee. The purpose of the workshop was to allow experts to discuss the risks associated with the proposed infrastructure and to develop hypotheses regarding the probability and impact of the identified risks as well as to propose mitigation measures. During this stage, a non-restrictive approach was favored to identify as many risks as possible and cover all aspects of the Study. The discussions also focused on identifying opportunities or possibilities to be seized in the context of the future development of the proposed infrastructures.

A total of 56 risks were identified of which 3, or 5.4%, were rated as “very low” or “low”, 24 or 42.9%, were rated as “moderate” and 29 or 51.8%, were rated as “high” or “very high”. Of the 53 risks with severity levels above the tolerence threshold, 29 require immediate attention due to their “high” or “very high” severity.

Table 5-1 Distribution of the Proposed Project Risks

RISK CATEGORIES	VERY LOW	LOW	MODERATE	HIGH	VERY HIGH	TOTAL
Planning phase	0	0	3	5	1	9
Design phase	0	1	4	1	0	6
Site conditions - Environment	1	0	1	3	0	5
Construction & Commissioning	0	0	8	5	0	13
Operation & Maintenance	0	0	3	3	0	6
Social & Political	0	0	3	5	0	8
Finance & Economy	0	0	0	3	1	4
Legal	0	1	2	2	0	5
Total	**1**	**2**	**24**	**27**	**2**	**56**

Among the general mitigation measures to be considered to minimize the risks of the proposed infrastructures, it is essential to continue to communicate and work in concert with the stakeholders and government authorities throughout the development of the proposed infrastructures to obtain agreement on the scope of work and the support of the stakeholders, and more particularly the Cree community.

The proposed alignments optimized solutions retained for the projected infrastructures will have to avoid or reduce the risks associated with the protected areas and the environment in conformity with cultural values of the Cree Nation, notably by maintaining the involvement of the Cree population in the decision-making process leading to the choice of the infrastructures to be built in full knowledge of their impacts on the territory.

It is also important to mention that this study, with its engagement approach, is a mitigation measure in itself to reduce the risk of social acceptability. The fact that this study is conducted by the Cree Nation for the Cree population is an innovative way of doing things in Cree territory since the population is informed well in advance of potential future work and adjustments can be made to meet the expectations of the Cree population. This is a completely different approach from what was done in the past.

5.1.2 BENEFIT COST ANALYSIS

This analysis monetizes the social and community-level benefits and disbenefits of the built infrastructure proposed by Phase II and Phase III of La Grande Alliance. Social and community-level benefits and disbenefits are the positive and negative externalities to economic agents who will not be directly involved in the construction and the operation of La Grande Alliance infrastructure. The externalities generated by transportation infrastructure come in the form of travel time savings, reduced transportation costs, better environment and improved safety for the entire population, firms, and governments in the Northern region of Quebec.

As the study area is situated in a remote area with abundant natural resources, lack of transportation infrastructure makes all forms of economic development, namely mining but also community economic development, extremely difficult. The study area is well known for its Hydro-Québec landmarks and infrastructure which will reach their end of life soon, and therefore will require replacement and, quite possibly, upgrading. Demand for transportation of goods and people is expected to grow over the next decades. Based on our forecasted demand for transportation, social and community-level benefits were assessed and monetized using the MTQ's 2016 Benefit-Cost Analysis Guidance.

Several traditional benefits were quantified, and a number of non-quantifiable benefits were discussed qualitatively. For quantifiable benefits, seven categories were quantified, namely:

1. Freight shipping costs;
2. Passenger transportation costs;
3. Travel time for passengers and drivers;
4. Users' vehicle operating expenses;
5. GHG emissions;
6. Air contaminants emissions;
7. Road accidents.

Table 5-2 summarizes the Benefit Cost Analysis results monetized over the entire 2027-2074 period. This 48-year period of analysis includes 13 years of construction in Phase II from 2027 to 2039, 13 years of construction in Phase III from 2032 to 2044, and 30 years of operations starting from 2040 and 2045 for Phase II and Phase III respectively.

The present CBA uses the net present value (NPV) and the Benefit-to-Cost Ratio (BCR) as two common benefit-cost evaluation measures. Both the NPV and the BCR express the relation of discounted benefits to discounted costs as a measure of the extent to which a Project's benefits either exceed or fall short of the costs. The NPV is the difference between the Project total benefits and the Project costs, while the BCR is the ratio between the former over the latter.

In sum, Phase II is expected to generate a NPV of $2.3 billion and a BCR of 1.36 when no discount rate was used. Phase III is expected to create a loss for the society with a NPV of - $3.1 billion and a BCR of 0.37. On a discounted standpoint, Phase II returns a negative NPV of - $1.6 billion, with a BCR of 0.20. For Phase III, the discounted NPV and discounted BCR are both negative, with - $1.0 billion and -0.01. The interpretation of a negative BCR is that for every dollar investing in La Grande Alliance's Phase III, the associated discounted economic loss for the society would be equivalent to an amount of $0.01. If both phases II & III were combined, the BCR becomes 0.93 when using no discount rate, and 0.13 when using a discount rate of 10%.

The most important benefit brought by the proposed La Grande Alliance infrastructure is users' vehicle operating cost savings ($4.0 billion), followed by travel time savings ($1.5 billion), both generated mostly by Phase II. To a lesser extent, the benefits of reduced GHG emission, air contaminant emissions, and road accidents are all significant. However, the operating and maintenance of La Grande Alliance infrastructure is expected to be costly, with $2.3 billion to be spent over the 2040-2074 period.

Table 5-2 Cost Benefit Analysis Results, 2027-2074 (Million of 2023 Dollars)

#	Benefit & Cost Item	Undiscounted Value (M$)			Discounted Value (M$) at 10%		
		Phase I I	Phase III	Total	Phase II	Phase III	Total
1	Freight shipping cost savings (Whapmagoostui only)	14	4.1	18	1	0.2	1
2	Passenger transportation cost savings (Whapmagoostui only)	57	0.9	57	4	0.0	4
3	Travel time savings (road &rail transportation)	1,469	5.6	1,475	100	0.2	101
4	Users' vehicle operating expenses (road transportation)	3,996	5.3	4,002	273	0.2	273
5	GHG emissions (road &rail transportation)	669	0.7	670	40	0.0	40
6	Air contaminant emissions (road &rail transportation)	310	0.2	310	21	0.0	21
7	Accident Cost Savings (including Fatalities, Injuries and PDO) - (road transportation)	379	2.0	381	26	0.1	26
8	Infrastructure Operating and Maintenance Costs (road & rail transportation)	(1,484)	(766)	(2,250)	(98)	(31)	(129)
9	Residual Value	3,327	2,560	5,888	41	20	61
10	Total Benefits	8,737	1,813	10,550	409	(11)	399
11	Total Costs (CAPEX)	6,439	4,956	11,395	2,031	1,014	3,045
12	NPV	2,297	(3,143)	(845)	(1,621)	(1,025)	(2,646)
13	BCR	1.36	0.37	0.93	0.20	(0.01)	0.13

5.1.3 ECONOMIC IMPACT ANALYSIS

This section analyzes the economic impacts during the construction periods and the operation periods of Phases II and Phase III of the proposed La Grande Alliance infrastructure. It also reports the economic impact results from the construction of the La Grande Alliance's Phase I infrastructure, carried out by the VEI consultant team.

Economic impacts are different from economic benefits. Economic benefits generated by transportation infrastructure come in the form of travel time savings and reduced transportation costs for the entire population, firms, and governments in the Nord-du-Québec region. Economic impacts are understood as the number of jobs

created for the workers and the value added to the economy by the entrepreneurs, firms and governments involved in the construction and the operation of the proposed La Grande Alliance infrastructure.

By combining Statistics Canada provincial input-output multipliers with the cost estimate figures presented in Technical Note 16, and the projects' schedule presented in Technical Note 15, we arrive at the following results.

PHASE II

- The economic impacts of the proposed infrastructure will create 41,730 full-time jobs measured in persons-years over the 2027-2039 construction period, 12,031 jobs in persons-years between 2040 and 2069;
- The construction phase will contribute $4.3 billion to the Quebec's GDP, and generate $2.91 billion in labour income, while the operation phase will contribute $1.32 billion to the GDP, and $0.93 billion in labour income;
- Tax revenues collected by all-level governments are estimated to be $214 million in taxes on production and $205 million in taxes on products during the construction phase. The operating phase would generate fiscal revenues of $68 million in taxes on production, and $74 million in taxes on products.

PHASE III

- An equivalent of 32,120 full-time jobs will be created over the 2032-2044 construction period, additional 6,214 full-time jobs will be created between 2045 and 2074 for operating the infrastructure;
- The construction phase will contribute $3.31 billion to the provincial GDP, and require $2.24 billion in labour income, while the operation phase will add $0.68 billion to the GDP and $0.48 billion in labour income;
- Tax revenues collected by all-level governments are estimated to be $165 million in taxes on production and $158 million in taxes on products during the construction phase. The operating phase would generate $35 million in taxes on production and $38 million in taxes on products.

Given the strong capacity and experience of Cree workers and entrepreneurs in the construction sector, in particular for major infrastructure projects such as the construction of Hydro-Quebec power stations in the Nord-du-Québec region, it is expected that the economic impacts for the 10 Cree communities will be significant.

5.1.4 FINANCIAL SUSTAINABILITY ANALYSIS

The infrastructure program of La Grande Alliance represents strategically significant assets aimed at enhancing long-term economic growth and regional competitiveness by more efficiently moving passengers and goods via the new and upgraded infrastructure. Recognizing the importance of this infrastructure program, the analyses and conclusions developed throughout have been developed diligently and iteratively through engagement with key stakeholders. In particular the development of the financial analysis at the portfolio level (i.e., Phase I, II and III) was assisted by the Phase I consulting team. It should be noted that both consulting firms hired by CDC have produced independent analysis using different financial models and assumptions. WSP has not verified the Phase I analysis and taken the output results "as is".

In order to inform the procurement and financing strategy for the infrastructure program, an ecosystem scan of major passenger rail projects was performed, and international freight rail project examples were reviewed, including the Inland Rail project in Australia. This overview provides an understanding of the financial structure, procurement approach and key issues faced by existing projects; it also points to some key lessons that can inform the decision-making regarding risk allocation and thus procurement options for La Grande Alliance. The key overarching conclusions include:

- Freight and passenger rail projects are increasingly being delivered through a range of PPP models.
- Few PPP rail projects transfer full revenue risk to the private partner; the tendency is to structure these deals with availability payments or to provide minimum revenue guarantees.
- Governments play a significant role in funding rail projects, including PPPs. Public funds account for a more significant portion of total capital costs. The private sector's contributions on rail projects are normally low.

- For this project to be deemed commercially viable by lenders, a significant level of public sector support in the form of minimum revenue guarantees, direct capital contributions and/or risk guarantees will likely be required to cover the private sectors annual financing and operating expenditures during the debt tenor.

As noted above, WSP completed two financial assessments, one specific for Phases II and III and a second one reflecting the entire La Grande Alliance project, which includes Phase I and its key outputs. The overall financial model combines the proposed Project's cost assumptions, forecasted revenue for the corridor, and a series of assumptions regarding the proposed Project financing. It is built to evaluate the three main phases of La Grande Alliance project independently and on an overall portfolio basis. However, the majority of the analysis focused mainly on Phases II and III which is the subject of WSP's scope and effort.

The base case scenarios for each phase were calibrated based on various inputs including estimates for revenue (freight tonnage and passenger volume), capital and operating costs and various financing inputs. The base case was modelled without any government support to understand the proposed Project's performance based on the project costs and revenues. The NPV of Phase II and Phase III are $(2,735) million and $(3,312) million respectively for a total NPV of $(6,047) million at the start of 2027. The total infrastructure asset valuation generates an NPV of $(8,519) million for Phase I, II and III combined, at the start of 2023. This points to the need for government support to offset the large capital costs and fairly low forecast tonnages.

In order to strengthen the reliability of the financial analysis a sensitivity analysis was undertaken to test the impact of different base case inputs assumptions on the project's financial results. The sensitivities tested included +50% to +80% capital contributions, +10% to +30% increases in revenue and -10% to -30% decreases in operating costs. The overarching takeaways from the sensitivity analyses are as follows:

- The base case tariff would need to be increased to $83.20/tonne (real $2023) for equity holders to earn a minimum IRR of 12%.
- The minimum subsidy required for equity holders to earn a minimum IRR of 12% is 73.8% which would return a Phase II Project NPV of $815.4 million and a minimum DSCR of 1.47x.
- Given the size and high capital cost of the proposed Project, the model is not very sensitive to a normal level of optimal sensitivities for the main model drivers, namely tonnage volume increases (+10%, +20%, +30%) and reduction in operating costs (-10%, -20% and -30%). The proposed Project NPV in all cases remains highly negative.
- It should be noted that the Phase I outputs indicate that even with an 80% subsidy the project is not feasible (i.e., negative NPV). Accepting these results as is would weigh down the overall financial feasibility at the global portfolio level.

Based on the project's objectives and constraints, review of precedent PPP passenger and freight rail projects and comprehensive financial analysis, it was determined that the project is not financially feasible and should be further assessed to meet the requirements of the project. While understanding the financial feasibility is considered foremost in advancing the project's development it is not the only consideration. The project creates social and economic benefits which are worth considering to make the project more attractive to investors and more convincing to funding partners.

Additionally, from a strategic point of view, greater market growth for rail infrastructure in northern Quebec could result from increasing demand (from increased shipped throughput tonnage or increased selling price per tonne) for "green resources" that are deposited in this resource-rich area. The growing demand and supply constraints for these commodities which include cobalt, lithium, graphene, copper, nickel, etc. can make the project more compelling. Prior to making Capex decisions to increase production, mining companies will ensure appropriate rail service capacity exists that is cost-effective, reliable, and safe. As the viability of the infrastructure relies heavily on the mining sector, their rate of growth is of central importance. Faster growth would incrementally increase additional net economic and social benefits, supporting the rational for both capital and operating funding.

6 CONCLUSION

The demand for transportation can take the form of individuals' need to travel for school, work, leisure, or services. It also takes the form of businesses and companies offering services or goods in the region. Infrastructure improvements will likely stimulate activity and induce demand by increasing an area's attractiveness as well as improving connectivity between communities. This, in turn, induces investment that subsequently stimulates increased productivity.

The proposed infrastructures are an opportunity to position the Cree population by creating targeted programs to ensure the growing population has access to job opportunities these would create. These opportunities will originate firstly from the construction of the La Grande Alliance infrastructure and then from the induced construction projects associated with the augmented attractiveness of the area. Secondly, opportunities will be associated with the operations and maintenance of the infrastructure as well as the other induced developed activities. Lastly, benefits will come from secondary induced activities associated with the increased attractiveness of an area better serviced by an improved transportation network. Both employees and employers can develop highly skilled competencies through increased economic integration and hence a cumulative causation effect.

Hence, the La Grande Allianceprogram with its multiple components will not only address the current issues related to transportation such as decreased greenhouse gas emissions, improved road safety and accessibility as well as a reduction in transportation costs, but can also induce many latent opportunities for both the population living in the area and the companies offering goods and services. Clearly, the proposed La Grande Alliance program will increase the supply side of transportation to a great extent.

Although the evaluation of potential demand as part of this study was found to be weak relative to the foreseen costs of such infrastructure, La Grande Alliance the development could be seen as a strategic investment to position the Cree population in the management of their land and the resources they hold.

If a proposed infrastructure is approved to be developed, the key will no doubt be for it to be done in a manner that closely involves local communities, entities, entrepreneurs and companies, in conformity with the JBNQA, thus making the proposed infrastructures socially, economically, and culturally viable both during the construction and operation phases.

This study's assessments and analyzes has confirmed that it is feasible to develop the proposed transportation infrastructure in coexistence and respect with the territory and its tradition and land uses.

However, more work is needed to build community understanding and trust towards the proposed infrastructures, hence the communication phase planned following this study. Sharing the study results, benefits, challenges and, most importantly. Ensuring that this information is well understood by communities and stakeholders is a key factor to help educated decisions towards the value of the proposed infrastructures and the future development of the Eeyou Istchee Baie-James territory.

6.1 MEETING THE STUDY'S OBJECTIVES

The proposed alignments of La Grande Alliance phase II and III foreseen infrastructures meet the main objectives of the study, namely:

To maximize connections between communities and the main drivers of economic development in the region, throughout the territory

- All the proposed road and railways as part of Phases II and III will create increased savings on transportation costs
  - The proposed Route 167 and BHD extension road corridor will improve year-round accesses to currently isolated areas and will provide an efficient connection between the two largest population centers of the region (Chibougamau-Mistissini and Chisasibi).

  - The proposed Route 167 extension will provide a second north-south transportation corridor to serve the eastern part of the territory
- The proposed BHD extension to Whapmagoostui/ Kuujjuarapik will bring economic benefits via the transport of goods by truck rather than by ship, resulting in a reduction in the current cost of living (food, materials, and other goods).

To identify transportation corridors that concentrate the development footprint, to limit environmental impacts elsewhere, in a manner that is in harmony with other land use activities on the territory:

- The proposed alignment are the result of efforts to avoid, as much as possible, lakes and rivers, Cree land use areas, Highly Sensitive Areas (HSAs), Protected Areas and fauna and flora habitats.
- The proposed railway alignments are the result of maximizing the length following the existing and projected road alignments

To understand how to balance infrastructure development with environmental protection as well as the preservation and enhancement of Cree culture for the benefit of future generations

- Information sessions, Engagement and validation interviews were organized with tallymen and land users from all traplines in the Study Areas (60 traplines in total) to document Cree Knowledge about the land potentially touched by the foreseen infrastructure work.
- Over 100 questionnaires, posters, info sheets, focus groups, meeting calls and presentations were organized with the private and public sector, the Cree and Jamesian communities as well as with the Cree stakeholders, organizations, and government.
- The proposed alignment reflects the effort devoted to preserve current land use on the territory
- It is essential that the detailed design of the proposed alignments is based on avoiding and/or reducing the impacts on the Protected Areas and the environment in conformity with the fundamental and cultural values of the Cree nation, notably by maintaining the involvement of the Cree population in the decision-making process leading to the choice of the infrastructures to be built in full knowledge of their impacts on the territory.

To minimize the emission of harmful greenhouse gases in the construction, operation and use of future infrastructure developments on the territory:

- The construction industry is adapting to reduce their greenhouse gas. It is essential that all emission be measured and control during the construction phase.

To identify opportunities to create meaningful jobs for the inhabitants

- Phase II: The economic impacts of the construction will create 31,997 full-time jobs measured in persons-years over the 2033-2038 period, and the operation will create 25,321 jobs in persons-years between 2039 and 2068;
- Phase III: The economic impacts of the construction will create 25,075 full-time jobs measured in persons-years over the 2038-2043 period, and the operation will create 19,511 jobs in persons-years between 2044 and 2073

To better understand the implications, risks and opportunities related to the various infrastructures contemplated in the study:

- A total of 56 risks were identified of which 3 were rated as “very low” or “low”, 24 were rated as “moderate” and 29 were rated as “high” or “very high”.
- It is essential to continue to communicate and work in concert with the stakeholders and government authorities throughout the next stages of the development of these proposed infrastructures to obtain agreement on the scope of work and the support of the stakeholders, and more particularly the Cree community.
- It is essential that the detailed design of the proposed alignments is based on avoiding and/or reducing the impacts on the Protected Areas and the environment in conformity with the fundamental and cultural values of the Cree nation, notably by maintaining the involvement of the Cree population in the decision-making process leading to the choice of the infrastructures to be built in full knowledge of their impacts on the territory.

6.2 RECOMMENDATIONS

The proposed infrastructures are in the early stages of their life cycle and will be completed over a period of ten to fifteen years. In addition to the major stages of implementation typical of an infrastructure project, the following recommendations are intended as avenues for reflection and optimization specific to the foreseen infrastructures of La Grande Alliance phases II and III.

The purpose of the present study was:

1. To better understand the implications, risks and opportunities related to the various infrastructures contemplated in the study;
2. To maximize connections between communities and the main drivers of economic development in the region, throughout the territory;
3. To identify transportation corridors that concentrate the development footprint, so as to limit environmental impacts elsewhere, in a manner that is in harmony with other land use activities on the territory;
4. To minimize the emission of harmful greenhouse gases in the construction, operation and use of future infrastructure developments on the territory;
5. To identify opportunities to create meaningful jobs for the inhabitants;
6. To understand how to balance infrastructure development with environmental protection as well as the preservation and enhancement of Cree culture for the benefit of future generations.

If the proposed infrastructures (collectively or individually) are deemed valuable by the communities, various steps will be required prior to construction start. The following study represents the first step required to complete a project of this nature and scale. Detailed analysis, alignment optimization and further site data collection should be carried out in coordination with other preparatory studies that will feed the concept design and further detailed engineering and construction work. A detailed Environmental and Social Impact Assessment, as required by Section 22 of the JBNQA, as well as other applicable laws, is a mandatory requirement.

NEXT STEP RECOMMENDATIONS

1. Pursue the engagement effort
   - Engage with the Inuit: further discussion with communities and leadership as well as consultation of existing documentation is a mandatory next step for the development of the proposed harbour, road and railway to Whapmagoostui/Kuujjuarapik.
   - Maintain a Cree liaison team made of the CIO of each Cree community and a Cree liaison officer within the consultant consultation team, and other local Cree associate(s). This format guaranty that the engagement activities of the Crees are led by Crees, meaning that the interviews are conducted in Cree and translated in English to the consultant's anthropologist in a second time, for the note taking.
   - Continue to engage with Cree land users and other Cree stakeholders in the next stages of development in order to document their use of the land to protect as much as possible the integrity of the activity zones and highly sensitive areas (HSAs) defined by the Crees in the pre-feasibility study for phases II and III.
   - Conduct engagement sessions with the Cree public, and mostly with key informants who are specialized in Cree culture. Engaging Cree experts and key informants will help to better define what cultural preservation means, and what are the various dimensions that must be understood by development project proponents. Key informants could include staff from Aanischaaukamikw, CCDC, Cree Trappers' Association, Elders' groups, cultural coordinators, academics, etc.
   - Organize workshops on the positive and negative aspects of the presence of infrastructures in relation to the economic opportunities

2 Carry out rigorous multidisciplinary research on Cree cultural preservation and the Cree way of life

- This research must have a conceptual framework that can assessthe cumulative effects of past and current projects as well as isolate the impacts of development projects from the overall social change affecting the Cree population. For example, the fact that people do not go out on the land on a regular basis is a consequence of "development" (new technologies, infrastructure projects in Eeyou Ischtee, etc.).

3 Planning must strengthen its focus on Cree Knowledge.

- So far, archeological sites and artefacts' protection is helpful. But purposeful attention to Cree Knowledge, such as medicine from the land, stories, legends, language, ways of life, elders' teachings, ways of the past, is lacking. Building an encyclopedia of Cree Knowledge, such as UNESCO's intangible heritage, could be a good start. The proposed approach could combine ongoing research to gather, archive, grow and display Cree Knowledge in an accessible format. This is important since the loss of every Elder is a blow to the preservation of Cree Knowledge.

4 Determine mitigation measures specific to the health of the communities

- It is suggested that a Health Impact Assessment [HIA] be carried out with a gender-based, intersectional (GIA+) analysis approach to understand the differentiated impact on different groups such as youth, women, hunter-trappers, workers, etc.

5 Determine mitigation measures specific to the land uses

- The impact study will have to involve a new engagement of the land users and their participation in the elaboration of compensation measures or other types of measures, if necessary (e.g., preventive measures, enhancement, or mitigation measures).

6 Transportation Infrastructures

- Proceed with a complete LIDAR survey will have to be generated for each of the proposed routes to have an accurate picture of the topography.
- Subsequent geotechnical investigations, including permafrost characterization
- Proceed with a more accurate delimitation of wetlands and deposits made up of unstable materials (since the information available from CANVEC is relatively imprecise).
- Detailed coordination with ongoing separate study on woodland caribou and/or conducting additional aerial surveys to validate their wintering areas within a 10 km zone on either side of the proposed infrastructures.
- Initiate discussion with responsible authorities about affected areas where proposed infrastructures pass close or encroach on a Protected Area.
- Additional research regarding riverine flooding, permafrost distribution and melt, and wind.
- Proceed with a climate resilience assessment.
- Proceed with a greenhouse gas (GHG) emission analysis
- Refine the design of the proposed alignments to integrate land users comments, local mitigation measures, coordination with stakeholders and northern specific conditions.

7 Proposed Railway

- It is strongly recommended to define the ownership structure for both construction and operations (e.g., private vs. Cree-Quebec joint ownership; leased, contracted out or stand-alone/fully self-staffed entity) as this will have a direct impact on the financial analysis.
- A more detailed study with train operation simulations, including up to date railway freight customer needs and passenger needs, and with travel time should be performed to confirm the design speeds;
- Future feasibility activities should thus focus on all aspects of a railway project, including train operation, and optimize the infrastructure design;
- Railway/roadway crossings should be detailed in the next phases
- Crossings with power lines are important to investigate early in the next phases.

8 Proposed Roadway:
- It is strongly recommended to define the user-payer structure for both construction and operations (e.g., public vs. Cree-Quebec joint agreement) as this will have a direct impact on the financial analysis.
- Coordination with stakeholders regarding best practices and paving lessons learned from past projects.
- Coordination with stakeholders regarding maintenance lessons learned from past projects.

9 Proposed Civil structures
- Proceed with bathymetric and hydrometric surveys
- Field campaigns to characterize in detail the species at risk, aquatic habitats, spawning grounds, and grass beds within or in proximity of watercourses crossed by the proposed infrastructures.
- The use of watercourses by First Nations communities for navigation should be to consider in the design of watercourse crossing structures. The application of Article 98 of the RADF yields a major change in soffit elevation of the structures, as it requires a vertical clearance of 1,5 m above the high-water level mark. In comparison, when the watercourse is not use for navigation, the vertical clearance can be of up to 1m, but typically in the range between 0 cm (culverts) and 1 m for bridges.
- Evaluation of the fish passage requirements: The fish passage requirement should be evaluated by biologists, and surveys should be planned along the watercourses to refine the sizing of the culverts associated with these watercourses.
- Proceed with a life cycle analysis to determine best suitable structural type at each location

10 Proposed Harbour
- Proceed with photointerpretation of the littoral to identity salt marshes and possibly eelgrass meadows, to perform specific inventories on species at risk, bird colonies and shellfish beds, summering haulout, and fish spawning areas.
- Additional archeology research in marine and estuarian environments of the Hudson Bay coast. Potential archaeological sites may be buried near the shoreline considering accretionary processes involved in sand dune formation in the area.
- Additional studies will be required to confirm that the area targeted for harbour construction is not an important habitat, for example for capelin reproduction (a sensitive element), given that most of the available information is over 20 years old.
- Detailed vegetation inventory should be conducted, as the entire area along Hudson Bay is considered suitable for some species of flora of special concern.
- If the presence of a shoreline peatland is confirmed, it should be avoided if possible or encroachment into it should be minimized;
- Frequent landslides and unstable shores along the Great Whale River shall be further studied

11 Jobs and training opportunities
- Discussions to be held with various stakeholders regarding jobs and training expectations and opportunities related to infrastructures development.

6.3 STUDY COLLABORATION

WSP wish to underline the great collaboration of all the stakeholders in this unique study approach. We would like to thank the local partners, public and private organizations and individuals for their support and sustained involvement which greatly contributed to the study.

APPENDIX

A CREE LAND USERS

APPENDIX A

Appendix A – Summary of Cree land users' interviews

TRAPLINE	DATE - INTERVIEW	DATE - VALIDATION	NAMES OF INTERVIEWEES/STATUS
Nemaska			
R17	Nov. 18, 2021	-	William Wapachee, former tallyman
Mistissini			
M01 (x2)	Nov. 18, 2021 Nov. 18, 2021	Sept. 2022	Samuel Rabbitskin, tallyman Noreen Moar, Samuel Rabbitskin's wife Matthew Rabbitskin, tallyman Paul Rabbitskin, tallyman
M01 A	Nov. 19, 2021	Sept. 2022	Clarence Shecapio, tallyman John Henry Shecapio, tallyman's brother
M02 A	Nov. 18, 2021	-	Rene Neeposh, tallyman
M03	Nov. 3, 2021	-	Leslie Mianscum, tallyman and main land user Michael Mianscum, tallyman
M04	March 16, 2022	Nov. 22, 2022	Charlie Jimikin, tallyman Mary-Jane Coon-Come Jimikin, Charlie Jimikin's wife Jimmy-Paul Coon-Come, Charlie Jimikin's son
M06	Nov. 4, 2021	Sept. 2022	Willie Loon, tallyman Maggie Loon, tallyman's wife Sydney Loon, tallyman's son Johnny Loon, tallyman's son
M07	Nov. 3, 2021	-	John Ottereyes, tallyman Harriet Ottereyes, tallyman's mother Willie Longchap, tallyman's cousin Wilfer Longchap, Willie Longchap's son
M10	Nov. 4, 2021	Sept. 2022	William Swallow, tallyman Walter Swallow, tallyman Andrew Swallow-Neeposh, tallyman and Walter Swallow's son
M11	Dec. 2, 2021	Nov. 22, 2022	Emmerson Swallow, tallyman Sydney Swallow, tallyman Gordon Swallow, trapline user
M12	March 17, 2022	-	Alex Brien, tallyman 1 Nathan Brien, tallyman 2 and Alex Brien's nephew
M13	March 16, 2022	-	Steven Wapachee, tallyman Kevin Wapachee, tallyman's brother
M16	March 15, 2022	Nov. 22, 2022	Norman Matoush, tallyman 1 Johnny Matoush, tallyman 3 Henri Matoush, tallyman 4
M23	March 25, 2022	-	John Brien, tallyman Kenny Brien, tallyman Jonah Brien, tallyman, and Kenny Brien's son Raymond Brien, tallyman
Chisasibi			
CH01	Dec. 1st, 2021	August 2022	Eric House, tallyman (CH01 – FG01) Karen Napash, tallyman's wife (CH01) Kevin House, tallyman's cousin (CH01) Harry House, tallyman's cousin (CH01)
CH02	Nov. 30, 2021	-	John Rednose, tallyman (CH02 – FG02)

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TRAPLINE	DATE - INTERVIEW	DATE - VALIDATION	NAMES OF INTERVIEWEES/STATUS
CH03	Apr. 29, 2022	August 2022	Walter Rupert, tallyman Andrew Rupert, tallyman's father James Rupert, tallyman's cousin Keith Rupert, tallyman's cousin Ronnie Rupert, tallyman's cousin Leslie Rupert, tallyman's cousin
CH05	Dec. 3, 2021	-	John Lameboy, George Lameboy's nephew Sydney Chewanish, George Lameboy's cousin **George Lameboy is the tallyman. He was unavailable for the interview.*
CH06	Dec. 3, 2021	-	Elmer Cookish, tallyman (CH06 – FG06) Noah Chakabash, tallyman's cousin (CH06 – FG06) Paul Chakabash, tallyman's cousin (CH06 – FG06)
CH07	March 31, 2022	August 2022	Reggie Scipio, tallyman Freddie Scipio, tallyman's uncle, and previous tallyman Julian Snowboy, land user
CH09	Dec. 1st, 2021	August 2022	Steven NineO'clock, tallyman
CH10	March 30, 2022	August 2022	William Shem, tallyman Thomas Shem, tallyman's brother Harry Shem, tallyman's brother
CH11	Nov. 30, 2021	August 2022	William Pepabano, tallyman (CH11 – FG11) Richard Pepabano, tallyman's father and formal tallyman (CH11 – FG11)
CH12	Aug. 25, 2022	-	Robbie Matthew, tallyman Randy Matthew, tallyman's son
CH26	March 29, 2022	-	George Lot Bearskin, tallyman Marjorie Bearskin, tallyman's wife
CH32	Dec. 2, 2021	-	Samuel Tapiatic, tallyman (CH32 – FG32) Sarah Tapiactic, tallyman's wife (CH32 – FG32)
CH34	March 31, 2022	-	Emile House, tallyman (CH34 – VC02) Paul House, tallyman's uncle (CH34 – VC02) Louis House, tallyman's cousin (CH34 – VC02) Ross House, tallyman's cousin (CH34 – VC02) Christopher House, tallyman's cousin (CH34 – VC02) J.-Henry House, tallyman's cousin (CH34 – VC02)
CH35	March 30, 2022	-	Reginald Sam, tallyman David Sam, tallyman's uncle John R. Sam, tallyman's cousin Clayton Sam, tallyman's son Elmer Sam, tallyman's son
CH36	Dec. 2, 2021	August 2022	Samuel Cox, tallyman
CH37	March 30, 2022	-	Adrian Chiskamish, tallyman (CH37 – VC05) Claude Matches, land user and previous tallyman's nephew (CH37 – VC05) Matthew Chiskamish, land user and tallyman's cousin (CH37 – VC05)
CH38	Nov. 30, 2021	-	Jimmy Kanatewat, tallyman

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TRAPLINE	DATE - INTERVIEW	DATE - VALIDATION	NAMES OF INTERVIEWEES/STATUS
Waskaganish			
R01A	Nov. 17, 2021	Sept. 2022	Henry Erless, tallyman Stephane Erless, tallyman's grandson
R6	June 22, 2022	-	Danny Whiskeychan, tallyman
R7	June 23, 2022	-	Jeffrey Whiskeychan, tallyman
R8	Nov. 16, 2021	Sept. 2022	Philip Blackned, tallyman Raymond Blackned, tallyman's brother
R9	Nov. 17, 2021	Sept. 2022	James Jonah Sr., tallyman
R12	Nov. 16, 2021	-	Dondus Hester, tallyman
R13	Nov. 16, 2021	Sept. 2022	Gordon Blackned Jr., tallyman
R14	Nov. 16, 2021	Sept. 2022	Ron Blackned, tallyman
Whapmagoostui			
GW01	June 6, 2022	August 2022	Tallyman *(does not want to be identified in the reports)*
GW02	June 9, 2022	-	Noel Masty, tallyman
GW03	June 8, 2022	August 2022	Jacob Dick, tallyman
GW04	June 8, 2022	August 2022	Steven Masty, tallyman
GW05	June 10, 2022	August 2022	Robbie Dick Sr., tallyman
GW06	June 7, 2022	August 2022	James Kawapit Jr., tallyman
GW20	June 9, 2022	August 2022	Matthew Mukash, tallyman
GW22	June 8, 2022	August 2022	Elijah George, tallyman
Eastmain			
RE02	June 21, 2022	August 2022	Brian Weapenicappo, tallyman Bernard Mayappo, tallyman's brother Valerie Whiskeychan' tallyman's cousin Robert Gilpin, Valerie Whiskeychan's partner
RE03	June 22, 2022	-	John Moses, tallyman Sinclair Gilping, tallyman's brother-in-law
VC30	June 21st, 2022	August 2022	Victor Robert Gilpin, tallyman Irene Gilpin, tallyman's spouse Camil Gilpin, tallyman's son Marcel Mose, tallyman's brother-in-law
VC33	June 20, 2022	-	Sydney Weapenicappo, Clifford Weapenicappo's brother David Weapenicappo, Clifford Weapenicappo's brother **Clifford Weapenicappo is the tallyman. He was unavailable for the interview.*

APPENDIX A

TRAPLINE	DATE - INTERVIEW	DATE - VALIDATION	NAMES OF INTERVIEWEES/STATUS
Wemindji			
VC12	June 21st, 2022	August 2022	Sinclair Mistacheesick, tallyman Irene Mistacheesick, tallyman's wife
VC13	June 22, 2022	August 2022	Leonard Asquabaneskum, tallyman
VC14	June 24, 2022	August 2022	Henry Steward, tallyman
VC16	June 20, 2022	August 2022	John Moses, tallyman Henry Atsynia, tallyman's uncle
VC17	Aug. 16, 2022	Sept. 2022	Bruce Hughboy, tallyman
VC18	June 22, 2022	August 2022	Roy Matches, tallyman Allan Matches, tallyman's brother Norman Matches, tallyman's brother
VC19	June 23, 2022	August 2022	Vern Gilpin, tallyman Albert Gilpin, tallyman's brother Ronnie Gilpin, tallyman's brother
VC23	June 23, 2022	August 2022	Lindy Georgekish, tallyman Denis Georgekish, tallyman's brother Doreen Georgekish, tallyman's mother Morse Tomatuck, land user

Source: Optional

APPENDIX

B CREE STAKEHOLDERS

APPENDIX B

Appendix B – Summary of Cree stakeholders' engagement activities

STAKEHOLDERS & ENGAGEMENT ACTIVITY	DATE - INTERVIEW	NAMES OF INTERVIEWEES/STATUS
Regional Level		
COTA Focus Groups	March 7 and April 13, 2022	Robin McGinley, Executive Director Anderson Jolly, President & Nemaska Representative Irene Otter, Executive Committee & Waswanipi Representative Louise B. Saganash, Elders Committee Representative
Economic Development Officers (EDOs) Focus Group	July 20, 2022	David Neeposh, Eeyou Economic Group, General Director Elvis Weapenicappo, Eastmain EDO, Eeyou Economic Group Vice Prsdt Harris Happyjack, Eeyou Economic Group, Youth Business Advisor William Paddy, Oujé-Bougoumou EDO Drayden Mistacheesick, Wemindji EDO Malvin Wesley, Business development manager, Waskaganish Andrew Coon, Coordinator of Economic development, Mistissin) Marlene Sam Dixon, Waswanipi EDO Randall Black, Eeyou Economic Group, Business Loan Councillor Sydney Orr, Whapmagoostui EDO, President for Eeyou Economic Group
Nemaska		
Tallyman & Land Users Focus Group	November 18-19, 2022	n. d.
Mistissini		
Cree Trappers Association (CTA) Focus Group	Nov. 3, 2021	Stanley Mianscum, local Administer Andrew Loon, local CTA member Willie K. Gunner, local CTA member
Elders Focus Group	Oct. 21, 2022	Harry Mianscum Bella M. Mianscum Bella Moses Petawabano Katheleen Wooten Jimmy Macleod Mary Macleod Thomas Coon
Chisasibi		
Elders Council Cree Café	March 14 and 15, 2022	Jimmy R. Fireman, Coordinator Elders Program Robbie Matthew George C. Bearskin Charlie Pepabano William Fireman Mina Fireman Elizabeth Louttit
Cree Women of Eeyou Istchee Association (CWEIA) Focus Group		Sherri-Ann Louttit Mina Bearskin-Fireman Chief Daisy House Deputy Chief Paula Napash Nathasha Bates Mabel Bearskin
Chief and Council Roundtable discussion	October 11, 2022	Chief Daisy House George L. Pachano, Councillor Jody House, Councillor William Chisakamish, Councillor Roger Orr, Councillor Louise Etapp Neeposh, Councillor

APPENDIX B

STAKEHOLDERS & ENGAGEMENT ACTIVITY	DATE - INTERVIEW	NAMES OF INTERVIEWEES/STATUS
Waskaganish		
Tallyman & Land Users Focus Group	Nov. 17, 2021	Glen Katapatuk, N-05 Clarence Cowboy, R-11 Andrew Salt R-10 William T. Hester R-12 Ernest Blueboy R-
Whapmagoostui		
Economic Development Conference	March 28, 2022	Sydney Orr, Whapmagoostui EDO, President for Eeyou Economic Group Elijah Shem, Radio technician Joshua Kawapit, Communication Officer John Shem, LGA CIO
Elders Focus Group	June 14, 2022	Isaac Bearskin Samson Petagumskum George Kawapit John Ruppert Stella Masty Maggie Kawapit Joseph George
Chief and Council Roundtable discussion	n. d.	Rita Masty, Deputy Chief Jordan Masty, Councillor Maria Kawapit, Councillor Amy Dick, Councillor Benjamin Masty, Corporate Secretary
Women Focus Group	June 14, 2022	Rachel Kawapit, President of Local Women's Association and Community Education Administrator, CSB Amy Dick, Councillor and WFN Employee, Cultural Department
Think Tank Meeting	n. d.	Sydney Orr, Whapmagoostui EDO, President for Eeyou Economic Group
Eastmain		
Youth Focus Group	n. d.	Denis Moses Dawn Namagoose Wendall Moar Jasmine Namagoose
Wemindji		
Chief and Council Roundtable discussion	March 30, 2022	Christina Gilpin, Chief Roslyn Tomatuk, Councillor George Natascum, Councillor Stanley Shashaweskum, Councillor Esnest Tomatuk, Councillor

Source: Optional

APPENDIX

C JAMESIAN STAKEHOLDERS

APPENDIX C

Appendix C – Summary of Jamesian stakeholders' engagement activities

STAKEHOLDERS	DATE - INTERVIEW	NAMES OF INTERVIEWEES/STATUS
Matagami		
Municipality of Matagami	January 21, 2022	Daniel Cliche, Director General, Municipality of Matagami
Public Information and Consultation Session	February 9, 2022	Daniel Cliche, Director General, Municipality of Matagami René Dubé, Mayor, Municipality of Matagami Martin Filion, municipal councillor Marie-Claude Brousseau, Director General, ARBJ Josée Roy, treasurer, SADC Matagami Réal Dubé, municipal councillor Denis Lord, Journalist, La Sentinelle Denis Audette, Strategic Advisor for Eeyou Istchee James Bay and Nunavik, ministère des Transports du Québec (MTQ) Citizens (2), Municipality of Matagami
Chapais		
Public Information and Consultation Session	May 25, 2022	Isabelle Lessard, Mayor, Municipality of Chapais Stéphanie Houde, Strategic development assistant and Project manager, Municipality of Chapais Citizens (24), Municipality of Chapais
Public Information and Consultation Session – socioeconomic stakeholders	May 26, 2022	Isabelle Lessard, Mayor, Municipality of Chapais Stéphanie Houde, Strategic development assistant and Project manager, Municipality of Chapais Simon Blanchet, President, Opémisca Lake residents' association Steeve Boissoneault, President, Cavan Lake residents' association Isabelle Milord, Director General, Tourisme Baie-James Intern, Tourisme Baie-James Régis Simard, Director General, Table jamésienne de concertation minière
Radisson		
Locality of Radisson – elected representatives	March 9, 2022	Annabelle Larouche, Director General, locality of Radisson Sébastien Lebrun, President, locality of Radisson Hugo Bondu, Director, Fire Department, locality of Radisson Aurèle Gravel, locality councillor Judy Boissonneault, locality councillor
Public Information and Consultation Session	June 1st, 2022	Annabelle Larouche, Director General, locality of Radisson Sébastien Lebrun, President, locality of Radisson Annie Juteau, municipal officer, locality of Radisson Judy Boissonneault, locality councillor Suzanne Pelletier, locality councillor Manon Provencher, locality councillor Citizens (11), locality of Radisson
Chibougamau		
Municipality of Chibougamau – elected representatives	January 25, 2022	Manon Cyr, Mayor, Municipality of Chibougamau Alain Landry, Director General, Municipality of Chibougamau Claude Girard, municipal councillor, Municipality of Chibougamau Lyne Choquette, economic development, Municipality of Chibougamau Jonathan Mattson, municipal councillor, Municipality of Chibougamau Stéphane Hudon, municipal councillor, Municipality of Chibougamau Alain Poirier, municipal councillor, Municipality of Chibougamau Luc Michaud, municipal councillor, Municipality of Chibougamau Nichèle Compartino, Communication councillor, Municipality of Chibougamau

APPENDIX C

STAKEHOLDERS	DATE - INTERVIEW	NAMES OF INTERVIEWEES/STATUS
Public Information and Consultation Session	Sept. 27, 2022	Manon Cyr, Mayor, Municipality of Chibougamau Nichèle Compartino, Communication councillor, Municipality of Chibougamau, and Director, Development Chibougamau Nadia Duval, Project manager, Développement Chibougamau Citizens (13), Municipality of Chibougamau Citizens (2), Municipality of Chapais
Public Information and Consultation Session – socioeconomic stakeholders	Sept. 28, 2022	Manon Cyr, Mayor, Municipality of Chibougamau Nichèle Compartino, Communication councillor, Municipality of Chibougamau, and Director, Development Chibougamau Sylvain Dallaire, MTQ Jair Rodriguez, MTQ Miriam-Audrey Lessard-Légaré, Deputy Director, FaunENord Jean-François Tremblay, Project Director, TJCM Régis Simard, Director General, TJCM François Payette, academic advisor, Centre d'études collégiales de Chibougamau Frédéric Maltais, Project manager, Créneau d'excellence en tourisme nordique Sébastien Vandal, Administrator, Chambre de commerce de Chibougamau, and Sales Director, Transportation Company Michel Laurendeau, Administrator, Tourisme Baie-James, and Representative, Fédération québécoise des Clubs de Quad
Lebel-sur-Quévillon		
Municipality of Lebel-sur-Quévillon – elected representatives	Sept. 7, 2022	Guy Lafrenière, Mayor, Municipality of Lebel-sur-Quévillon Denis Lemoyne, municipal councillor, Municipality of Lebel-sur-Quévillon Jacques Trudel, Director, Public works and urban planning, Municipality of Lebel-sur-Quévillon Anik Racicot, Director General, Municipality of Lebel-sur-Quévillon Michael Sandapen, Director (interim), Economic Development, Municipality of Lebel-sur-Quévillon Linda Audet, municipal councillor, Municipality of Lebel-sur-Quévillon Pierre-Yves Baril, municipal councillor, Municipality of Lebel-sur-Quévillon Charles Goyer, municipal councillor, Municipality of Lebel-sur-Quévillon Marc Blain, municipal councillor, Municipality of Lebel-sur-Quévillon Violaine Audet, municipal councillor, Municipality of Lebel-sur-Quévillon
Public Information and Consultation Session	Sept. 28, 2022	Guy Lafrenière, Mayor, Municipality of Lebel-sur-Quévillon Denis Lemoyne, municipal councillor, Municipality of Lebel-sur-Quévillon Violaine Audet, municipal councillor, Municipality of Lebel-sur-Quévillon Michael Sandapen, Director (interim), Economic Development, Municipality of Lebel-sur-Quévillon Gérald Lemoyne, former mayor and resident, Municipality of Lebel-sur-Quévillon Citizens (13), Municipality of Lebel-sur-Quévillon
Public Information and Consultation Session – socioeconomic stakeholders	Sept. 29, 2022	Jacques Marquis, Business owner, Motel Iris, and Quévillon aller-retour (transportation Company) Violaine Audet, municipal councillor, Municipality of Lebel-sur-Quévillon, and Employee, Foresterie Gilles Gaudreault Norman Labrie, President, Club de motoneige Lebel-sur-Quévillon Vice-President, Club de motoneige Lebel-sur-Quévillon Céline Deschênes, secretary-treasurer, Club de motoneige Lebel-sur-Quévillon Jenny Fortier, Property owner, apartment buildings Patrick Renaud, Property owner Julie Lavoie, property owner, and owner of the Tavern and pizzeria Michael Sandapen, Director (interim), Economic Development, Municipality of Lebel-sur-Quévillon

Source: Optional