Project Proposal

Grays Bay Road and Port Project

July 2017

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GRAYS BAY ROAD AND PORT

QURLUQTUARYUNGMI
APQUTIKHANGA TULUQTAQVIKHANGA
HAVAKTAKHAT

ROUTE ET PORT À GRAYS BAY

Arctic Gateway Connecting
Nunavut to the World

GBRP.CA

GBEEC
Grays Bay Engineering & Environmental Consultants

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Abbreviations

AAQO	Ambient Air Quality Objective
AEMP	Aquatic Effects Monitoring Program
AER	Alberta Energy Regulator
AGM	Annual General Meeting
ANFO	ammonium nitrate and diesel fuel
AQMS	air quality monitoring stations
ARD	acid rock drainage
ATV	all-terrain vehicle
ARD/ML	acid rock drainage and/or metal leaching
BCB	Bering-Chukchi-Beaufort
CAC	criteria air contaminant
CCME	Canadian Council of Ministers of the Environment
CIE	International Commission on Illumination
CLO	Community Liaison Officer
CO	carbon monoxide
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPUE	catch per unit effort
dBA	A-weighted decibels
DEIS	draft environmental impact statement
DFO	Fisheries and Oceans Canada
DO	dissolved oxygen

DWT	deadweight tonnes
EC-WG	Eastern Canada-West Greenland
EIS	environmental impact statement
EPP	environmental protection plan
FAL	freshwater aquatic life
FIFO	fly-in fly-out
GBEEC	Grays Bay Engineering & Environmental Consultants
GBRP Project	Grays Bay Road and Port Project
GDP	gross domestic product
GIS	Geographic Information System
GN	Government of Nunavut
GNWT	Government of Northwest Territories
HTO	Hunters and Trappers Organization
ICP	Izok Corridor Project
IDA	International Dark Sky Association
IES	Illuminating Engineering Society
IIBA	Inuit Impact and Benefit Agreement
ILUOP	Inuit Land Use and Occupancy Project
INAC	Indigenous and Northern Affairs Canada
IOL	Inuit Owned Land
IQ	Inuit Qaujimajatuqangit
KIA	Kitikmeot Inuit Association
Leq	equivalent sound level
MMG	Minerals and Metals Group Limited

MMO	marine mammal observer
NAC	Nunavut Arctic College
NHC	Nunavut Housing Corporation
NIRB	Nunavut Impact Review Board
NO_2	nitrogen dioxide
NPC	Nunavut Planning Commission
NTI	Nunavut Tunngavik Incorporated
NTKP	Naonaiyaotit Traditional Knowledge Project
NuPPAA	*Nunavut Planning and Project Assessment Act*
NWT	Northwest Territories
OHS	occupational health and safety
PINIDEP	Partners for Innovation in Northern Infrastructure Development and Economic Progress
PM_{10}	particulate matter of 10 µm in diameter or less
$PM_{2.5}$	fine particulate matter of 2.5 microns (µm) in diameter or less
PSIR	Project Specific Information Requirements
RAA	regional assessment area
RCMP	Royal Canadian Mounted Police
SO_2	sulphur dioxide
TCWR	Tibbitt-Contwoyto Winter Road
TFF	Territorial Formula Financing
TK	traditional knowledge
TLRU	traditional land and resource use
TSP	total suspended particulate

TSS	total suspended solid
VC	valued component
VOC	volatile organic compound

Glossary

Arctic Bay	*Ikpiaryuk*
Bathurst Inlet (community)	*Qingauk*
Bathurst Inlet	*Kiluhiktuq*
Burnside River	*Kiluhiktuq*
Cambridge Bay	*Iqaluktuuttiaq*
Contwoyto Lake	*Tahiryuaq*
Coronation Gulf	*Qalgiuyap Taryunga*
Grays Bay	*Aariaq*
Great Bear Lake	*Imaryuaq*
Hood River	*Hivuraqhit*
Izok Lake	*Qaumavaktuq*
Kennarctic River	*Qurluqtuaryuk*
Kugluktuk	*Qurluqtuq*
M'Clintock Channel	*Ualliayuk*
Resolute	*Qauyuittuq*
Taloyoak	*Talurjuaq*
Victoria Island	*Kiilliniq*
Arctic char	*iqalukpiit*
Arctic cod	*hiuryuktuut/uugait*
Arctic fox	*tiriganniat*
Arctic hare	*ukalrit*

beluga whale	*qilalukkat*
bowhead whale	*arviat*
Calving	*irniurniit*
Capelin	*angmagiat*
Caribou	*tuktuit*
common raven	*tulugait*
fourhorn sculpin	*kanayuit*
Gjoa Haven	*Uqhuqtuuq*
grizzly bear	*akhait*
Gyrfalcon	*kilgavikpait*
lake trout	*ihuuqit*
long-tailed duck	*aahanngiit*
migration routes	*aullayaaqtut*
Moose	*tuktuvait*
Muskox	*umingmait*
Narwhal	*tuugaaliit*
peregrine falcon	*kilgaviit*
polar bear	*nanuit*
Ptarmigan	*aqilgiit/aqilgiviit*
red fox	*kayuqtut*
ringed seal	*nattiq*
Wolf	*amaqqut*
Wolverine	*qalviit*

Executive Summary

We, the Government of Nunavut (GN) and the Kitikmeot Inuit Association (KIA) (collectively, the Proponents) are jointly proposing to construct, manage and operate the Grays Bay Road and Port Project (the "GBRP Project"), a nation-building transportation infrastructure project to be located in Nunavut's Kitikmeot region. The culmination of many years of study and planning, the GBRP Project consists of an approximately 230 km all-season road that would connect to a deep water port at Grays Bay on the Coronation Gulf.

The proposed port would be the first and only deep water port in the Canadian central arctic. The proposed road would be the first road to connect Nunavut to the rest of Canada. The road's terminus at the former Jericho Mine site would connect the road to the Tibbitt-Contwoyto Winter Road that starts in Yellowknife in the Northwest Territories, and is connected to Canada's national highway system.

We believe that the GBRP Project has the potential to positively transform this remote area of Canada that is struggling with high levels of poverty, pervasive food insecurity, low income levels, high unemployment, housing shortages and an expensive cost of living.

Our partnership is a unique feature of the GBRP Project. Both partners believe that this project builds on and advances the spirit and intent of the Nunavut Agreement. The Nunavut Agreement established the GN as Nunavut's territorial government. It represents its Inuit and non-Inuit constituents through its democratically elected, consensus-based legislature.

The GN has exclusive responsibility to govern and regulate the entirety of Nunavut. It also has lead responsibility to foster sustainable economic and community development across the territory. The GN sees the GBRP Project as the most important commitment of its current vision and mandate. This project is clearly set out in *Sivumut Abluqta—Stepping Forward Together,* produced by the Fourth (and current) Assembly of the Legislative Assembly of Nunavut (Government of Nunavut 2014).

The KIA represents approximately 6,000 Inuit beneficiaries of the Nunavut Agreement who reside in Nunavut's Kitikmeot region. Among other things, the KIA has a mandate to promote the economic well-being of its membership. Through the Nunavut Agreement, the KIA is entrusted with the administration and management of 106,360 km^2 of Inuit Owned Land (IOL) for benefit of its members. An important feature of the GBRP road corridor is that it would connect many IOLs to tidewater.

KIA's role as a co-proponent of the GBRP Project has been confirmed at its highest level of decision-making authority, its Annual General Meeting (AGM). In 2016, all elected board members and delegates representing elders, women and youth groups from each of the five Kitikmeot communities unanimously passed a resolution endorsing the KIA's involvement in its role as co-proponent of the GBRP.

The Nunavut Agreement sought a way forward from longstanding social and economic challenges for this area. Consistent with Agreement objectives, the GBRP Project promotes Inuit participation in economic opportunities, and encourages Inuit self-reliance and social and cultural well-being.

The project also provides a key opportunity to implement Inuit decision-making in the use, management and conservation of land, water and resources. We believe that the successful execution of this project - throughout planning, construction and operation - will depend on rigorous regulatory oversight to develop and implement a suite of innovative governance, management, and wildlife conservation tools to minimize and mitigate potential impacts.

We have made it fundamental to the GBRP Project that we will control its operation and use by third parties using the substantial powers provided to us by the Nunavut Agreement. We recognize the importance of caribou, and we propose to address their needs as a priority during each year of the project's operation. Thus, any user of the infrastructure will have to abide by management, legislative and regulatory standards imposed upon the project. Equally, based on current studies, we expect that our regulatory innovations will need to include, among other measures, seasonal modifications of road use based on ongoing wildlife monitoring and adaptive management.

We recognize and welcome substantial public interest in this project. Public input is important to assess the project's scale, location, potential for impacts on sensitive wildlife, and implications for the local, regional, and territorial economies and social and cultural well-being.

Therefore, we also jointly accept the need to subject this project to a *Nunavut Agreement*-based environmental assessment, as implemented under the *Nunavut Planning and Project Assessment Act* (NuPPAA).

This environmental assessment will make one question fundamental to determining whether and how this project may proceed:

> "Will this project cause significant adverse ecosystemic or socio-economic impacts or significant adverse impacts on wildlife habitat or Inuit harvesting activities?"

As we work together to prepare the environmental assessment and regulatory answers to this question, we have relied on many sources of information, including Inuit Qaujimajatuqangit, traditional and community knowledge, and studies and effects assessments respecting MMG Limited's proposed Izok Corridor Project.

We have already engaged widely with communities and stakeholders, and will continue to do so. As we continue our engagement efforts, we will generate a comprehensive list of issues and concerns, and provide responsive approaches and measures.

1.0 INTRODUCTION

We, the Government of Nunavut (GN) and the Kitikmeot Inuit Association (KIA), are the co-proponents and future operators of the Grays Bay Road and Port Project (GBRP Project), a transportation infrastructure project to be located on a combination of Crown and Inuit-owned land in the Kitikmeot region of western Nunavut. Subject to approval, the GBRP Project would provide the first road to connect Nunavut to the rest of Canada via the Tibbitt-Contwoyto Winter Road (TCWR) into the Northwest Territories (NWT) from Jericho Station. The project would also result in the establishment of the first and only deep water port in the Canadian central arctic at Grays Bay.

1.1 PROJECT PROPOSAL

Part 3 of the *Nunavut Planning and Project Assessment Act* (NuPPAA) requires the submission of a project proposal to the Nunavut Planning Commission (NPC) and the Nunavut Impact Review Board (NIRB) to initiate regulatory review for a project.

As co-proponents of the GBRP, we submitted a preliminary project proposal to the NPC in December 2016. On January 20, 2017, the NPC determined that there was no land use plan that is applicable to the GBRP Project. NPC forwarded the abbreviated project proposal it had received for its screening to the NIRB. On January 30, 2017, the NIRB issued an information request to the KIA requesting that additional project details be provided for NIRB to conduct its screening. This document is the revised project proposal for the GBRP Project.

The purpose of this document is to provide the NIRB with sufficient information to screen this project, as well as to assist the federal Minister of Indigenous and Northern Affairs Canada (INAC) in determining whether the GBRP Project requires review by the NIRB or by a federal environmental assessment panel. Prior to the enactment of the NuPPAA, the review options were governed by Article 12 of the Nunavut Agreement and involved consideration of a review by NIRB (termed a Part 5 review) or by a federal panel (termed a Part 6 review). Under the NuPPAA, the key considerations are found in s.94. We co-proponents believe that this project is of significant importance to the Kitikmeot region and Nunavut as a whole – economically, socially and environmentally.

Turning to what the NIRB requires, this document provides information to assist the NIRB with determining the scope of the project (s.86 of NuPPAA), as well as assisting in addressing the following three legal considerations (s.89 of NuPPAA) that guide its screening of projects:

(1) whether the project may have significant adverse ecosystemic or socio-economic impacts or significant adverse impacts on wildlife habitat or Inuit harvesting activities;
(2) whether the project will cause significant public concern; or
(3) whether the project involves technological innovations, the effects of which are unknown.

1.1.1 Existing Studies and Information

This document relies on many sources of information, including available studies, Inuit Qaujimajatuqangit, and traditional and community knowledge.

Considerable work has been completed to date to understand the environmental and socio-economic conditions of the project area and potential GBRP Project effects, including:

- Baseline studies and effects assessments, including extensive studies conducted for MMG Limited and previous owners of the proposed Izok Corridor Project (ICP) (which has several common elements with the GBRP Project; see Appendix 1A);
- Consultations with KIA's membership, and with Indigenous, community and stakeholder groups inside and outside the Kitikmeot Region, including the groups within the Northwest Territories;
- Review of Traditional and Inuit Qaujimajatuqangit regional studies;
- Feedback from federal, territorial and Institutions of Public Government through direct consultations and through the Interagency Coordination Group established by us; and,
- Internal scoping workshops conducted by us.

1.1.2 Factors to Assess the Significance of Effects

The NuPPAA specifies multiple factors that are relevant to determining the significance of impacts (s.90). The following provides an overview of the most relevant information concerning each identified factor:

- Regarding the size of the geographic area, including the size of wildlife habitats, likely to be affected by the impacts

> The proposed GBRP Project is a linear infrastructure project that includes a new, approximately 230 km all-season road and a new deep water port on the Arctic Ocean.
>
> Of note, the proposed activities overlap with the highly variable and important seasonal ranges of the Bathurst and Dolphin & Union caribou herds.

- Regarding the ecosystemic sensitivity of that area

> Species at risk may occur within the proposed project area. In addition, important wildlife habitats are known to occur within the spatial and temporal boundaries of the proposed project.

- Regarding the historical, cultural and archaeological significance of the area

> The cultural importance of parts of the project area has been documented in Inuit Qaujimajatuqangit (IQ) and traditional knowledge studies. Archaeological sites have been recorded within the project area indicating further research and study is required to predict archaeological significance.

- Regarding the size of the human and the animal populations likely to be affected by the impacts

This project is proposed in a remote area, distant from existing human population centres: it is therefore unlikely to directly affect existing human populations, although a small number of individuals who live or seasonally use areas in proximity to the project could be affected. On the other hand, the project is expected to provide a number of benefits to Inuit and Nunavummiut through improved access to goods and services through overland access and improved marine access.

Based on studies integrating traditional knowledge and years of collar data, the project is located in an area that is often part of the highly variable seasonal range of the Bathurst and Dolphin & Union caribou herds.

- Regarding the nature, magnitude and complexity of the impacts, the probability of the impacts occurring, the frequency and duration of the impacts, and the reversibility or irreversibility of the impacts

The GBRP Project is intended to achieve positive socio-economic benefits for the entire population of the Kitikmeot region, which has over 6500 residents, through improved overland and marine access, as well as through employment and contracting opportunities.

The GBRP Project is proposed in an area used by important wildlife, especially caribou. We will implement measures to address the Nunavut Agreement principles of wildlife conservation. We will use innovation to design and construct the road in ways that minimize obstruction impacts to caribou and we will use innovative management tools to control road operation and access and use of the infrastructure once it is constructed. Our key management goal is to employ as many tools as are necessary to help avoid any significant irreversible adverse impacts to caribou and other key species.

- Regarding the cumulative impacts that could result from the impacts of the project combined with those of any other project that has been carried out, is being carried out or is likely to be carried out

As a result of environmental protection measures and timing of project activities, combined with few other activities in the region, construction of the facilities alone is unlikely to result in cumulative impacts.

Cumulative impacts will result from the future operation and use of the road and marine facilities. At this time, the number of reasonably foreseeable future users of the facility is limited. From the private sector, it is reasonably foreseeable that construction and operation of the Izok mine will result in use of the facilities. We will be actively managing and regulating their use to reduce the potential for project effects and associated cumulative effects.

1.1.3 Public Interest in the Project

We recognize that there is significant public interest in the GBRP Project, related to its scale, location, potential for impacts on sensitive wildlife, and implications for the local, regional and territorial economies. To confirm this interest and better understand the environmental and socio-economic issues the project raises, the public has participated in the following ways:

- Consultations with KIA's Inuit membership in KIA-held meetings as part of KIA's governance;
- Meetings with stakeholder and community groups based in the Kitikmeot region;
- Meetings with Nunavummiut in other regions of Nunavut;
- Meetings with Indigenous organizations and other stakeholder groups in adjacent jurisdictions, including the Northwest Territories; and
- Obtaining feedback from federal, territorial and Institutions of Public Government through direct meetings and through the Interagency Coordination Group established by the co-proponents.

We intend to continue with these engagement efforts to generate a comprehensive list of issues and concerns, provide approaches and measures to address these concerns for the purposes of obtaining feedback on the perceived efficacy of proposed management measures and continuing to engage until the issues are reasonably addressed. More details on public participation are presented in Section 4.

1.1.4 Position of the Proponents on Future Review of the Project

Having regard for the scale of the project and the sensitivity of wildlife in the area, the proponents jointly accept the need to subject this project to an environmental assessment. As described in the Nunavut Agreement, this could proceed as a review led by the NIRB (Part 5) or a panel review (Part 6). The minister of INAC will make this determination after screening of the Project Proposal by NIRB. Throughout this project proposal, we have presented information that is based on the assumption of the project being subject to a Part 5 review.

The fundamental question in determining whether and how this project may proceed is:

> "Will this project cause significant adverse ecosystemic or socio-economic impacts or significant adverse impacts on wildlife habitat or Inuit harvesting activities?"

We believe that an environmental review will ensure appropriate consideration of potential effects and the development of the best overall design and operation of the GBRP Project. We also support an environmental review as a credible way to promote meaningful opportunities for public input and community consultation within both Nunavut and the Northwest Territories.

1.1.5 Environmental Impact Statement Guidelines

When appropriate, we welcome the opportunity to begin work with the NIRB to develop the draft and then final environmental impact statement guidelines that should guide the review of this project.

1.2 PROJECT PROPONENTS

We are the Government of Nunavut (GN) and the Kitikmeot Inuit Association (KIA). We are the co-proponents and future stewards of the Grays Bay Road and Port Project (GBRP Project), a major transportation infrastructure project to be located on a combination of crown and Inuit Owned Land in the Kitikmeot region of western Nunavut. The GBRP Project will empower Inuit and the GN with the opportunity to pursue their joint vision of responsible development especially on Inuit Owned Land. We take this responsibility seriously.

Our respective roles and responsibilities are set out in a Memorandum of Understanding that was signed on July 10th, 2016 in Cambridge Bay.

1.2.1 The Government of Nunavut

The GN is Nunavut's territorial government. It represents its Inuit and non-Inuit constituents through its democratically elected, consensus-based legislature. The GN is the only government with exclusive responsibility to govern and regulate the entirety of Nunavut. The GN also has lead responsibility to foster sustainable economic and community development across the territory. As a public government with authority over key areas such as wildlife, environment protection and socio-economic well-being, the GN will assume a leading role in regulating and managing any potential environmental and socio-economic impacts of the GBRP Project.

Nunavut is the only province or territory that is not linked to Canada's National Highway System. The lack of any link restricts overland transportation of goods in and out of Nunavut. Improved road connections are expected to help diversify the Nunavut economy through expanded renewable and non-renewable resource development, as well as providing benefits to other Canadians. Additionally, economic diversification would aid Nunavummiut in becoming more self-reliant, and improve standards of living and the quality of life for families.

Given the core importance of transportation infrastructure to Nunavut's economic well-being, the GN has joined with the KIA on the GBRP Project as part of the GN's efforts to advance its mandate to strengthen Nunavut's economy, ensure the safe and effective movement of people and goods, and implement the Nunavut Agreement's principles concerning management and conservation of land, water, and resources, including wildlife conservation. The GN's role as project champion and co-proponent is driven in part by *Sivumut Abluqta—Stepping Forward Together* (Government of Nunavut 2014), which is the Vision and Mandate of the Fourth (and current) Assembly of the Legislative Assembly of Nunavut. The *Sivumut Abluqta* mandate sets out four "thematic priorities:"

1. Self-reliance and optimism through education and training
2. Healthy families through strong and resilient communities
3. Economic growth through responsible development across all sectors
4. Good government through wise use of resources

Among other things, *Sivumut Abluqta* directly highlights the issues of Arctic sovereignty, growth of shipping in Arctic waters, the responsible development of mineral and petroleum resources, and the dependency of Nunavut's targeted economic growth on the development of transportation infrastructure – all issues that the GBRP Project directly seeks to address.

Based on *Sivumut Abluqta,* the GN prepared the "Four Steps Forward" document which outlined the GN's proposal for transportation infrastructure funding under the New Building Canada Fund - National Infrastructure Component. *Four Steps Forward* builds from the mandate of *Sivumut Abluqta*. It recognizes that growth in the territory's economy depends on the development of transportation infrastructure, and that to step forward, partnerships are required between the GN and regional Inuit organizations, other stakeholders, and Canada. The GBPR was one of four priorities identified in *Four Steps Forward*.

The GN also finds support for the GBPR project in four priority areas set out in "Canada's Northern Strategy: Our North, Our Heritage, Our Future" (2009):

- Exercising our Arctic Sovereignty
- Promoting Social and Economic Development
- Protecting our Environmental Heritage
- Improving and Devolving Northern Governance

1.2.2 The Kitikmeot Inuit Association (KIA)

The KIA was incorporated in 1976 and represents the approximately 6000 Inuit beneficiaries of the Nunavut Agreement who reside in the Kitikmeot region of Nunavut. Through the authority of the Nunavut Agreement, the KIA is the largest private land owner in the Kitikmeot region. The KIA administers and manages the surface rights and use of 106,360 km^2 of Inuit-owned Land (IOL) for the benefit of its membership.

The KIA has important responsibilities regarding the management of IOL and associated wildlife in the Kitikmeot region. KIA also promotes social and economic development, employment training, culture and language, and the development of Inuit leadership. KIA advocates for, and delivers services and programs in these mandated areas.

In joining with the GN on the GBRP Project, the KIA seeks to substantially advance its mandate, which is "to manage Kitikmeot Inuit lands and resources, to protect and promote the social, cultural, political, environmental and economic well-being of Kitikmeot Inuit".

KIA's role as a proponent of the GBRP Project has been confirmed at its highest level of decision-making authority, its Annual General Meeting (AGM). In 2016, all elected board members and delegates representing elders, women and youth from each of the five Kitikmeot communities unanimously passed a resolution endorsing the KIA's role as co-proponent of the GBRP Project.

The KIA will also have a lead role in managing the potential effects of the GBRP Project. Because Inuit culture is inherently connected to the land, KIA places considerable importance and resources on land and wildlife management. A key goal of the KIA is to carefully manage the land and resources in its trust to promote sustainable development and bring substantial benefits to the Kitikmeot Inuit, while protecting the wildlife and environment for generations to come.

1.2.3 Legislative Authorities and Responsibilities

The Nunavut Agreement (1993, as amended in 2010) established the boundaries of the Nunavut Territory, and set out the governance structure for the Territory. It thus established the Government of Nunavut, and other institutions such the Nunavut Wildlife Management Board, the Nunavut Impact Review Board, the Nunavut Planning Commission, the Nunavut Trust, and the Nunavut Water Board. The Nunavut Agreement also laid out the principles for aspects such as wildlife conservation and compensation, the establishment of parks and conservation areas, land and resource management, land use planning, resource royalty sharing, Inuit impact and benefit agreements, and taxation.

Under the Nunavut Agreement, we co-proponents possess substantial powers to regulate and enforce land use, and wildlife management during all stages of the Project, including during construction but also, and perhaps most importantly, during project operations. This ability sets us apart from typical project proponents in Nunavut. Industrial and government entities wishing to use the GBPR for their projects or programs will have to abide by the management, legislative and regulatory standards set out by us, and this will also include future modifications to these instruments based on ongoing monitoring and the resulting adaptive approaches.

Uniquely, we both have a long-term burden of performance that far exceeds the burden that most proponents of northern development face. We are accountable to our constituents and, of necessity, must continue to try to ensure that all issues are identified and properly addressed over the life of the project. This direct accountability of the co-proponents to all Nunavummiut provides a unique guarantee of effective execution of the project.

1.2.3.1 Achieving the Objectives of the Nunavut Agreement

The objectives of the Nunavut Agreement, as set out in its preamble, are to:

- “provide for certainty and clarity of rights to ownership and use of lands and resources, and of rights for Inuit to participate in decision-making concerning the use, management and conservation of land, water and resources, including the offshore”;
- “provide Inuit with wildlife harvesting rights and rights to participate in decision- making concerning wildlife harvesting”;
- “provide Inuit with financial compensation and means of participating in economic opportunities”; and
- “encourage self-reliance and the cultural and social well-being of Inuit”.

To reflect the objectives and requirements of the Nunavut Agreement, we intend to implement the GBRP Project through meaningful Inuit decision-making regarding the use, management and conservation of land, water, and resources. The Project will also help to provide the catalyst through which Inuit and other Nunavummiut can gain long-term employment, develop capacity, and generate personal wealth.

Unlike most proponents of major project development in Nunavut, we co-proponents each have legal responsibilities to implement the Nunavut Agreement. This includes upholding the principles of sustainable management and conservation of land, water, wildlife and other resources. It also means providing Inuit with means to participate in economic opportunities, and encouraging self-reliance and the cultural and social well-being of Inuit. As mentioned above, we are both directly accountable to our constituents and membership for fulfilling these responsibilities effectively.

Even though we anticipate that this project will deliver substantial economic and social benefits, we also recognize that all such benefits must be considered against the conservation imperative set out in the Nunavut Agreement, particularly as it concerns the Bathurst and Dolphin & Union caribou herds and other sensitive wildlife species in the project area.

We believe that our ability to manage development responsibly by executing our respective authority over key challenges and issues, complimented by rigorous regulatory oversight from the NIRB and other authorities, will result in the design and implementation of a suite of innovative tools and approaches that will mitigate any potentially significant adverse effects. Ongoing environmental and social monitoring will inform an adaptive management strategy to modify existing programs and, as necessary, add additional mitigation and management measures.

As we work together to achieve these objectives, we have relied and will continue to rely on many sources of information, including: Inuit Qaujimajatuqangit; the traditional knowledge of other potentially-affected Indigenous groups; and, the broader knowledge of Nunavut communities and the Nunavummiut. This information, together with western scientific information from field studies, and existing studies[1] will be used to prepare a comprehensive environmental assessment to address effects associated with the GBRP Project, as well as cumulative effects.

1.3 GENERAL PROJECT DESCRIPTION

A detailed description of the proposed GBRP Project is provided in Section 2.

[1] Including MMG Limited's proposed Izok Corridor Project which is proposed within the same region as the Grays Bay Road & Port Project

1.3.1 Works and Undertakings Forming Part of the Project

The principal components of the GBRP Project are the following physical works and undertakings:

- construction and operation of an approximately 230 km all-season controlled access road from Grays Bay, Nunavut to the Jericho Mine site, Nunavut (the "Grays Bay Road")
- construction and operation of watercourse crossing structures
- construction and operation of up to 40 temporary and permanent quarries
- construction and operation of a deep water port in Grays Bay (the "Grays Bay Port") suitable for commercial shipping
- construction and operation of a small craft harbour at the Grays Bay Port
- construction and operation of temporary and permanent airstrips near Grays Bay Port
- construction and operation of materials storage, staging and handling facilities at Grays Bay Port
- construction and operation of bulk fuel storage facilities at Grays Bay Port
- construction and operation of staging and fuel storage facilities at the Jericho Mine site ("Jericho Station")
- construction and operation of temporary and permanent works to service the Project, including power, accommodation, administration, waste management, water supply, resupply, emergency shelters, operation and maintenance and emergency response facilities and telecommunication infrastructure to link GBRP Project components
- reclamation of areas not required for ongoing operations and maintenance

The GBRP Project will be connected seasonally to southern transportations systems via the TCWR.

The road and port components of the GBRP Project are considered permanent infrastructure with a design life of 75 years.

The GBRP facilities will be controlled for their access and use. No one is intended to have uncontrolled access. Equally, all commercial users of the road and/or port facilities will pay for this use. Individual users will have access to the road at no charge but will be subject to access controls.

The GN and KIA anticipate that, in most cases, the tolling regime for individual use of the road will mirror the existing tolling regime on the TCWR. This should facilitate integrated use of these facilities. The existing TCWR regime is premised on the concept of cost recovery. Cost recovery pricing considers the estimated cost of operations and maintenance expenditures, repayment of debt principal and interest, and a payment to the owners of the road. These expenses will be aggregated and applied against estimated usage to calculate a cost per tonne per kilometre for an individual commercial user of the road. Similarly, port fees will be established based on port fees already charged at smaller port sites across Canada and will include charges for docking, berthing, loading and unloading and service hook-ups. It is anticipated that aggregate usage from both the road and the port will generate sufficient revenue to provide an annual payment to the KIA over the medium and long term.

1.3.2 Excluded Activities Not Forming Part of the Project, but Considered under Cumulative Effects

We accept that the screening of this Project Proposal should include consideration of the use of the GBRP Project infrastructure by third parties including the public. These uses are not components of the Project, but are appropriate considerations in relation to the cumulative effects of the Project. The sources of anticipated cumulative effects of the Project include:

- activities of marine vessels at and around the port under the care and control of third parties
- use of the road by third party vehicles
- activities of aircraft under the care and control of third parties
- mining or exploration-related activities

For activities and projects that fall under the jurisdiction of the NIRB, proponents for these activities and projects would also have to conduct an environmental impact assessment, as well as an assessment of cumulative effects. MMG is an example of a third party that could make use of the GBRP infrastructure (Appendix 1A).

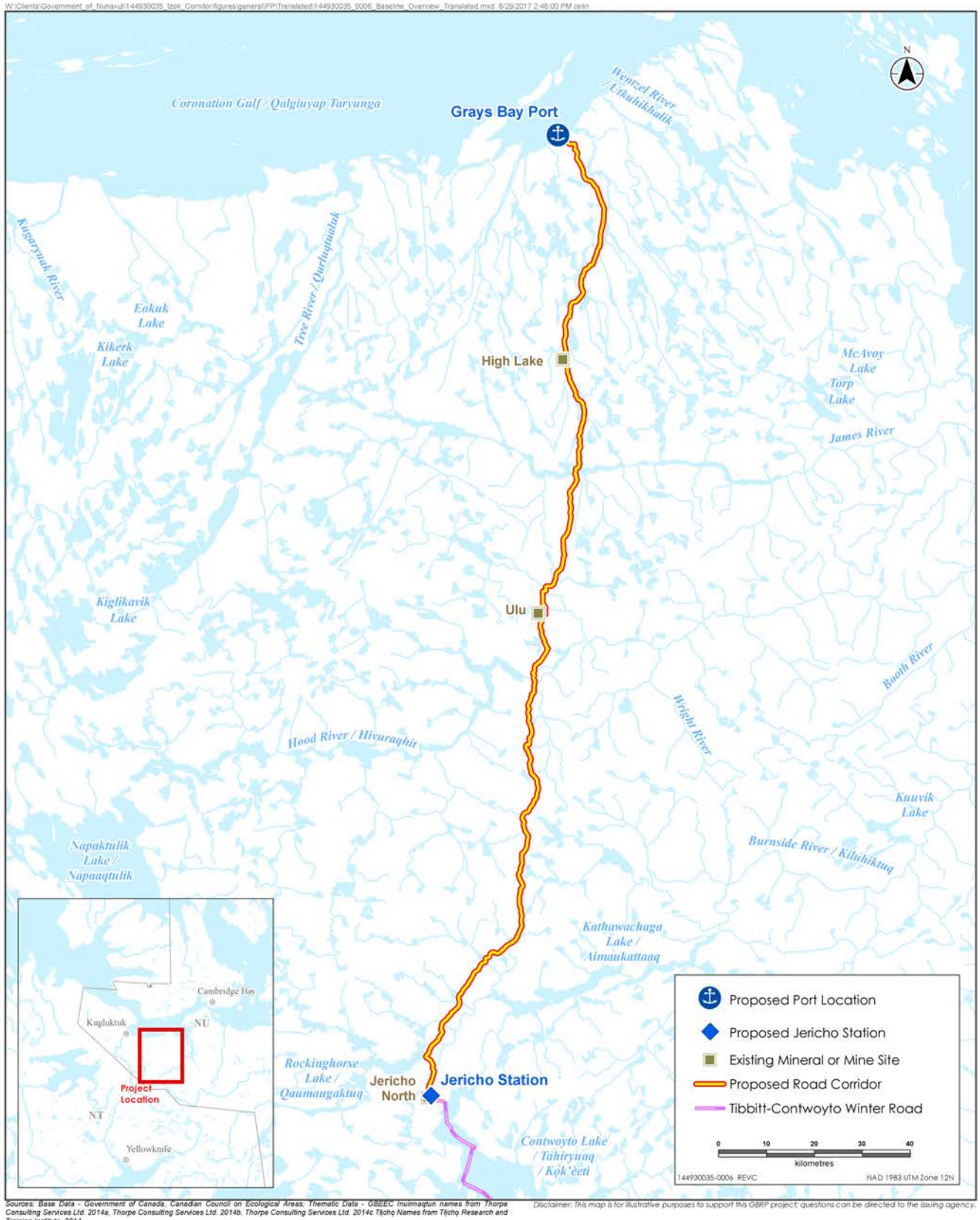
1.4 PROJECT LOCATION

The GBRP Project is entirely located within the Kitikmeot Region of Nunavut Territory as shown in Figure 1-1. Project components are located on a combination of Crown land and Kitikmeot Inuit-owned lands and in federal waters. Endpoints are summarized in Table 1-1.

Table 1-1 Project Feature Locations

Project Feature	Latitude (N)	Longitude (W)
Grays Bay Port (Wharf)	67° 48' 18.811" N	110° 52' 15.306" W
Grays Bay Road Northern Terminus	67° 47' 48.328" N	110° 51' 37.390" W
Grays Bay Road Southern Terminus	66° 0' 24.579" N	111° 27' 56.626" W

Approximately 51% of the road traverses Crown land and 49% traverses Inuit Owned Land. The port location is entirely on Crown land.



Sources: Base Data - Government of Canada, Canadian Council on Ecological Areas; Thematic Data - GBEEC Inuinnaqtun names from Thorpe Consulting Services Ltd. 2014a, Thorpe Consulting Services Ltd. 2014b, Thorpe Consulting Services Ltd. 2014c Tłı̨chǫ Names from Tłı̨chǫ Research and Training Institute. 2014

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GRAYS BAY ROAD AND PORT
ROUTE ET PORT À GRAYS BAY

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GRAYS BAY ROAD AND PORT

Project Overview

Figure 1-1

1.5 OTHER ISSUES OR CONCERNS RELEVANT TO FUTURE NIRB REVIEW AND EIS GUIDELINES

The NuPPAA makes provision for the NIRB to identify issues or concerns that should be considered in any required review. Having regard for the scope of information that may be required by future guidelines for the environmental impact statement of the GBRP Project, the current document provides preliminary information on several topics.

1.5.1 Purpose of the GBRP Project

The purpose of the Grays Bay Port and Road Project is to provide a controlled access, multi-modal transportation system to connect to existing transportation infrastructure and serve existing and foreseeable public and private needs in the Kitikmeot region. This purpose is important to both proponents. The project purpose references controlled access because this control is essential to ensure safe use of the facilities and will also assist wildlife conservation. Consistent with controlled access, industry, government, and other entities using the port and/or road facilities will pay fees to use these facilities[2]. These fees are anticipated to eventually pay for the planning, construction, and maintenance of the road, as well as for ongoing environmental monitoring and adaptive management strategies and actions.

The proponents support the application of this purpose to set the appropriate scope of the technically and economically feasible options requiring assessment.

1.5.2 Measures Proposed by the Proponents to Optimize Benefits

Subject to adherence to the Nunavut Agreement principles of wildlife conservation, the proponents believe strongly that the GBRP Project has the potential to be transformational for this area of Canada and a foundation for regional economic development in the Kitikmeot and the Northwest Territories throughout the 21st century.

The GBRP Project would provide the only road that connects Nunavut to the rest of Canada, and the only deep water port in the Canadian central Arctic. The project would provide the means to deliver substantial and broadly-based economic development within the Kitikmeot region, as well as support to community infrastructure and supply.

Currently, the Kitikmeot region experiences challenging socio-economic circumstances, featuring high levels of poverty, pervasive food insecurity, low income levels, high unemployment, housing shortages and a cost of living much higher than that found in southern Canada. The GBRP Project provides a legitimate opportunity to address the conditions that currently result in Kitikmeot communities being among the most deprived in Nunavut and Canada (See Section 6 – Socio-economic Environment).

[2] The general public will not be charged a fee to use the facilities.

Sections 1.5.2.1 to 1.5.2.3 provide an overview of anticipated project benefits.

1.5.2.1 Access to Mineral Resources

The configuration of the road is intended to take advantage of the mineral potential of the Slave Geological Province that straddles the Nunavut /NWT border. The favourable geology of this area on the Nunavut side of the border helped influence the selection of IOL during negotiations for the Nunavut Agreement. Mineral development on IOL was viewed by the negotiators of the Nunavut Agreement as a potential source of wealth for Inuit. The development of the GBRP Project would help significantly to facilitate the achievement of that vision.

There are a substantial number of identified mineral deposits and prospects along the proposed road alignment. Many IOL parcels are located on or adjacent to this corridor. The Slave Geological Province possesses similar geology to the Abitibi Geological Province that straddles the Ontario-Quebec border. The Abitibi region has spawned many producing mines during the past 100 years and continues to offer multiple opportunities for new development. The Abitibi region was initially developed as a result of the construction of the Ontario Northland railway that provided low-cost access to what had been a remote region in northeastern Ontario. Similarly, the intent of the GBRP Project is to lower the cost of access to the geologically rich interior of the Kitikmeot region.

1.5.2.2 Transportation Corridor

The proposed road is intended to be the first step in the development of an all-weather transportation corridor connecting a port on the Arctic coastline to Yellowknife. An all-weather corridor allows for seasonal access to the south and the opportunity for seasonal trucking of bulk goods to a laydown area at the port site and marine transport to the communities immediately upon ice-out, thereby facilitating lower-cost, more frequent community re-supply and improving food security. It also would benefit the construction season in the Kitikmeot region by providing for mobilization at the beginning of the ice-out season in July versus waiting for the annual sealift in September when the weather is beginning to cool; this would save a year in a typical construction schedule. Depending on economic feasibility, an ice-road network radiating from the port may offer the opportunity to provide terrestrial re-supply of bulk and perishable goods during the winter versus extremely expensive re-supply by air.

1.5.2.3 Social Benefits

We believe that through the development and operation of the GBRP Project, extensive wealth can be unlocked for the benefit of the people, the communities, the region, the territory, and the country. Some of the social benefits that we believe can be achieved include the following.

1.5.2.3.1 Reduced Dependency on Social Programs and Government Transfers

The GBRP Project offers substantial prospects for long-term, sustainable employment and business opportunities through:

- Need for local businesses and workers to construct and operate the road and port (e.g. heavy equipment operations, supply and maintenance, trucking)
- Creation of new businesses in response to infrastructure (e.g. barging companies for community re-supply, mineral exploration activities including on Inuit-owned lands, providers of tourism activities and excursions, regional logistics and expediting activities).
- Increase in number of support businesses, including professional services, based in Kitikmeot communities
- Greater personal income from employment and contracting, which should lead to improvements in housing, diet, food security, health, and greater family and community well-being
- Improved results from training initiatives as longer-term employment opportunities should replace or supplement current seasonal employment, and, through a virtuous circle, should also justify more human resource development investment by businesses and governments

1.5.2.3.2 Improved Connection to the Rest of Canada and Improved Community Resupply

The port and road infrastructure will create marine and potentially terrestrial connections within the Kitikmeot region, as well as between the Kitikmeot region and the South. This will provide a number of benefits to Kitikmeot Inuit, Nunavummiut and others such as:

- Access to the road and port (small craft harbor) by community members for local and regional use
- Potential to improve connectivity with nearby communities in Kitikmeot during the winter through development of an ice road network from the port
- Reduced cost of living and improved quality of life through earlier and potentially more consistent delivery of durable goods and construction materials
- Timely and less expensive delivery of fresh foods via winter and ice road network
- Potential future development of other linear infrastructure and services such as natural gas pipelines, electrical transmission lines; telecommunications and fibre optic cable
- Potential to eventually link to an all-weather road to Yellowknife (assuming that the Government of Northwest Territories (GNWT) advances its initiative).

1.5.2.3.3 A Potential Source of Funding for Social and Cultural Programming

User fees for the port and road will be used to pay for the costs of design, construction and operation/maintenance of the Project, including environmental mitigation and management programs, ongoing monitoring of environmental and social impacts, and adaptive management. When all other annual costs are covered, any excess user fees will be profit that flows to the Kitikmeot Trust and can be made available to:

- Support and enhance delivery of KIA's social and cultural programs; and
- Serve as future equity investment in development of new infrastructure that serves KIA's social and cultural objectives.

1.5.3 Measures to Avoid or Minimize Adverse Ecosystemic and Socio-economic Impacts

This Project will require a suite of innovative measures throughout its planning, construction, and operations to ensure that it is appropriately located, designed, and operated to meet the Nunavut Agreement principles of wildlife conservation and environmental and social sustainability.

We have used Inuit Qaujimajatuqangit, traditional knowledge and western science to better understand wildlife populations and habitat near the Project, particularly the migratory behavior, migration routes, and calving and post-calving habitat of the Bathurst caribou herd and the Dolphin and Union caribou herd. Information on caribou migration patterns is being compiled and we are committed to using the best evidence to identify successful mitigation and adaptive management measures as a means to assess the significance of residual effects.

Through proposed future workshops with traditional knowledge holders, and use of years of scientific and engineering studies, we have begun to identify specific road designs that are compatible with caribou migration. In addition, access to, and use of the road will be managed strictly to reduce effects on wildlife, especially caribou, through:

- controlled access to the road,
- restricted or prohibited road use during sensitive migratory periods, and
- annual road use plans that implement adaptive management to observe current caribou movement, anticipate future caribou movement, and prohibit access during adjacent caribou movement.

1.5.4 Alternatives to, and Alternative Means of Carrying Out the Project

This Project Proposal includes a deep water port and a 2 km wide corridor within which an all-weather road will be built. This proposal is based upon previous studies of "alternatives to" this project and "alternative methods" of carrying it out.

We co-proponents recognize that the NIRB may have an interest in reviewing both types of alternatives and therefore look forward to discussion on what information NIRB may require through future Environmental Impact Statement (EIS) Guidelines.

By way of background to this discussion, a new road-port transportation system was the preferred alternative compared to alternatives recently studied by us that was shared with Transport Canada. We would propose to use this study as the starting point for future consideration of this topic by NIRB.

There has also been extensive study of corridor options carried out over a 30-year period regarding means to connect mineral resources in the Kitikmeot region to overseas markets. This work has identified three corridor alternatives:

- A port location on Grays Bay; road connection to Jericho Mine passing near multiple tracts of IOL, High Lake and Ulu mineral sites (Grays Bay Road and Port);
- A port location at the southwest end of Bathurst Inlet/*Kilukiktuq*; road connection to Contwoyto Lake passing near Hackett River, George Lake, Goose Lake, Yava and Musk mineral sites;
- A port location 18 km east of Kugluktuk; road connection to Lupin Mine passing near the Izok mineral site.

On the other hand, the most recent work on corridor options focused on corridors that met the following objectives:

- Provide a protected deep water port on the Arctic Ocean mainland coast in the Kitikmeot Region, suitable for moorage and loading of 50,000 t bulk ore carriers and bulk storage of ore
- Provide an all-season connection to the existing TCWR within Nunavut.
- Provide potential future connection to the Izok Lake and High Lake properties and Slave Geological Province road by third parties.

Using these objectives, the Grays Bay Road and Port is the preferred corridor as it meets all three criteria. There has also been recent evaluation of route options within this Grays Bay Road corridor. This evaluation has integrated technical, environmental and economic information and has resulted in the currently preferred alignment for the Grays Bay Road.

We recognize that future review of this project will involve input from the NIRB and stakeholders, and this input is likely to include additional scientific studies and Inuit Quajimajatuqangit, and refinements of existing routing and engineering design to avoid or reduce impacts to wildlife and heritage impacts resources and to address public safety. A discussion of these considerations will be presented in the Draft Environmental Impact Statement (DEIS).

1.6 APPLICABLE LEGISLATION AND APPROVALS

Table 1-2 lists the potential authorizations applicable to the development of the GBRP Project and the agencies expected to have a role in authorizing one or more aspects.

Table 1-2 Preliminary List of Project Approvals

Authorization	Agency	Activity
Project Certificate	Nunavut Impact Review Board	All
Water License(s)	Nunavut Water Board	Watercourse crossings, watercourse training, use of water, deposits of waste
Land Use Permit(s) – Class A	Indigenous and Northern Affairs Canada	Use of explosives; use of heavy equipment; drilling; camp operation; fuel storage; earth moving; road construction
Access to Inuit Owned Land	Kitikmeot Inuit Association	Drilling; fuel storage; camp operation; road construction; quarrying; research
Land Use Lease	Kitikmeot Inuit Association	Long-term use of land for road and quarrying
Long-Term Lease	Indigenous and Northern Affairs Canada	Operation of road and port
Fisheries Act Authorization(s)	Fisheries and Oceans Canada	In-stream construction; pier construction
Navigation Protection Act Approval	Transport Canada	Construction of port and harbour
Environmental Protection Act Approval	Environment and Climate Change Canada	Dredging
Quarry Permit(s) and License(s)	Indigenous and Northern Affairs Canada and Kitikmeot Inuit Association	Quarry development
Explosives Permit and License	Natural Resources Canada	Storage, transport and use of explosives
Archaeological Permit(s)	Government of Nunavut Department of Culture and Heritage	Documentation and excavation of archaeological sites or specimens
Scientific Research License	Nunavut Research Institute	Any field investigations associated with the GBRP Project
Environmental Emergency Plan Approval	Environment and Climate Change Canada	Bulk storage of fuel
Permit to Store Detonators	WSCC	
Explosive Use Permit	WSCC	
Spill Contingency Plan Approval	Department of Environment	

1.7 PROJECT SCHEDULE

Should the project be approved, the following Table (Table 1-3) provides information on the anticipated schedule, in three phases:

- pre-construction
- construction
- operations

As it is not possible to anticipate approval or thus a date of approval, this anticipated schedule treats a future approval date as the start of the schedule (i.e., Q1 YR 1).

Table 1-3 Preliminary Schedule of Project Activities (Post-Approval)

Project Activity	Start	Duration
Pre-construction		
Detailed design	Q1 YR 1	6 months
Permitting	Q4 YR 1	12 months
Construction regulatory approvals	Q3 YR 2	
Construction contracting and procurement	Q3 YR 2	
Construction		
Materials staging for sea lift (southern Canada)	Q3 YR 3	
Materials and equipment staging Grays Bay	Q3 YR 3	
Materials and equipment staging Jericho	Q1 YR 4	
Construction	Q1 YR 4	26 months
Demobilization and Commissioning	Q2 YR 6	4 months
Operations		
Opening of port	Q4 YR 6	
Opening of road	Q1 YR 7	

Additional details regarding construction activities and operation and maintenance are provided in Sections 2.2 and 2.3 below.

2.0 PROJECT DESCRIPTION

The following sections provide more detail about Project components, the basis for their design, construction methods and timing and operations of the GBRP Project. The description is intended to provide information to inform the NIRB's screening of the Project, and to notify regulators of their potential role in authorizing one or more works or activities. Initial discussions with key regulators were held in October 2016 and in June 2017 via the Interagency Coordination Group and a Resource Development Advisory Group. Where information is not yet available as indicated, it will be provided during the environmental review of the Project, to a level of detail required to conduct an assessment of the Project's effects on the environment.

2.1 OVERVIEW

The design of the project components is guided by the following principles:

- operational and maintenance requirements
- health and safety requirements
- engineering and environmental considerations
- consideration of climate change
- public participation and engagement
- traditional knowledge
- other considerations as appropriate

The design reflects our main purpose of the GBRP Project: to create industrial and public shared use infrastructure. The design also considers, and makes use of, extensive data, information and traditional knowledge owned by and available to the KIA and previously collected through the advancement of the design and environmental reviews of the ICP. In addition to the overall project design principles, specific design considerations as set out below will apply to each of the project components.

There are three main components to the GBRP Project that are described further in the sections below: Grays Bay Port; Grays Bay Road; and Jericho Station. Additional detail regarding these project components will be provided to support the environmental review of the project. However, detailed design will be developed at a later date to support permitting and to take into account findings of the environmental review and additional information from site-specific studies and engagement with communities and regulators.

2.1.1 Grays Bay Port

The port component of the GBRP Project includes a deep water port, small craft harbour, and support facilities. The size, and configuration of these facilities are foremost determined by their intended use. The Grays Bay Port is intended to:

- support the receipt of inbound materials, supplies, goods and equipment for operations such as mining, exploration, community re-supply and other industrial or government operations
- support the staging and loading of inbound and outbound shipping containers, outbound bulk ore concentrate and inbound and outbound equipment
- support delivery and storage of bulk fuels for a broad range of commercial operations and community resupply
- provide moorage and support for all manner of commercial and government vessels on transarctic routes, including cargo vessels, cruise ships, and coast guard and military vessels during open-water season
- provide a safe harbour for small vessels
- provide year-round refuge for community-based travelers during ice-in and ice-out seasons

A conceptual port layout is presented in Figure 2-1. This layout provides a conceptual (not based on preliminary design) layout of the proposed facilities that are part of the Project design basis. These facilities consider the needs of immediate users, such as community resupply vessels, government vessels and the public. The layout is also configured to address potential future needs of commercial users, such as MMG, and therefore includes areas where site grading is part of the current scope, though no facilities will be constructed there. These areas for potential third party use are depicted in Figure 2-1. A scale model of this port was displayed at various venues including the Nunavut Mining Symposium, Kitikmeot Trade Show and Prospectors and Developers Association Conference in 2017.

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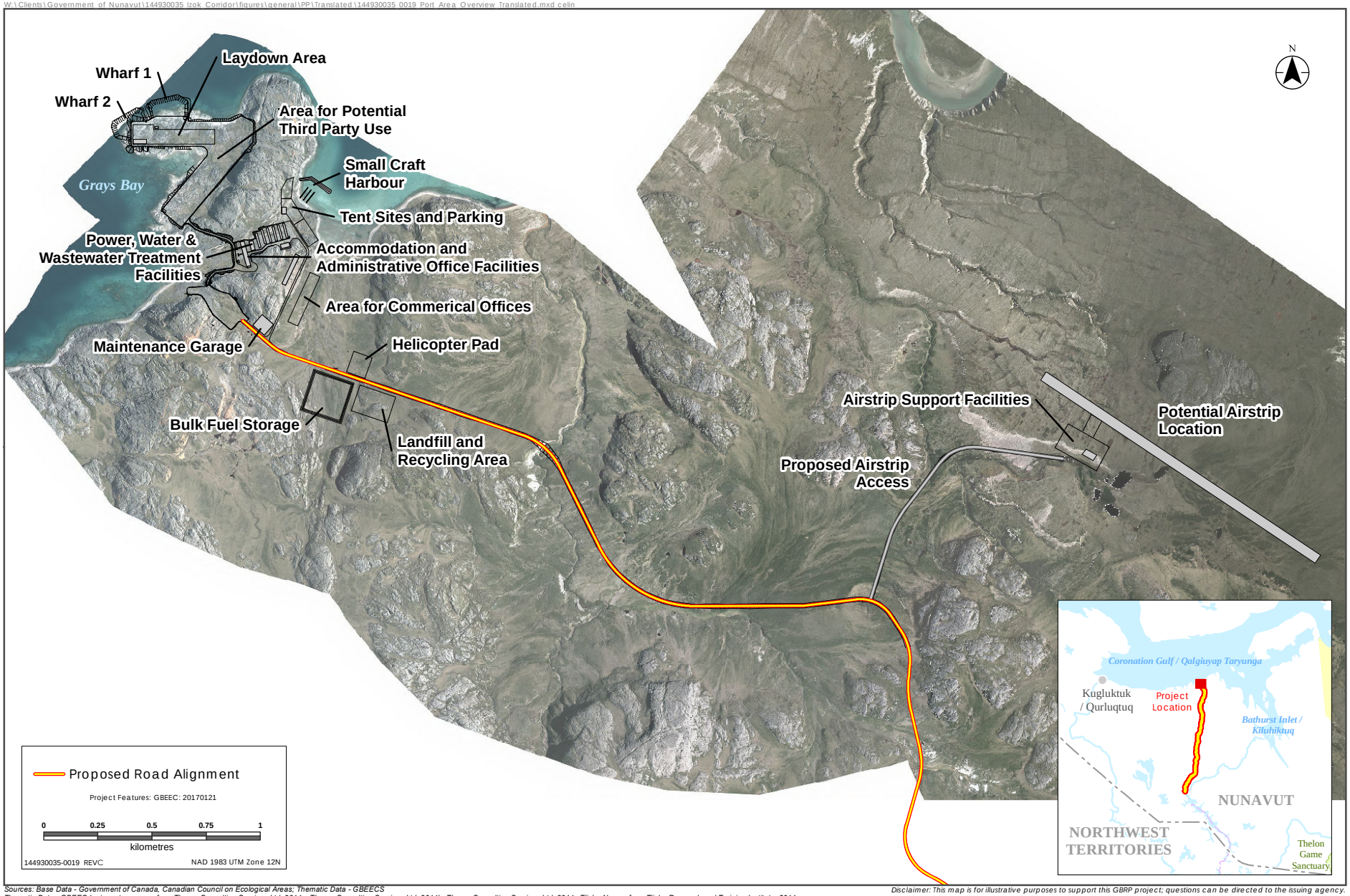

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Grays Bay Conceptual Port Site Plan

Figure 2-1

The following facilities to be constructed are required to support immediate operations:

- deep-draught wharf
- barge landing
- small craft harbour
- tent sites and refuge area
- public parking spaces and refueling station
- laydown areas for bulk goods
- bulk diesel fuel storage facility (25 million L initially with potential to expand to 100 million L)
- other fuels storage facilities (gasoline, jet fuel)
- accommodations and offices for permanent staff
- water and wastewater facilities (mechanical treatment plant or stabilization/treatment lagoon)
- maintenance garage
- diesel-fueled power generation facilities (alternative energy sources utilizing the latest technology will be examined for future consideration)
- landfill and waste management area
- communications and emergency response facilities
- temporary airstrip

Construction of land-based facilities is expected to take place year-round, whereas nearshore facilities will be constructed during the open-water season. The siting of facilities will be determined during final design, as informed by site geotechnical, oceanographic, environmental and regulatory conditions, traditional knowledge, and input from local communities.

Additional facilities will be constructed as demand requires, including:

- a second deep-draught wharf
- 75 million L of additional fuel storage
- a permanent 1,800 m airstrip
- accommodations and other commercial facilities including a hotel
- site grading for facilities anticipated to be required by potential future third party users (such as MMG)

All the facilities listed above are considered to be part of the GBRP Project. Additional details of the components of the deep water port and small-craft harbor are provided below.

2.1.1.1 Deep Water Port

The design of the deep water port (up to two wharves) is based on docking the maximum size of vessel: Post-Panamax 75,000 deadweight tonnes (DWT) Ore-Bulk-Oil ice class 1A vessel. This type of vessel is expected to be required for outbound ore from MMG's ICP. This type of vessel has a loaded draught of up to 14 m, and a length of up to 225 m. Wharves designed for this size of vessel can also accommodate other cargo vessels, tankers and barges that currently supply the Arctic.

2.1.1.2 Small-Craft Harbour

A small-craft harbour at the port site, located away from the main wharf to improve public safety, will provide safe moorage for up to 50 vessels from local communities and other travelers in the Coronation Gulf. Floating docks and a launching ramp will be available during open-water season. A breakwater may be constructed to reduce wave height within the harbour (decision pending final design). The small-craft harbour area will include a refueling station, tent and refuge area, and light vehicle parking for the public.

2.1.1.3 Landside Infrastructure

Accommodations, power, water and wastewater facilities and solid waste facilities will be designed for the permanent operational workforce of 10 to 20 persons, year-round), seasonal variability of the workforce, operational functions of the port, and potential future requirements of third party users.

The conceptual layout of the port is planned to accommodate MMG's potential needs for an ore concentrate shed, concentrate conveyor and laydown area. The manpower required to support MMG's operations will be greater than what the initial design of the port is intended to accommodate. While space is being made available to MMG, if MMG becomes a major user of the port facility, landside infrastructure requirements will need to be enhanced to reflect a much larger port site population.

A tank farm and all associated fuel systems will be constructed in stages for storage of up to 100 million L diesel, although Project needs during construction and operation will be less than 25 million L, annually.

2.1.2 Grays Bay Road

The routing and design of the all-season road component of the GBRP Project will be based on Transportation Association of Canada's designation of a "Low Volume Public Road." This designation refers to expected vehicle traffic of up to 150 vehicles per day, including both public and commercial vehicles. The design speed is 60 km/h. The design criteria (e.g., speed) may be reduced in some areas where the existing terrain and soil conditions constrain the design alignment.

A 75-year design life is applied to all road components, including embankment and crossing structures. The road is intended to facilitate economic development within the region by stimulating development of multiple known ore resources and other undiscovered ore bodies and to lower the cost of community re-supply. Neither of these activities is intended to have a limited economic life. Both the road and port are considered permanent infrastructure. Therefore, there are no plans for closure and reclamation.

2.1.2.1 Embankment

The road crest will be between 8.7 and 10 m wide, which will allow for passing lanes without shoulders. The embankment will range from 0.3 to 2 m in thickness, and will consist of rock fill, base course and surface course obtained from temporary quarries. In certain areas where geotechnical conditions allow, rock and soil cuts will be used. It is estimated that 6 million to 8 million m^3 of rock fill will be required for embankment construction obtained from roadside quarries and cut areas.

The maximum vertical slope will be 6% and the maximum cross-slope will be 2.5%.

The road design considers:

- user safety (taking into consideration that there will be considerable industrial use of the road and port)
- means to reduce potential impacts to the environment (taking into consideration the setting of this Project within a largely undisturbed environment)
- science and traditional knowledge for reducing potential effects on caribou (taking into consideration the concerns over potential effects to caribou and the considerable knowledge of Inuit and other Indigenous groups)
- best available information and best practices (taking into consideration existing standards and experience with design in tundra environments)
- optimization of construction logistics, cost and operation (taking into consideration experience with construction of infrastructure in Northern Canada)

A summary of the road design is provided in Table 2-1.

Table 2-1 Summary of Road Design Parameters

Design Parameter	Value
Standards used	Transportation Association of Canada (TAC). *Chapter H-Low Volume Roads* (TAC 1986) *Geometric Guide for Canadian Road (*TAC 2017) *Mines Health and Safety Act* of Nunavut and the Northwest Territories
Road classification	Resource Development Low Volume or Rural Low Volume
Design speed	60 km/h
Design vehicle	B-Train with side dumps; 3.3 m width, 201 tonnes gross vehicle weight
Travel surface width	8.7/10 m
Maximum gradient	6% desirable with 8% permitted for short segments
Embankment side (toe) slopes	2h:1v to 3h:1v depending on terrain and geotechnical considerations 5h:1v at caribou crossing locations
Road surfacing material	25 mm minus crushed gravel

Final values will be determined through evaluating soil and geotechnical conditions and by applying environmental mitigation measures. Four main terrain types are expected to be encountered, influencing embankment height and toe slopes:

- Terrain Type I: Exposed bedrock
- Terrain Type II: Soils with low ice content, thaw stable
- Terrain Type III: Soils with medium ice content, somewhat thaw sensitive
- Terrain Type IV: Soils with high ice content, highly thaw sensitive

Typical cross-sections for the road are provided: Figure 2-2 shows a cross-section where fill is used and Figure 2-3 shows a cross-section in which cut areas are used.

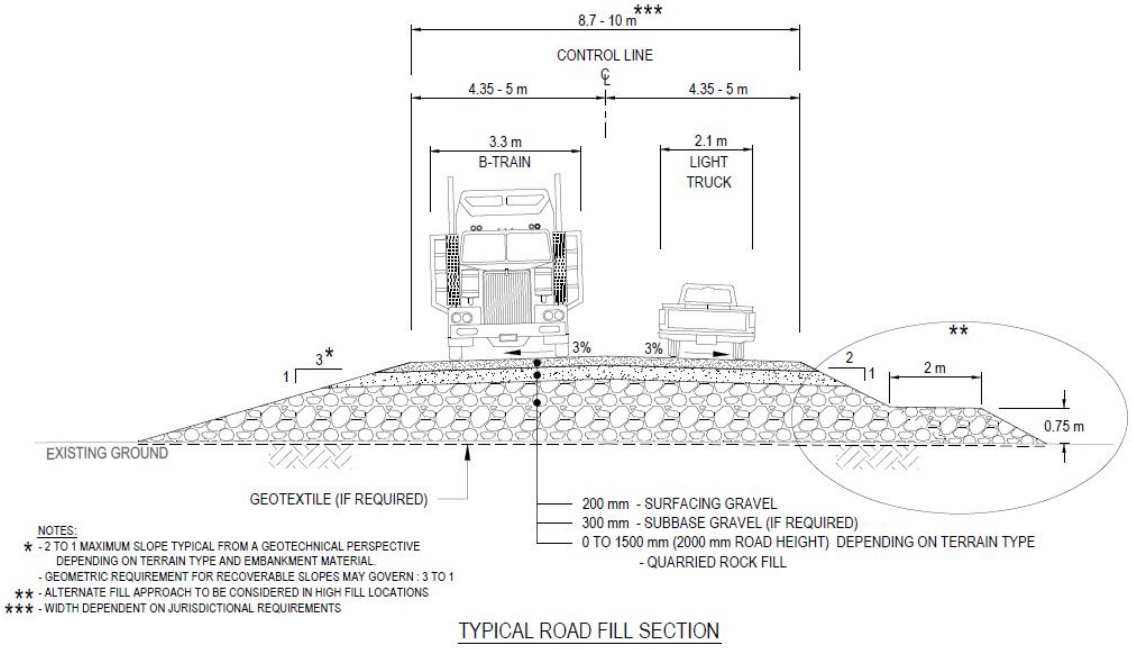


Figure 2-2 Typical Cross Section—Fill Areas

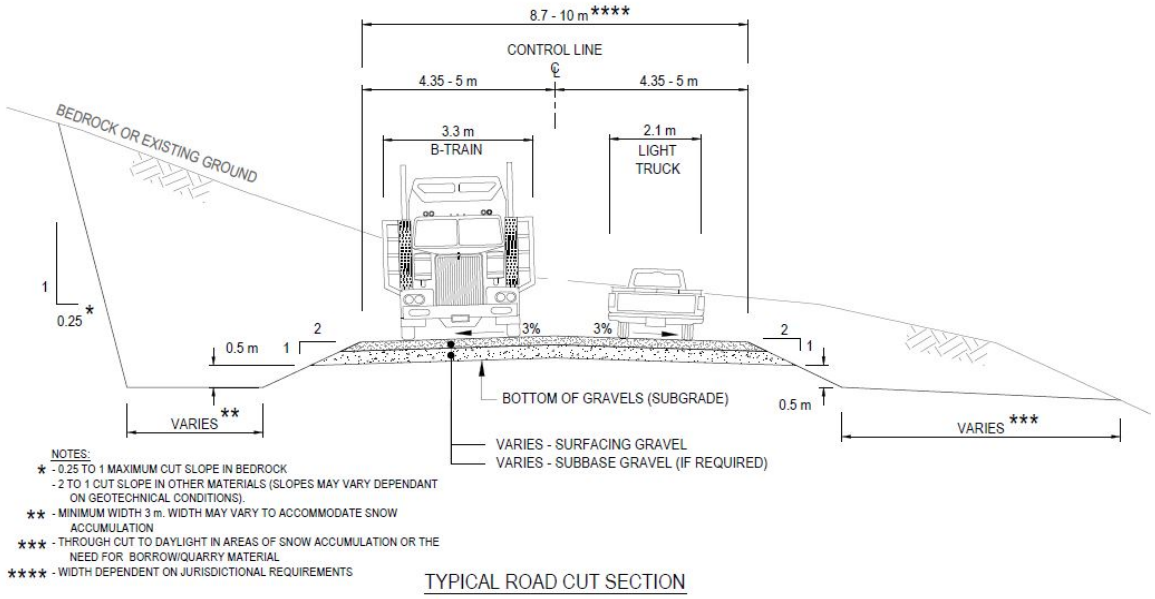


Figure 2-3 Typical Cross Section—Cut Areas

A unique feature of this road will be placing caribou crossings along segments of the alignment that overlap with the historical area of Bathurst Caribou calving and migration. Where traditional knowledge and scientific expertise identifies areas where caribou are likely to cross the alignment, we will have sections of the embankment constructed with minimum practical embankment height, shallow (5H:1V) toe slopes and 25 mm minus compacted surface material.

The design of the road, including placement and configuration of caribou crossings will continue to be developed from a preliminary status (current) until issuance for construction, conditional upon receipt of regulatory approvals.

2.1.2.2 Watercourse Crossings

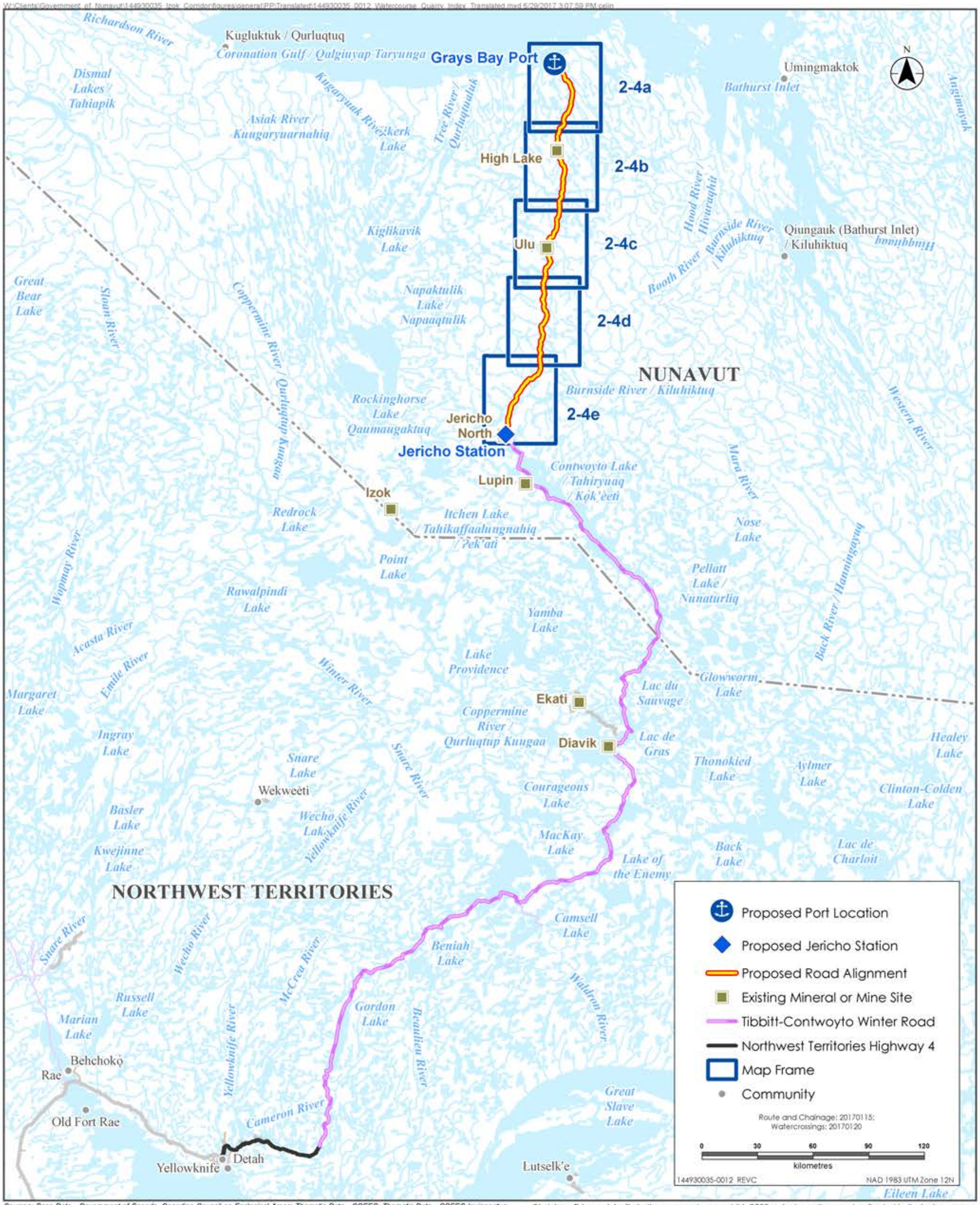
There are more than 230 watercourse crossings along the GBRP Project's length, requiring design and construction of different types of watercourse crossing structures. All watercourse crossing structures will be designed to meet 1:100-year flood events and requirements related to fish passage and fisheries protection where applicable. None of the identified crossings are over waterways designated under the *Navigation Protection Act*. Crossing structures will be designed based on hydrotechnical, fisheries, environmental and geotechnical considerations at each location.

At present, 18 major crossings have been identified that will require structures greater than a 5 m structural span (Figure 2-4 is the index map and the subfigures following provide greater detail). The structures at these locations will include single-span or multi-span bridges. Three to four of these structures will require in-stream pier construction (Burnside River/*Kiluhiktuq*, Kennarctic River/*Qurluqtuaryuk*, Crossing 68 unnamed). There will be 40 to 50 crossings requiring structures between 1.5 m to 5 m. These crossings will use bridge-sized closed or open-bottom culverts. An undetermined number of small-diameter culverts, less than 1.5 m in diameter, will be used at minor crossings less than 1.5 m in diameter and to prevent ponding along the embankment.

2.1.3 Jericho Station

Jericho Station, at the southern terminus of the GBRP Project and principal interconnection with the TCWR, will be located at, or near, the existing Jericho Mine site. Jericho Station will be a permanent truck stop and check-in point for north- and south-bound vehicles traveling the Grays Bay Road. The station will consist of vehicle parking area, permanent accommodations for two to three persons, offices, refueling facilities, refuge station and all associated water, waste and power facilities. Where possible, previously disturbed areas of the Jericho Mine site will be used to locate facilities, limited by geotechnical and access conditions, and current ownership of the site. Jericho Station will be located approximately 7 km from the shore of Contwoyto Lake/*Tahiryuaq/Kǫk'èetì*, along the winter access road.

We will determine the exact location and configuration during final design and this will be based on site investigations and input of land owners and land users.



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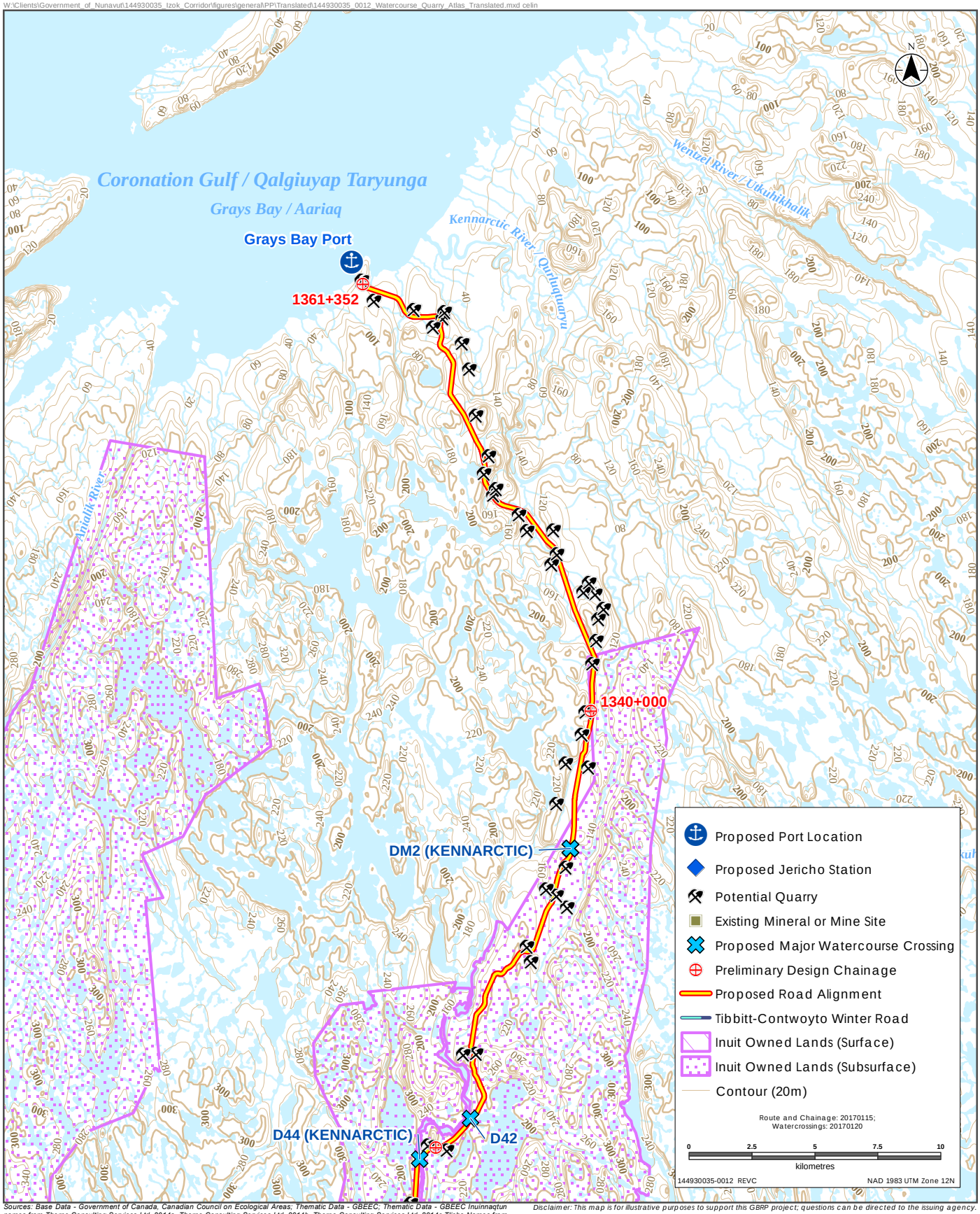
GRAYS BAY ROAD AND PORT
QURLUQTUARYUNGMI APQUTIKHANGA TULUQTAQVIKHANGA HAVAKTAKHAT
ROUTE ET PORT À GRAYS BAY

GBEEC
Grays Bay Engineering & Environmental Consultants

Proposed Watercourse Crossing and Quarry Locations
GBRP Project

GRAYS BAY ROAD AND PORT

Figure 2-4



Sources: Base Data - Government of Canada, Canadian Council on Ecological Areas; Thematic Data - GBEEC; Thematic Data - GBEEC Inuinnaqtun names from Thorpe Consulting Services Ltd. 2014a, Thorpe Consulting Services Ltd. 2014b, Thorpe Consulting Services Ltd. 2014c Tłı̨chǫ Names from Tłı̨chǫ Research and Training Institute. 2014

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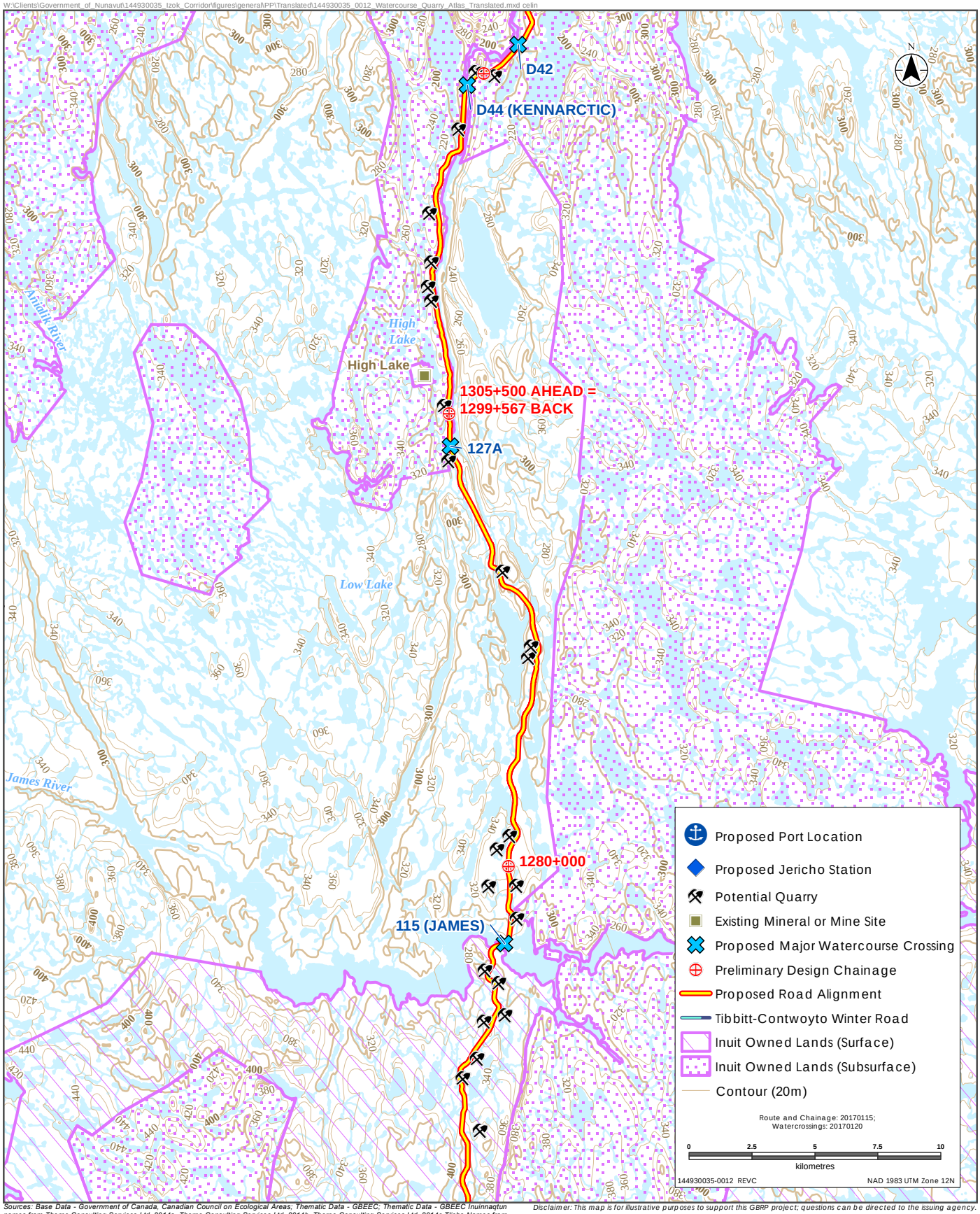
GRAYS BAY ROAD AND PORT
QURLUQTUARYUNGMI APQUTIKHANGA TULUQTAQVIKHANGA HAVAKTAKHAT
ROUTE ET PORT À GRAYS BAY

GBEEC
Grays Bay Engineering & Environmental Consultants

Watercourse Crossings and Potential Quarry Locations
GBRP Project

Figure 2-4a



Sources: Base Data - Government of Canada, Canadian Council on Ecological Areas; Thematic Data - GBEEC; Thematic Data - GBEEC Inuinnaqtun names from Thorpe Consulting Services Ltd. 2014a, Thorpe Consulting Services Ltd. 2014b, Thorpe Consulting Services Ltd. 2014c Tłı̨chǫ Names from Tłı̨chǫ Research and Training Institute. 2014

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GRAYS BAY ROAD AND PORT
QURLUQTUARYUNGMI APQUTIKHANGA TULUQTAQVIKHANGA HAVAKTAKHAT
ROUTE ET PORT À GRAYS BAY

GBEEC
Grays Bay Engineering & Environmental Consultants

Watercourse Crossings and Potential Quarry Locations
GBRP Project

Figure 2-4b

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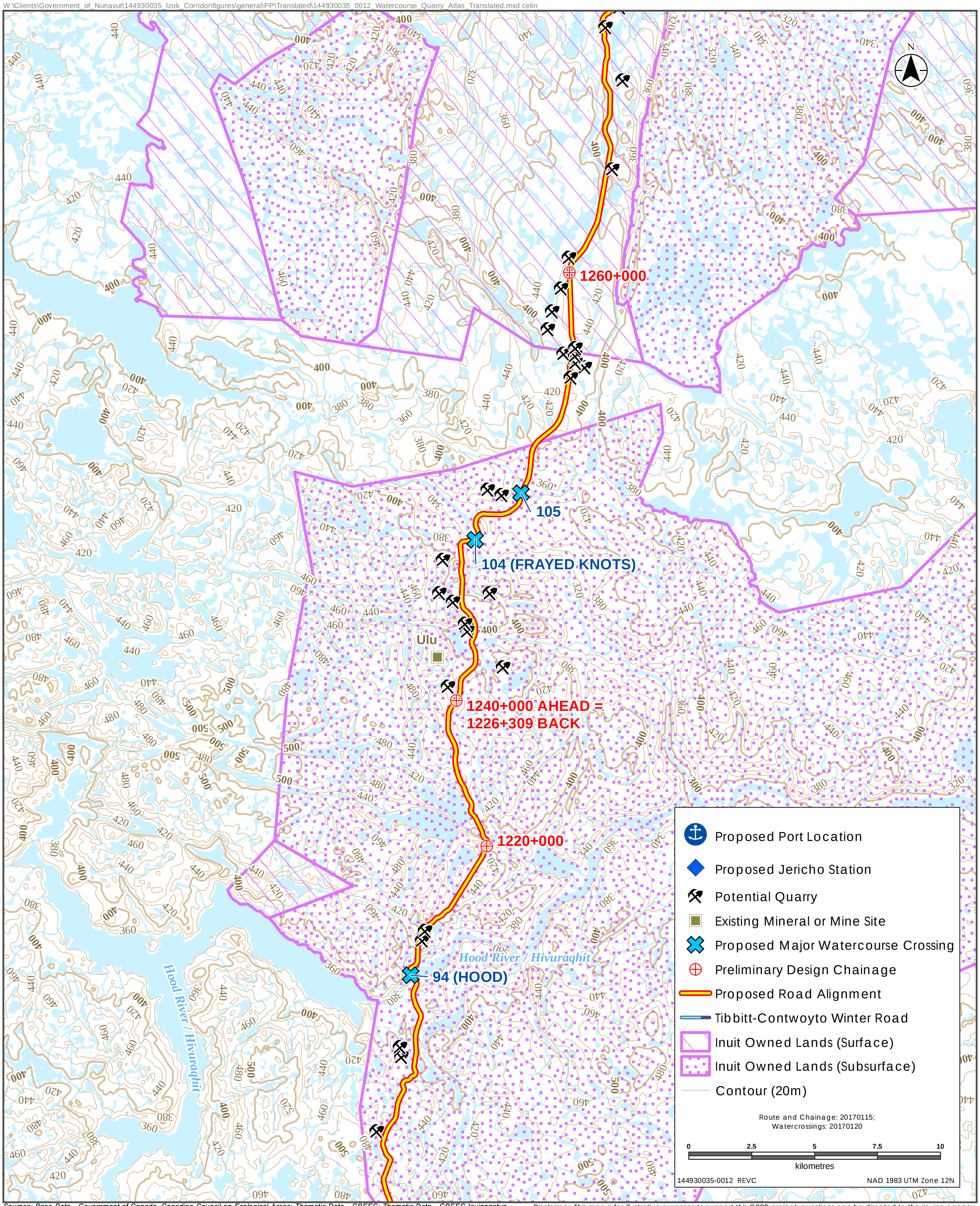

Sources: Base Data - Government of Canada, Canadian Council on Ecological Areas; Thematic Data - GBEEC; Thematic Data - GBEEC Inuinnaqtun names from Thorpe Consulting Services Ltd. 2014a, Thorpe Consulting Services Ltd. 2014b, Thorpe Consulting Services Ltd. 2014c Tłı̨chǫ Names from Tłı̨chǫ Research and Training Institute. 2014

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GRAYS BAY ROAD AND PORT
QURLUQTUARYUNGMI APQUTIKHANGA TULUQTAQVIKHANGA HAVAKTAKHAT
ROUTE ET PORT À GRAYS BAY

GBEEC
Grays Bay Engineering & Environmental Consultants

GRAYS BAY ROAD AND PORT

Watercourse Crossings and Potential Quarry Locations
GBRP Project

Figure 2-4c

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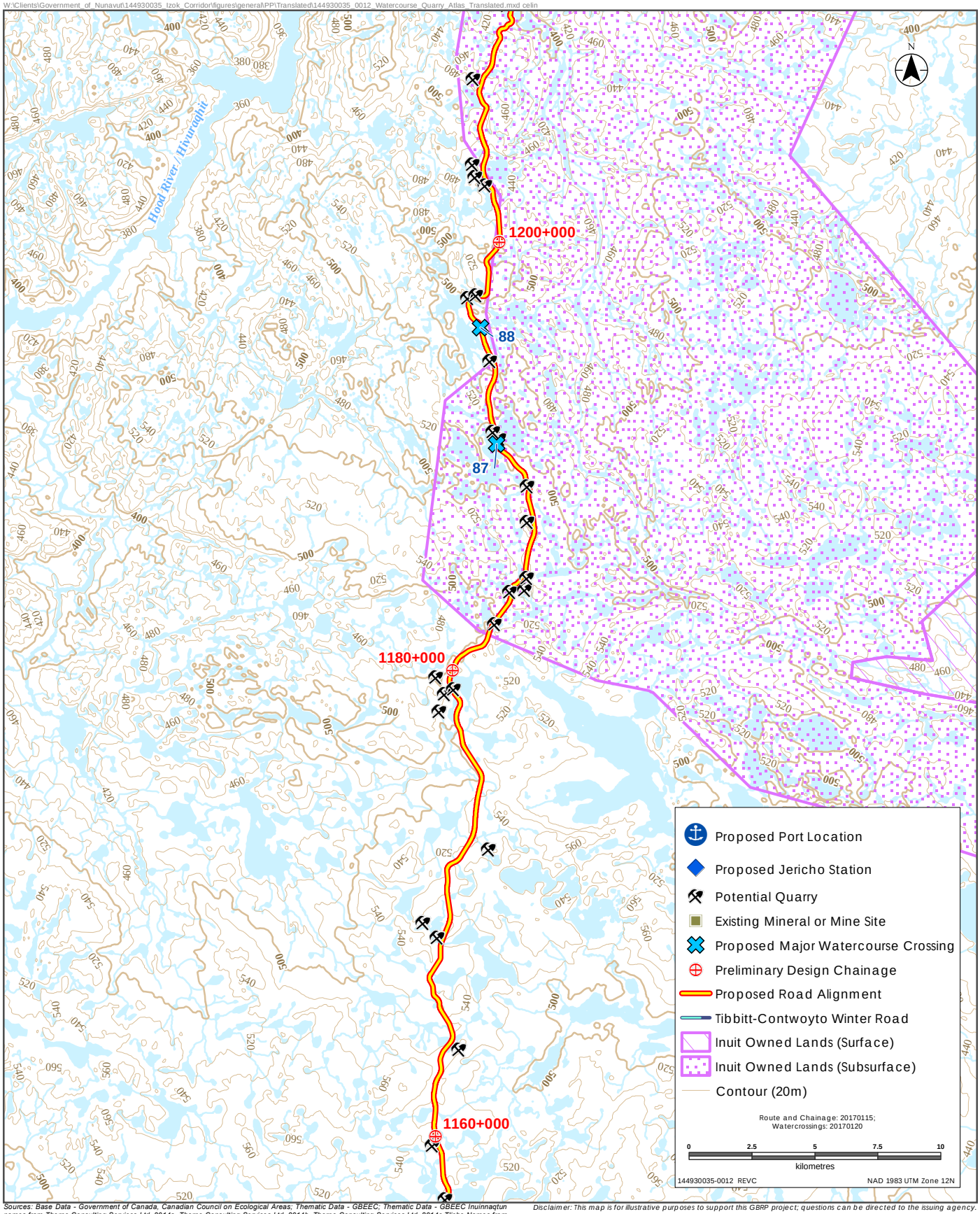

Sources: Base Data - Government of Canada, Canadian Council on Ecological Areas; Thematic Data - GBEEC; Thematic Data - GBEEC Inuinnaqtun names from Thorpe Consulting Services Ltd. 2014a, Thorpe Consulting Services Ltd. 2014b, Thorpe Consulting Services Ltd. 2014c Tłı̨chǫ Names from Tłı̨chǫ Research and Training Institute. 2014

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GRAYS BAY ROAD AND PORT
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ROUTE ET PORT À GRAYS BAY

GBEEC
Grays Bay Engineering & Environmental Consultants

Watercourse Crossings and Potential Quarry Locations
GBRP Project

Figure 2-4d

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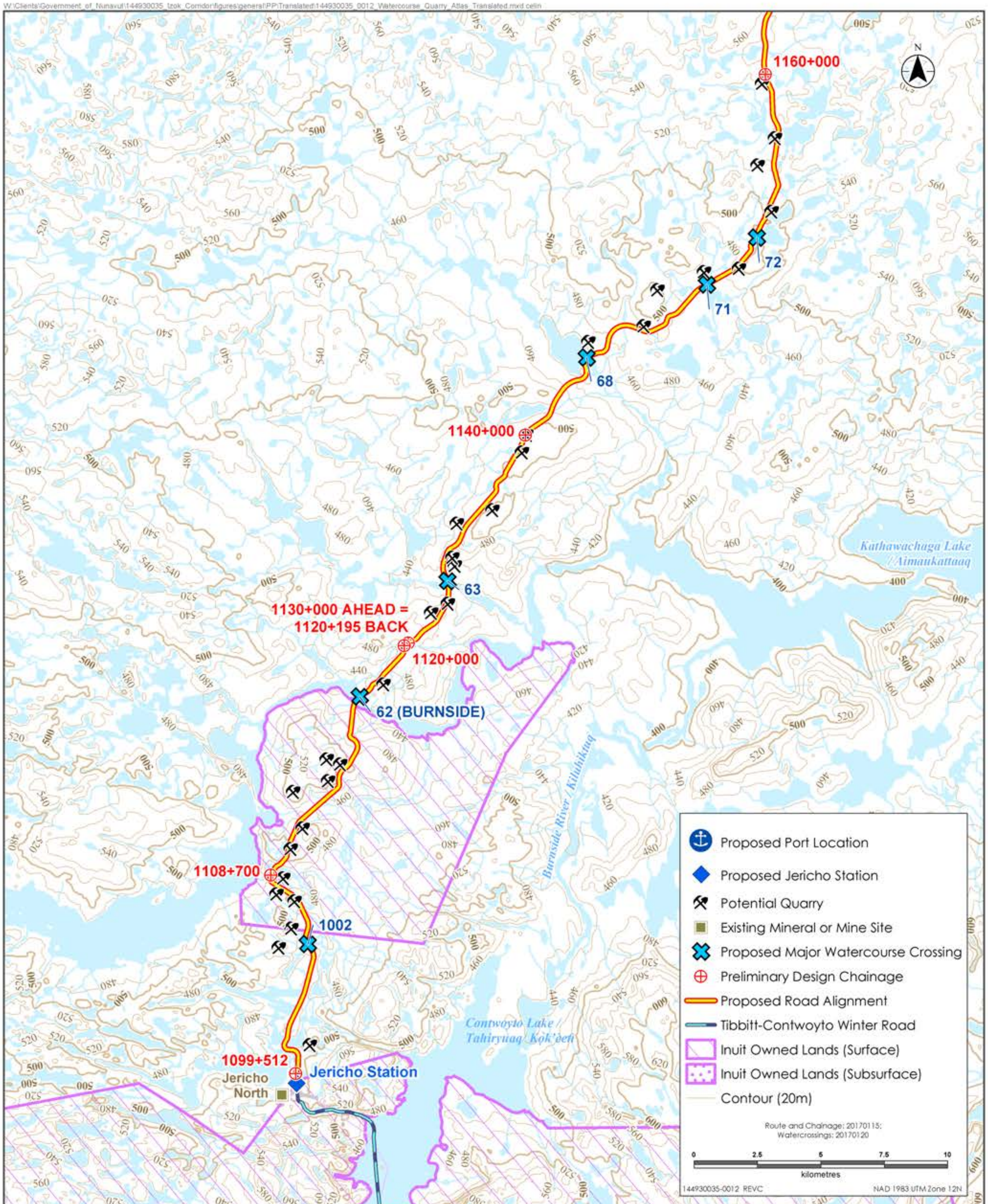

Sources: Base Data - Government of Canada, Canadian Council on Ecological Areas; Thematic Data - GBEEC; Thematic Data - GBEEC Inuinnaqtun names from Thorpe Consulting Services Ltd. 2014a, Thorpe Consulting Services Ltd. 2014b, Thorpe Consulting Services Ltd. 2014c Tłįchǫ Names from Tłįchǫ Research and Training Institute. 2014

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GRAYS BAY ROAD AND PORT
QURLUQTUARYUNGMI APQUTIKHANGA TULUQTAQVIKHANGA HAVAKTAKHAT
ROUTE ET PORT À GRAYS BAY

GRAYS BAY ROAD AND PORT

GBEEC
Grays Bay Engineering & Environmental Consultants

Watercourse Crossings and Potential Quarry Locations
GBRP Project

Figure 2-4e

2.2 CONSTRUCTION

Construction will consist of:

- staging and storage of materials, fuel, equipment and pre-fabricated components
- development of supporting infrastructure such as camps, workspaces, fuel storage areas and laydowns
- development and operation of quarries
- in-water nearshore marine dredging and wharf development
- construction of port land facilities
- construction of land facilities at Jericho Station
- construction of road embankments
- construction of watercourse crossing structures
- materials and fuel resupply
- construction of temporary winter roads
- reclamation of temporary work sites and facilities

We expect the project to employ up to 250 persons annually on a rotational basis in remote construction camps for a period of three years to four years. Construction is expected to be conducted year-round, except for seasonal shutdowns as follows:

- the road during periods of caribou calving activity, as determined by Inuit environmental monitors and regulators
- nearshore activities during periods of unsafe ice conditions

2.2.1 GBRP Project Requirements During Construction

A summary of the GBRP Project requirements during construction is provided in Table 2-2. An update of the estimated requirements for fuels, equipment and deposits of waste will be provided as additional planning and design is undertaken and will ultimately be determined by the construction contractor prior to permitting.

Table 2-2 Summary of Project Requirements

	Construction	Operations
Number of camps	Up to 4 temporary mobile camps 2 stationary camps (Grays Bay and Jericho Station)	2 permanent camps
Persons / camp	40-80	10–20 permanently at Grays Bay 2–3 permanently at Jericho Station
Water use	80,000–100,000 m^3/year maximum 600 m^3/day	<100 m^3/day
Diesel fuel	25 million L/year	<5 million L/year
Jet fuel	To be determined	5,000 L/year
Gasoline	To be determined	Approximately 5,000 L/year
Propane	To be determined	To be determined
Quarry material	6 million to 8 million m^3	Up to 100,000 m^3/year
Domestic waste	To be determined	To be determined
Sewage	To be determined	To be determined
Hazardous waste	To be determined	To be determined
Heavy equipment	To be determined	To be determined
Light vehicles	To be determined	To be determined
Drills	3–4	1–2
Rock crushers	2	1–2
Explosives	To be determined	To be determined

2.2.2 Materials and Equipment Staging

Project construction will generally be advanced concurrently from Grays Bay Port at the north end and from Jericho Mine site at the south end of the GBRP Project. Materials necessary for construction including camps, equipment, fuel, explosives, parts, supplies and pre-fabricated structures will be advanced to Grays Bay/*Aariaq* by sea lift during open water season of the first year of construction and annually thereafter. The initial staging of equipment and materials at the Grays Bay Port site will require barges to be beached on shore with ramps extended to offload mobile equipment, camp and temporary fuel storage. Upon arrival, camp facilities will be set up and made operational for a temporary workforce of 30 to 40 personnel. Permanent laydown areas will be developed for use in construction and long-term operations. A fuel storage area for temporary storage of fuel required for construction will be constructed at the site of permanent tank facilities. A fuel barge will be used to transport fuel to the Grays Bay Port site and transferred to enviro-tanks for temporary storage until a permanent facility is constructed. A temporary airstrip will be used to transport personnel to and from the Grays Bay Port site camp. It is estimated that initial mobilization will require two freighter (sealift) sailings and 60 to 100 offload barge

trips to stage materials required for the first season of construction at Grays Bay Port, Subsequent annual resupply will be by sealift and barge.

On the south end of the GBRP Project, construction materials will be transported to the Jericho Mine site on the TCWR during winter prior to construction and annually thereafter. A third party will be engaged to annually construct the portion of the TCWR from Lac de Gras to the Jericho Mine site. A short portion (7 km) of new winter road may be developed from Contwoyto Lake/*Tahiryuaq/Kǫ̀k'èetì* to the Jericho Mine site because the current configuration requires access through difficult terrain. In the vicinity of the Jericho Mine site, and to construct the Jericho Station, fuel and materials staging areas will be developed on previously disturbed areas of the mine. Up to 1,000 trucks will be required to transport construction materials and equipment during each winter road season, beginning in winter of the first year of construction.

Additional, smaller staging areas will be required to store and maintain equipment and supplies, stockpile granular material, store fuel and provide helicopter landing sites during construction. Potential locations for additional staging areas include:

- High Lake camp
- a location approximately halfway along the road, proximal to the Arctic Circle
- quarry sites

Final locations of staging areas will be determined during the design stage and will be based on the analysis of Project efficiencies, maintenance requirements and input from Inuit and other stakeholders.

2.2.3 Support Infrastructure and Activities

2.2.3.1 Camps

For each advancing construction stage (heading), we expect the project to use two mobile camps and one stationary camp. For the south-bound heading starting from Grays Bay Port, the stationary camp will be at the Grays Bay Port site. For the north-bound heading, the stationary camp will be in the area of Jericho Mine/Jericho Station. The two mobile camps will be moved as the road heading progresses in a "leap frog" pattern where one camp will be moved ahead of the other, then the process repeated. The construction workforce for the port construction will also be housed at the stationary camp at Grays Bay Port. Occupancy at any given time dependent on the pace of construction. Camps are expected to be relocated approximately every three months and their locations will be combined with other components (e.g., borrow sources) to reduce the total footprint of the Project. Camps will accommodate up to 80 people, including construction, supervisory and technical personnel that will be required for each road construction stage. Port construction will require 40 to 60 personnel.

In addition to the above accommodations, Camps will include offices, maintenance shops, equipment and material storage, fuel storage, water use, and temporary solid waste and wastewater storage facilities.

2.2.3.2 Water Use

Water will be used during construction for domestic purposes, construction of winter access and for dust control. Potential water sources will be identified as planning and design of the Project progresses, and sources will be incorporated into final design. It is estimated that 80,000 m^3 to 100,000 m^3 of water per year will be required during construction.

2.2.3.3 Waste Management

During construction, domestic, grey water and sewage waste from camps will be transported to Grays Bay Port and Jericho Mine site staging areas for treatment, incineration or backhaul and disposal at accredited facilities until permanent solid waste and sewage facilities are commissioned. The types of waste expected to be generated during construction are listed in Table 2-3. To reduce the risks of animal attraction to camps, all food and food contaminated waste will be stored in airtight sealed containers separated from other wastes. We will develop a waste management plan that will detail the types of waste to be generated and plans for on-site management of waste. The plan will include handling and disposal in a manner that will prevent discharge to the environment, reduce risks of animal attraction and promote the health and safety of personnel.

Table 2-3 Wastes Expected to be Generated

Type of Waste	Description (examples)
Camp Wastes	
Recyclable material	Paper, glass, bottles, cans, metals, certain plastics
Food contaminated	Biodegradable waste, food and kitchen waste, animal and vegetable wastes typical of restaurants, hotels, markets
Composite	Discarded clothing, non-recyclable plastics
Human waste	Sewage related, black water
Grey water	Kitchen and washing related liquid waste
Industrial Wastes	
Recyclable/reusable construction and demolition materials	Building materials.
Non-recyclable construction and demolition materials	Inert material, such as soil and granular material.
Hazardous materials	Contaminated soil/snow/water, waste fuel, used oil, other oils and lubricants, solvents, glycol, batteries, tanks and drums, propane cylinders, crankcase fluids, solvents, glycol, batteries, tank, drum, container rinsings, empty drums

2.2.3.4 Fuel

Up to 25 million L of diesel fuel will be required annually to support construction of the road and port components. At the Jericho Mine site, fuel will be either stored in fuel tanks repurposed from previous mine operations, or will require construction of a new containment facility for storage of up to 20 million L of diesel fuel. At Grays Bay Port, a permanent containment facility of initial capacity 20–25 million L will be constructed to support port operations, and this location will be used to store up to 20 million L of diesel required annually for port and road construction. Fuels required during construction will include:

- diesel for power generation, heavy equipment and light vehicle operation
- gasoline for utility vehicles, snowmobiles and boats
- jet-A and Jet-B fuel for helicopter and aircraft support operations
- propane for camp operations and heaters

2.2.4 Embankment Construction

Embankments will be constructed by “end dumping” rock fill using rigid frame or articulated rock trucks with a payload of 40 t–60 t and then pushing and leveling with a dozer to achieve the required embankment thickness. Truck turnouts will be added to the edges of the embankment at regular intervals to facilitate this construction technique and to eliminate the need for a parallel winter road. These turnouts will be spaced approximately every 50 m to meet safety requirements. The turnouts are expected to remain part of the road embankment after construction, however consideration will be given to the retrieval of the material in the turnouts if it is economically and operationally feasible. It is expected that road construction will advance 200 m to 225 m per day.

2.2.4.1 Quarries

We expect that the project will access rock fill from up to 40 quarries optimally spaced approximately 7 km apart and ideally located within 500 m of the road. Figure 2-4 (index map and subsequent submaps) shows candidate quarry locations selected based on terrain and landform mapping. Final quarry locations will be selected based on:

- proximity to the road
- ease of access
- archaeological constraints
- input from local land users
- geotechnical and geochemical characteristics
- environmental constraints
- amount of available material

We will select our final quarries based on outcomes of archaeological, environmental and geochemical site-specific investigations and input from local land users. Terrain and landscape classification conducted by MMG for the ICP (unpublished) indicate that the desired spacing can be achieved; therefore, the volume of material required for construction of the GBRP Project is available.

Quarries with local rock geochemistry indicating potential for acid rock drainage (ARD) or metal leaching (ML) will be developed with mitigation plans to reduce ARD/ML. The number of such quarries is expected to be low because best efforts will be made to not use quarries with ARD/metal leaching potential. It is intended that every third quarry (approximately every 21 km) will be developed as a permanent quarry to be used for surfacing and maintenance during operations. We will not develop permanent quarries at locations that require extensive mitigation for ARD/metal leaching materials.

Quarries not needed for operations will be reclaimed in accordance with applicable regulatory requirements and based on input from Inuit land users.

2.2.4.2 Blasting

Drilling and blasting of rock will be required at quarries and at locations of rock cut. Explosives to be used will be primarily ammonium nitrate and diesel fuel (ANFO). Storage of ammonium nitrate will be at designated rock quarries in a secured location and in accordance with the appropriate legislation and permits.

While embankment construction and blasting will take place year-round, we will take into consideration applicable sensitive periods for wildlife, fish and migratory birds.

2.2.4.3 Watercourse Crossings Construction

Watercourse crossing structures such as culverts and bridges will be constructed in winter, where possible. In areas where surrounding embankment construction is proceeding in summer, temporary bridges will be installed to facilitate continual movement of material and equipment. Where concurrent embankment construction is taking place in winter, temporary winter ice crossings will be constructed to allow movement of materials and equipment while crossings are being constructed. The exception is at certain major crossings such as Kennarctic River/*Qurluqtuaryuk*, Crossing 68 (unnamed) and Burnside River/*Kiluhiktuq*. At these locations, seasonal construction may be delayed until a permanent bridge can be established. In-stream structures will be constructed at these and any other multi-span bridge location crossings.

Culverts and bridge components will be pre-fabricated and brought to locations as part of annual staging activities using the TCWR or by sealift to Grays Bay Port.

2.2.5 Port Construction

2.2.5.1 Marine Infrastructure

Initially, we intend to construct only one wharf as part of the docking facility. The wharf will be constructed from earth-filled steel sheet pile structures designed to withstand ice crushing forces in addition to vessel berthing forces. Steel sheet piles constructed in a cellular fashion will provide a vertical wall for parallel berthing driven in a water depth to accommodate the required draught. Sheet piles will be driven by vibratory hammer into the marine soils. Earth fill material will then be placed by pushing into the sheet pile cells with bulldozers and compacted. An area around the wharves will require some dredging so that marine sediments can be replaced with crushed rock for scour protection from vessels' propeller wash. Dredged material will be disposed of on land or within the cells, depending on material characteristics determined through additional investigation. We will construct a second wharf as part of the GBRP Project only if actual user requirements necessitate. The timing of the addition of a second wharf is unknown, though the single wharf will accommodate our requirements as well as the first anticipated user, MMG.

The small-craft harbour will consist of floats anchored to ramps constructed on the beach. Floats will extend perpendicular from shore, approximately 75 m distance, and be moored with chains to permanent anchors on the seabed. This will allow for greater utility and assist with required annual removal and staging on shore for the winter season. Pending coastal studies, a breakwater may be required, which will extend approximately 200 m from shore. Breakwater construction will proceed outward from shore with a crushed fill core and armor rock slopes.

2.2.5.2 Land Infrastructure

The civil works at the port site for land-based infrastructure will consist of site grading, earthworks and building erection. Fill material will be obtained by drilling and blasting, and sourced from a permanent quarry to be established near the site. It is anticipated that most of the buildings will be pre-fabricated, modular structures.

A temporary construction camp will be established at the port site while the permanent camp is constructed and commissioned. The permanent camp will be fully equipped with offices, accommodations and kitchen, and will be serviced with electrical power, potable water and wastewater treatment facilities. Water will be drawn from an inland lake and will be trucked to the camp. Wastewater will be treated to applicable standards and discharged to the sea or overland. Options for a mechanical treatment plant or lagoon system are being considered. A solid waste facility will be constructed to accept inert waste and temporary storage of hazardous waste. We will incinerate or landfill domestic waste.

The fuel storage facility will incorporate a bermed area with an impermeable liner compatible with petroleum products as secondary containment for the tanks. The berms will be constructed out of quarried rock and crushed gravel. Depending on the size of the individual tanks, the tanks will be either built onsite or be prefabricated units. The facility will include dispensing equipment for transfer to fuel trucks. The tanks will be filled from ocean going, ice-rated tankers using a manifold located on the wharf and piped from the wharf to the fuel storage facility. Appropriate overfill protection and leak detection instrumentation will be installed in the facility. The initial bermed facility will accommodate expansion of tank capacity to 100 million L. The addition of tank capacity will be determined by our identifying commercial users who may wish to store fuel at this location.

2.2.6 Construction Sequence

The port marine, land infrastructure and road are to be mostly completed in just over two years. An initial mobilization period prior to construction will take place over six months during the first year, and demobilization of equipment and workforce will take place during the fourth year, during the same year as port commissioning. A proposed sequence (which we will finalize in the detailed construction plan) of construction activities follows:

Year 1 Summer: Materials Staging

- equipment and materials orders
- equipment staged for sea lift or barge transport
- equipment and materials arrive for unloading at Grays Bay Port site
- temporary laydown established for offloading of materials and equipment
- temporary camp established on barge or shore
- ice-reinforced fuel barge is mobilized concurrently with first sea lift with the intent of freezing in over the winter months
- enviro tanks (day tanks) are established on shore

Year 2 Winter: Construction

- temporary airstrip is established along road alignment near port site
- pad built for construction camp, supporting infrastructure installed and commissioned
- rock jetty constructed to facilitate barge offload of non-motive supplies
- initial construction of quarry site established outside blast perimeter of camp
- permanent lined or bermed fuel containment area established
- first road heading construction commences from the north
- winter road to Jericho Mine is constructed
- materials, equipment and fuel brought up along winter road
- camp and staging areas established at the Jericho Mine site
- first road heading construction commences from the south
- land-based port civil works

Year 2 Summer: Construction

- equipment, fuel and materials resupply arrive on sea lift
- dredging completed
- fill pushed out into the water in preparation for pile driving
- road construction continues southward from Grays Bay Port and northward from the Jericho Mine site
- buildings and other structural construction started

Year 3 Winter: Construction

- construct winter road to the Jericho Mine site
- resupply fuel, materials and equipment
- quarry development and construction advances northward and southward

Year 3 Summer: Construction

- sheet pile materials arrive on sea lift and are offloaded onto fill area constructed previous year
- pile driving equipment mobilized
- sheet piles driven and area behind the piles backfilled
- buildings and other structural construction completed
- selected dredging and earth moving equipment demobilized
- substantial completion achieved at port
- ongoing road and crossings construction

Year 4 Winter: Construction and Demobilization

- construct winter road to the Jericho Mine site
- resupply fuel, parts and equipment
- quarry development and construction advances to midpoint completion
- bridge crossings and culvert installations completed
- demobilize southern camp and equipment on winter road

Year 4 Summer: Demobilization

- demobilize remaining equipment on sea lift
- port facilities completed and in service

2.3 OPERATIONS AND MAINTENANCE

The facilities will operate permanently, so we do not propose to develop a closure plan for the permanent infrastructure. Areas required for construction only will be reclaimed according to permit conditions. For the purposes of operating and maintaining the road, we intend to establish an Authority, or a similar entity, which is anticipated to be wholly or partly owned by the Kitikmeot Inuit Association. A Road Management Plan will be developed and rigidly implemented for the purposes of establishing procedures for safe access, non-destructive use and the control over development tied to the road (see “Road Management Plan Framework”, below).

We will charge tolls for commercial use of the road and port facilities. We will use the revenue primarily to repay third party capital raised to cover construction costs and ongoing operations and maintenance costs. Permanent operations will include:

- administration of road and port facilities
- operation of port loading and unloading facilities and laydown areas
- bulk fuel storage and transfer
- road maintenance and monitoring, including snow clearing, grading, bridge and culvert maintenance and repair
- resupply of materials required for road and port operations (by air, sea or land)
- quarry operations
- operation of Grays Bay Port camp and supporting facilities
- airstrip maintenance and air traffic control
- staging for Kitikmeot community resupply
- operation of Jericho Station refueling, accommodation and access management facilities
- road traffic monitoring
- environmental monitoring

During operations, the port will be open to vessels only during times when no ice-breaking is required in the Coronation Gulf, which may vary from year to year, and as such, vessels will need to seek permission from the Authority to dock at the facility. Approximately 10 to 20 permanent staff will be located at Grays Bay Port to operate and maintain port facilities, and up to three staff will be located at Jericho Station.

Permanent quarries along the road will be used for ongoing road operations and maintenance such as surfacing and repair. Heavy equipment and rock crushers will be maintained at these locations to support operations. An estimated 50,000 m^3 to 100,000 m^3 of granular material will be required annually for road maintenance. Material required for maintenance will be obtained from permanent quarries established along the alignment.

These measures may include implementing seasonal shutdowns of the road and monitoring or controlling access to the road or port facilities.

2.4 ROAD MANAGEMENT PLAN FRAMEWORK

The purpose of the GBRP Project is to provide a controlled access, multi-modal transportation system to connect to existing transportation infrastructure and serve future needs in the Kitikmeot region. These needs include stimulating future resource development within a region where such activities are presently limited by the lack of infrastructure. Subject to future review and approval, the GBRP Project will reduce barriers to proximate economic development by creating infrastructure along a corridor of high mineral potential, and connect this corridor to marine and inland transportation systems. In doing so, the GBRP Project is expected to reduce the costs of logistics, supply and operations of future developments and community re-supply.

Under the Nunavut Agreement, *Motor Vehicles Act* and *Public Highways Act*, we have the authority to regulate and enforce conditions related to land access and use, resource use, wildlife habitat, public health and safety, and heritage resources within our respective jurisdictions. Our ability to make, modify and enforce regulations sets us apart from other proponents in Nunavut. Under such jurisdiction, access to GBRP facilities will be managed in consideration of:

- user safety
- reducing impacts to caribou and other wildlife

2.4.1 Safety

As will be discussed later in this proposal, the successful development of the Grays Bay Road and Port Project is likely to assist proponents of future resource projects in the region. In particular, the Grays Bay Project is likely to assist MMG with developing a positive business case to develop the Izok Lake and High Lake deposits. If MMG goes ahead with its plans, they will be extensive users of both the road and port - initially to construct their two planned developments, and over the longer term for the purposes of transporting their concentrated ore to refineries abroad. Based on existing information, the MMG project may use the road to haul ore or ore concentrate to the port on average every 12 minutes year-round. This means that, at any one time, there could be up to 20 loaded ore haul trucks heading to the port and another 20 empty trucks on their way back. Yet beyond industrial users, our plan includes public access and use of GBRP infrastructure. As public safety of a future road is our legal responsibility, we need to manage and control this access to ensure that the road remains safe for all users.

Further, our obligations to ensure safe use of the infrastructure will also require us to monitor user performance. With a road design speed of 60 km/h, we could see motivation to go a little faster to shorten the duration of the 230 km (or longer) trip, especially in the case of public users not restricted by installed vehicle speed governors. Irresponsible use could not only likely result in higher maintenance costs, but also increases the likelihood of safety incidents. It is in our economic interest to keep costs within budget based on expected road use and to maximize commercial use revenues. In this regard, we need to be able to monitor and control use of the infrastructure to ensure that the experience for all users is safe and productive.

2.4.2 Reducing Impacts on Wildlife and the Environment

The powers and authorities we plan to exercise in support of our safety objectives, will also extend to our management of development proximate to the road and port. The initial assessment (as discussed later in Section 9.2 – Cumulative Effects) of potential cumulative effects from the GBRP Project indicates that both positive and negative cumulative effects on ecosystemic valued component (VCs) in Nunavut and Northwest Territories are possible. We, the GBRP Project proponents—the KIA and GN, as stewards of their lands and resources—recognize that the mitigation of project effects on the environment is an inherent responsibility arising from our respective mandates. Therefore, our proposed road management plan will include mitigation measures based on western science, Inuit Quajimajatuqangit and traditional knowledge, and continuous monitoring to evaluate these mitigation measures for their effectiveness. Our objective will be to incorporate new technologies or knowledge for possible modification of mitigation, and to identify any changes to the effects from what were predicted.

We recognize that the GBRP Project has the potential to stimulate future development. For example, possible future users of the port and road infrastructure could include:

- mining exploration companies
- mining companies
- tourism operators
- military and Coast Guard
- researchers

Given this context of potential users and uses, we anticipate using our unique capacities to create policies and legislation in order to carry out ongoing adaptive management of the operation of the GBRP Project using innovative tools and approaches within an environmental stewardship framework. For example, we anticipate closing the road when we deem it necessary and similarly controlling access to the port by ships (such as not allowing access to ice-breaking vessels). Overall, our stewardship framework is expected to provide a forward-thinking resource management foundation to monitor key indicators, gather appropriate information, and develop innovative rules and tools to ensure that economic development and associated benefits do not harm our wildlife or environmental sustainability.

Such a management framework may initially focus on the issues most likely to be of concern, for example caribou/*tuktuit*, but may in the future, also include other important components of the environment such as water.

Management tools we can draw upon to responsibly manage development along the road include:

- Project-specific mitigation, both design and effects-based measures, to minimize the effects of the GBRP Project on the environment.
- Project-specific regulations regarding development on Inuit-owned Lands.
- regional collaborative programs or initiatives involving industry, government, Inuit and other relevant organizations, including our respective organizations.
- participation in the finalization of a Regional Land Use Plan that takes into account the intended benefits and minimizes the negative effects of the GBRP Project.
- participation in, and contribution to regional monitoring programs that use our infrastructure for access or staging.

3.0 TRADITIONAL KNOWLEDGE

The NuPPAA requires the NIRB to take into account any traditional or community knowledge provided to it during a project review (s.103(3)). Additionally, guidance provided by the NIRB to project proponents advises that the NIRB will use Inuit Qaujimajatuqangit and traditional knowledge during project screening. This provided guidance also requires that proponents state whether information was gathered through Inuit Qaujimajatuqangit and traditional knowledge.

Independent of these requirements, we co-proponents recognize that Inuit Qaujimajatuqangit and traditional knowledge comprise centuries of knowledge that, when integrated with western science can be used to optimize the development of this project and its sustainability. We have therefore sought and will continue to collect, evaluate and use Inuit Quajimajatuqanqit and traditional knowledge during all phases of the project, including its design, environmental assessment, construction, and operation Information sources

KIA possesses the most extensive repository of traditional knowledge concerning the use and occupancy of land by the Inuit of western Nunavut. Since 1996, KIA has maintained a traditional Geographic Information System (GIS) database called the Naonaiyaotit Traditional Knowledge Project (NTKP). The NTKP contains knowledge regarding wildlife, wildlife habitat and traditional land use.

The NTKP contains extensive knowledge of the Inuit who lived within and used the lands in the western Kitikmeot region. The NTKP has also been enhanced by the repatriation of information that was initially collected as part of the Inuit Land Use and Occupancy Project (ILUOP), a survey carried out in the early 1970s. The data contained in the ILUOP was broad in nature, touching on multiple features of Inuit traditional land use dating back many generations, especially concerning harvesting of wildlife and knowledge related to the behavior and abundance of wildlife.

The KIA makes it mandatory that all developers proposing major projects on Kitikmeot Inuit Owned Lands carry out traditional knowledge studies. The results of these various studies have been incorporated into the NTKP database, thus increasing the total amount of knowledge available to KIA and to other parties.

All traditional knowledge (TK) contained in the NTKP database remains the intellectual property of KIA.

Given the comprehensive nature of the NTKP database, it is a powerful tool to use for the environmental assessment, design and operation of the GBRP Project. For environmental assessment purposes, the NTKP database offers a substantial amount of data and information associated with a variety of VCs that are typically considered in project screenings and reviews. The NTKP database can also support development of management and mitigation plans that respect both Inuit values and their traditional knowledge.

Included in the NTKP database are three Inuit Qaujimajatuqangit reports prepared in 2012 and 2013 by MMG to gather information about land and marine environments, including caribou, in relation to its proposed ICP (Thorpe 2014a, b, c). In October 2016, the KIA granted use of information in these Inuit Qaujimajatuqangit reports for consideration of the planning of the GBRP Project. These studies provide information about land and marine environments related to a project with similar components and activities as the GBRP Project, including:

- information on past and existing conditions
- community and participants' experiences with other resource development projects
- concerns, recommendations, and input into mitigation measures, management strategies and monitoring.

We will provide the opportunity for participants and interviewees in MMG's process to review and update the existing reports prior to its incorporation into the environment assessment of the GBRP Project, as well as provide any additional Inuit Qaujimajatuqangit required for the GBRP Project.

Traditional knowledge information will also be sought from other potentially-affected Indigenous groups specifically for the area around Jericho Station and the interconnection to the Tibbitt to Contwoyto Winter Road. Further efforts on gathering traditional knowledge and Inuit Qaujimajatuqangit information regarding measures to mitigate potential Project effects to the Bathurst caribou/*tuktuit* herd will also be undertaken to prepare a traditional knowledge/Inuit Qaujimajatuqangit-driven risk assessment framework and risk management plan.

3.1 INUIT QAUJIMAJATUQANGIT INTEGRATION INTO PROJECT PROPOSAL

We have used available Inuit Qaujimajatuqangit along with western science, to better understand valued components of the environment in the vicinity of the Project, and how they may interact with the Project. We have paid particular attention to applying Inuit Qaujimajatuqangit to the understanding of the migratory behavior, migration routes/*aullayaaqtut*, and calving/*irniurniit* and post-calving habitat of *tuktuit* (the Bathurst caribou herd and the Dolphin and Union caribou herd). Inuit Qaujimajatuqangit contributed to the integration of caribou/*tuktuit* crossings (areas of less steep embankments) into the design of the road, and a commitment to restrict access to portions of the road during times of the year when caribou/*tuktuit* are calving/*irniurniit* in the area.

Inuit Qaujimajatuqangit also contributed to our decision to not operate the port during when full ice cover is present on the Coronation Gulf, therefore limiting potential disturbance to traditional land users, marine mammals and caribou that make use of the ice for travel during certain times of the year.

3.2 APPROACH AND METHODS

Inuit Qaujimajatuqangit and the traditional knowledge of other potentially-affected Indigenous groups, together with western scientific information from field studies and existing studies[3] will be used to prepare a comprehensive environmental assessment to help address effects and cumulative effects associated with the GBRP Project.

We will use this knowledge to support the environmental assessment for each selected VC to inform all parts of the assessment. The origin and ownership of Inuit Qaujimajatuqangit and traditional knowledge information will be acknowledged through citations throughout the text of the DEIS. Examples of where Inuit Qaujimajatuqangit and traditional knowledge information will be used include:

- In environmental baseline reports, we will use Inuit Qaujimajatuqangit and traditional knowledge information to inform the understanding of current conditions in the GBRP Project area. If species are selected based on Inuit Qaujimajatuqangit or traditional knowledge, this will be referenced.
- We will incorporate Inuit Qaujimajatuqangit and traditional knowledge into Project design where possible.
- We will include concerns and potential Project effects identified through Inuit Qaujimajatuqangit and traditional knowledge in the analysis of potential Project effects.
- We will evaluate Inuit Qaujimajatuqangit and traditional knowledge-based recommendations for mitigation and monitoring when developing mitigation measures and monitoring plans for the GBRP Project.

In addition, we will provide a separate analysis regarding potential effects of the GBRP Project on traditional land and resource use in Section 6.0. The traditional knowledge information collected from all data sources will be a key knowledge source in assessing potential effects on traditional land and resource use.

Our commitment is to develop, consider and incorporate Inuit Qaujimajatuqangit and other traditional knowledge throughout the progression of Project design and EA, and use it as a knowledge system that can enhance understanding about natural phenomena and socio-cultural aspects that are the subject of this EA.

[3] Including MMG Limited's proposed Izok Corridor Project which is proposed in the same region as the Grays Bay Road & Port Project.

4.0 PUBLIC PARTICIPATION

We co-proponents, as representatives of Kitikmeot Inuit, and GN as representatives of all of Nunavummiut, are committed to public participation. We will seek ongoing engagement with our respective constituencies and other potentially-affected parties throughout all phases of the Project, including indigenous communities in the Northwest Territories.

This section summarizes activities and results of our engagement activities to date and outlines plans for future engagement.

4.1 ENGAGEMENT

4.1.1 Kitikmeot Inuit

KIA has focused on engaging with its Kitikmeot Inuit membership on this Project for more than three years prior to beginning the formal engagement process described in Section 4.1.2, below. These prior engagements have included keeping our board members informed and updated during quarterly board meetings about the Project's business model and progress, keeping the delegates to the Annual General Meeting informed about the same on an annual basis and offering public access to board meetings during which the GBRP Project is discussed.

KIA's governance structure supports the organization's ability to deeply engage with its membership in a highly accountable manner with respect to the GBRP Project. Kitikmeot Inuit select our Board Members by democratic vote. Unlike most proponents executing a regulatory process, elected KIA personnel can be voted out of office.

KIA's efforts to specifically engage its membership in respect of the GBRP Project represents is only a small component of our over-all engagement with our membership. We have tools and resources at our disposal to support efforts to engage with our membership on a wide range of issues, these include but are not limited to:

- presence of Community Liaison Officers (CLOs) in each community who serve as a first point of our contact with KIA's membership
- a dedicated Planning and Communications Department
- regularly scheduled KIA Board meetings in all communities that are open to all KIA members
- an annual general meeting with representatives within each of our Kitikmeot communities in addition to community board members and the elected President and Vice Presidents.

4.1.2 Formal Engagement

Between September 2016 and June 2017, we initiated formal Project-specific engagement activities regarding the GBRP Project in accordance with our Engagement Plan. This engagement included a community tour of the Kitikmeot region, led by senior KIA leaders and several meetings with Yellowknife-based organizations. A summary of our community engagement activities conducted to date is presented in Table 4-1.

Table 4-1 Engagement Record for the GBRP Project, 2016

Community	Date and Time	Group
Taloyoak	November 21, 2016	Hamlet Council
	November 21, 2016	Spence Bay Hunters and Trappers Organization
	November 21, 2016	Netsilik School
	November 21, 2016	Public Open House
Gjoa Haven	November 22, 2016	Hamlet Council
	November 23, 2016	Hunters and Trappers Organization
	November 23, 2016	Qiqirtaq Ilihakvik School
	November 23, 2016	Public Open House
Kugaruuk	November 24, 2016	Hamlet Council
	November 24, 2016	Public Open House
	November 25, 2016	Kurairojuark Hunters and Trappers Organization
	November 25, 2016	Kugaardjuq School
Kugluktuk	November 29, 2016	Kugluktuk Angoniatit Association Hunters and Trappers Organization
	November 29, 2016	Hamlet Council
	November 29, 2016	Kugluktuk High School
	November 29, 2016	Public Open House
Cambridge Bay	December 1, 2016	Hamlet Council
	December1, 2016	Kitikmeot Socio-economic Monitoring Committee
	December 1, 2016	Public Open House
	February 6, 2017	Ekaluktutiak Hunters and Trappers Organization

In addition to meetings held in the Kitikmeot communities, our engagement activities for the GBRP Project in 2016 and into 2017 also included:

- Kitikmeot Inuit Association Annual General Meeting (October 5, 2016)
- Nunavut Tunngavik Inc. Annual General Meeting (October 20, 2016)
- Meeting of the Interagency Coordination Group (October 20, 2016)
- Presentation to the Geoscience Forum (November 14, 2016)
- Meeting with the Tlicho Government Executive Committee (November 14, 2016)
- Meeting of the Interagency Coordination Group (November 29, 2016)
- Presentation to Industry at Cordilleran Round-up (January 21, 2017)
- Presentation at the Prospectors and Developers Association of Canada Conference (March 6, 2017)
- Presentation to the GN's Sustainable Development Committee (March 10, 2017)
- Presentation to the Partners for Innovation in Northern Infrastructure Development and Economic Progress (PINIDEP) Workshop (April 13, 2017)
- Presentation to Resource Development Advisory Group consisting of potential regulators of the project (June 19, 2017)
- Meeting with the Slave Geological Province Road Working Group within the Government of the Northwest Territories (June 19, 2017)
- Meeting with the Deputy Ministers Committee within the GNWT (June 19, 2017)
- Meeting with Department of Environment within the GNWT representatives (June 20, 2017)
- Meeting with Executives of the North Slave Métis Alliance (June 22, 2017)
- Meeting with the Chief of N'Dilo (Yellowknives Dene First Nation) (June 23, 2017)

Through our efforts, both the Kitikmeot Inuit Association Annual General Meeting and the Nunavut Tunngavik Inc. Annual General Meetings passed resolutions unanimously endorsing KIA's role as co-proponent in the GBRP Project. The unanimous resolution passed at our AGM was particularly meaningful because of the unique governance structure of the AGM. At KIA AGMs, in addition to an elected board member, each of the five Kitikmeot communities sends delegates representing elders', women's and youth constituencies—all who have a vote on all resolutions proposed. The unanimous passing of the resolution confirmed the broad level of support that exists among Kitikmeot Inuit beneficiaries for the GBRP Project.

In addition, we have letters of support for our role as co-proponent from the Hamlet Councils of Gjoa Haven, Kugluktuk and Cambridge Bay and the Hunters and Trappers Organization (HTOs) of Kugaaruk, Kugluktuk and Cambridge Bay. We recognize that these letters are preliminary and do not represent final positions. Nevertheless, we believe that these letters certainly demonstrate the willingness of the respective letter writing organizations to be engaged in all necessary discussions. This level of engagement will enhance the process of addressing key issues and concerns.

We have also met regularly with regulators. To assist with these efforts, we have established an Interagency Coordination Group, consisting of representatives of the Kitikmeot Inuit Association, Institutions of Public Government; agencies and departments of the federal and territorial (Nunavut and Northwest Territories) governments; and wildlife management boards from Nunavut and the Northwest Territories. This group serves as a forum for information dissemination and discussion about the GBRP Project.

Lastly, we have created a website, www.gbrp.ca, to further help to disseminate information about the GBRP Project and to receive comments.

Though the Kitikmeot communities broadly support the KIA's advancement of the Project, a number of concerns have been raised that we expect to address during the anticipated environmental review of the Project.

4.2 SUMMARY OF ISSUES AND CONCERNS

The following is a summary of issues and concerns raised during the early engagement phase for the GBRP Project.

- **employment and training—**The need for employment now and in the future was raised in almost all engagement sessions. Many parties also raised the need for training to take advantage of anticipated employment opportunities.
- **business opportunities—**Parties in Nunavut and the Northwest Territories expressed an interest in the business opportunities arising from the GBRP Project.
- **caribou—**Protection of caribou populations was of utmost concern. The following specific concerns were identified, for example:
  - GBRP Project should not interfere with the migration of the Dolphin and Union herd between the islands and mainland
  - measures to mitigate the effects of road dust on habitat are necessary
  - interference with Bathurst caribou migration and calving should be minimized
- **access**—Community members voiced an interest in being able to access Grays Bay Road and Grays Bay Port for their own use; however, concern was also raised that access may need to be controlled to prevent overharvesting of caribou and other renewable resources.

The summary of issues is similar to the issues and concerns presented to MMG during its engagement with various parties in 2012 and 2013 about MMG's proposed ICP that included port and road components that are similar to the GBRP Project. We have been able to appreciate this work by obtaining access from MMG to its engagement records for the ICP.

We will consider and appropriately address the identified issues and concerns during the environmental review process. We will thus continue to document issues and concerns raised during engagement for this screening process and the anticipated environmental review. We also expect to consider and integrate input into the GBRP Project design as it progresses towards final definition and completion.

4.3 FUTURE ENGAGEMENT

In addition to our regular governance-related engagement with Inuit and other Kitikmeot residents, our future engagement activities will focus on providing more detailed information about the GBRP Project. Our intent is to provide potentially-affected Inuit, Nunavummiut, NWT Indigenous communities and other parties with a variety of opportunities to better understand the GBRP Project and engage in informed discussions about mitigation of potential effects and enhancement of benefits.

In addition to holding meetings of a more general nature that are focused on information sharing, we anticipate holding topic-driven workshops (e.g., caribou harm mitigation strategies), which will enable us to refine designs, and enhance mitigation measures and benefit delivery.

We propose to undertake the following activities throughout the planning, environmental review and permitting phases:

- public open houses and meetings in Kitikmeot communities
- meetings with applicable Institutions of Public Government, key stakeholder organizations and community high schools
- meetings with Indigenous communities and stakeholders in the Northwest Territories
- mitigation workshops with Inuit, government, Institutions of Public Government and other stakeholders
- ongoing communication with potentially affected Inuit, Nunavummiut, Indigenous communities and other parties and organizations

We also intend to update the GBRP Project website regularly regarding Project progress, status, information and activities. Other means of communicating with the public are being considered.

5.0 EXISTING ECOSYSTEMIC ENVIRONMENT

5.1 ECOSYSTEMIC VALUED COMPONENTS

This section introduces our approach to assessing the biophysical environment. It begins with identification of our proposed biophysical VCs.

The selection of VCs is an important topic. It is based on numerous considerations, including ongoing engagement, additional Inuit Qaujimajatatuqangit and traditional knowledge, previous relevant Nunavut NIRB EIS Guidelines, and professional judgment.

The VCs presented below rely on considerable existing information. For example, there is baseline information on each of these VCs, primarily drawn from the large volume of information collected by MMG between 2004 to 2014 for the ICP. This baseline information also includes Inuit Quaminajatuqangit.

The proposed biophysical VCs for the GBRP Project are:

- atmospheric environment
  - air quality
  - acoustic environment
  - ambient light
- terrestrial environment
  - soils and terrain
  - vegetation
  - wildlife and wildlife habitat
- freshwater environment
  - groundwater quality and quantity
  - surface water resources
  - freshwater fish and fish habitat
- marine environment
  - marine water and sediment quality
  - marine fish and fish habitat
  - marine mammals
  - marine birds

5.2 ATMOSPHERIC ENVIRONMENT

5.2.1 Air Quality

The GBRP Project is entirely located within the western Kitikmeot region in a remote area that is largely unaffected by local industrial, residential and transportation activities. The GBRP Project will result in emissions to the atmosphere during the construction and operation phases.

We currently have limited information on background air quality conditions in the GBRP Project. Data from representative regional air quality monitoring stations (AQMS), long-term regional data collected from Environment Canada monitoring stations, and air quality monitoring completed for other developments in the region were used to establish a baseline for air quality. We will update the air quality baseline information for the DEIS using data collected from representative AQMS, as well as any relevant data collected for other projects in the area.

For the criteria gases, our regional data indicated that the seasonal and diurnal variations in sulphur dioxide (SO_2) were negligible. Nitrogen dioxide (NO_2) show bimodal distributions in the diurnal variations, with peaks in the mornings and the evenings. Seasonally, NO_2 concentrations were at their lowest during summer months and highest in winter. Carbon monoxide (CO) concentrations were measured only at Yellowknife (a populated centre unlike anywhere in the Kitikmeot Region), and these were well below National Ambient Air Quality Objectives (AAQOs) and NWT AAQOs. Actual background concentrations in the area are expected to be much lower.

For particulate matter of 10 µm in diameter or less (PM_{10}), Environment Canada data collected at Yellowknife indicates concentrations peaked in mid to late afternoons and there were no diurnal variations in the maximum concentrations. Median and maximum concentrations peaked in April. Actual background concentrations are also expected to be much lower due to the remoteness of the area.

5.2.2 Acoustic Environment

The GBRP Project is located above the treeline in the low Arctic tundra, in a remote area that is not currently affected by permanent anthropogenic noise sources. There will be increased noise and vibration levels to the environment during the construction and operation phases of the GBRP Project.

We do not have site-specific baseline data on ambient noise levels. As a result, noise data were obtained from environmental assessments conducted in other remote regions in northern Canada that have similar environmental conditions and are considered representative. Specifically, background noise levels were based on a review of existing literature, including Alberta Energy Regulator (AER) documentation for sound levels in remote rural areas and previous noise impact assessments completed for various developments.

The baseline acoustic environment is characterized by ambient background sound levels found in a wilderness environment, which comes from primarily natural sources (e.g., wind, flowing water, ice, and animal noises). These sources are variable on an hourly, daily, monthly, or seasonal basis because of changing natural forces. Background noise levels are expected to be comparable to other remote wilderness environments where noise levels are relatively low. Based on site-specific baseline data obtained for other remote northern projects, and AER's *Directive 038: Noise Control* (AER 2007), a background of 35 dBA Leq at night is considered representative of the GBRP Project area (to possibly be modified based on additional information). Daytime ambient conditions are commonly 10 dBA higher than nighttime levels.

We have limited information available about noise levels in the marine environment. At present, the level of ship traffic in Nunavut is low relative to other major marine transportation corridors in Canada. It is restricted primarily to resupply vessels, research vessels and cruise ships operating during the open water season. Given the infrequent nature of existing marine vessel traffic and limited number of ships using the shipping routes, it is expected that background underwater noise near *Aariaq* (Grays Bay) Port and along the shipping corridors is largely from natural sources (e.g., marine life, wave action, ice movement) and characteristic of the open ocean where noise sources range from 74 dBA to 100 dBA (Heathershaw 2001, cited in Wolfden 2006).

5.2.3 Ambient Light

The GBRP Project is entirely located within the western Kitikmeot region in a remote area that is largely unaffected by local industrial, residential and transportation activities. At the southern end of the project, the existing Jericho Mine, which the project will overlap, is not currently in operation. Site-specific baseline data on ambient light are not available.

5.3 TERRESTRIAL ENVIRONMENT

5.3.1 Soils and Terrain

We know that landforms, including soils and terrain, are an important component of the terrestrial environment in the GBRP Project area. The diversity and distribution of terrain and their associated soils support a variety of vegetation communities and ecosystems. Soil patterns on the land have developed over thousands of years, and are influenced by climate, bedrock geology, landforms and drainage patterns. Industrial development, such as the GBRP Project, has the potential to affect landforms and the soils that have developed upon them, and therefore, the overall long-term health and diversity of Arctic ecosystems.

The bedrock underlying the region is part of the northern edge of the Bear Slave Upland on the Canadian Shield, dominated by granitoid, and locally, metavolcanic rock types. The upland surface is incised by three major valleys, including the north-trending Kennarctic River/*Qurluqtuaryuk* valley, the east-trending James River valley and Hood River/*Hivuraqhit* valley to the south of Ulu. Glaciation by the Wisconsinan Laurentide ice sheet was the major influence in forming the characteristic rugged terrain typical of well-glaciated shield topography.

Most of the GBRP Project area contains undulating to rolling bedrock overlain by thin covers of till, felsenmeer and colluvium. Till deposits are mainly stony, sandy to silty loams and either less than 1 m deep (veneers) or 1 m to 2 m deep (blankets, depressions). Small eskers and esker complexes occur. Deflation, an active process whereby wind erodes loose material, is widespread on these deposits. Within 13 km of the Arctic coast, sediments of marine origin occur on lower slopes and valley floors. These fine-grained silt and clay rich sediments were originally deposited in a marine environment and are now exposed due to isostatic recovery of the ground surface after the glaciers retreated. Ice content of these sediments is estimated at 30%.

The majority of soils are classified as part of the cryosol great group (permafrost-affected soils) and include both the static and turbic soil orders. The exception is near rivers and large bodies of water, or in areas of recent mass movement. Soils in these areas are most likely to be associated with the regosolic order. Regosols are generally characterized as weakly or more recently developed soils where depth to permafrost is greater than 2 m below the mineral soil surface. Soils of all orders are typically shallow, poorly developed, low in nutrients and characteristic of high arctic glaciated environments.

The GBRP Project area lies within the zone of continuous permafrost. The permafrost is estimated to extend to a depth of 400 m to 500 m below the surface. Talik zones (pockets of unfrozen ground) are found below large bodies of water near the coast, under major rivers and under lakes.

Uncommon landforms generally have a high value in terms of habitat potential for rare plant species or animal habitats. Such landforms include steep bedrock cliffs, fluvial floodplains, eskers and well-drained glaciofluvial landforms.

5.3.2 Vegetation

Vegetation patterns on the land are influenced by climate, substrate, terrain and water patterns. Characteristic groupings of vegetation, substrates and landforms occur at the landscape scale (land cover classes) and at smaller scales (ecosites). Different vegetation associations provide a variety of habitats used by wildlife and harvesters. Construction and operation has the potential to affect vegetation resources.

The GBRP Project is situated in the Southern Arctic Ecozone, as described by the Ecological Stratification Working Group (1995). The Project is also part of the Arctic Tundra Zone, a zone of continuous permafrost, with cold soils and a short growing season (CAVM Team 2003). Within the Arctic Tundra Zone, the GBRP Project is located within the "low shrub subzone", where vegetation patterns on the landscape are related to differences in parent material structure and chemistry, soil moisture and drainage, nutrient fluxes, temperature, and cryoturbation processes (Walker 2000).

The vegetation is strongly influenced by underlying bedrock systems. Glacial till and boulders form a thin cover on and between bedrock outcrops. The land cover classes that best reflect this underlying geology, with the most common classes are heath bedrock/boulder, heath tundra and cryoturbated heath tundra. Heath graminoid is also present and establishes on different parent material than that of heath tundra.

Low shrub and tussock sedge classes are found in wetter depressional areas. Wetland classes include the uncommon riparian tall shrub class that occurs in areas of flowing water on or below the ground surface, and the non-tussock sedge class that is found in shallow water along the edges of streams, lakes and perched ponds. Lichen veneer forms on thin dry soils associated with bedrock outcrops, and relatively level, dry, well-drained substrates including glaciofluvial outwash terraces and raised beaches.

Twenty plant species that "may be at risk" were recorded during previous field surveys. There were also observations of plant species not previously recorded in Nunavut, which are also considered to be rare plant species. The list of these species and their occurrences will be presented in baseline studies reports.

Plant species important to Inuit harvesters are identified in Inuit Quajimajatuqangit reports prepared for the ICP, as are observed trends in distribution and abundance of plants. Eighty-four species of plants are recorded in the GBRP Project Area.

There have been several field studies conducted for various developments from 2004 to 2012, including baseline studies conducted for the ICP. This information will be used for vegetation mapping and characterization to further understand the baseline conditions for vegetation at local and regional scales.

5.3.3 Wildlife and Wildlife Habitat

Inuit Quajimajatuqangit from reports prepared for the ICP identifies 13 key wildlife species and the importance of these species to Inuit. Wildlife in the western Kitikmeot Region is typical of Arctic tundra ecosystems, with large migratory mammals, large predators, furbearers, and small mammals. Activities during construction and operation of the GRBP Project have the potential to affect wildlife and wildlife habitat.

Caribou/t*uktuit* have historically dominated the landscape in this region. Herds within the region, as defined by western science, include the Bathurst, Dolphin and Union, Bluenose-East, Ahiak, and Beverly herds; however, the Project interacts directly with only two of these herds: Bathurst; and Dolphin and Union. There is little overlap in the ranges of these two herds, and the animals within each herd are genetically and physically distinct. Inuit Quajimajatuqangit indicates a decline in caribou/*tuktuit* population.

Barren-ground caribou/*tuktuit* of the Bathurst herd are present within the GBRP Project area from spring (April) to late fall (October), with the herd's traditional calving grounds around Bathurst Inlet/*Kiluhiktuq*, and ranges throughout portions of western mainland Nunavut (west of Bathurst Inlet/*Kiluhiktuq*) and the NWT (generally between Great Bear/*Imaryuaq* and Great Slave lakes). The herd, once numbering more than 450,000 animals in the late 1980s, is now estimated at 20,000 animals (Boulanger et al. 2016). The herd is currently under strict harvest management by the Tłı̨chǫ and Northwest Territories governments.

Caribou*/tuktuit* from the Dolphin and Union herd are distinct from Bathurst caribou/*tuktuit* and are identified by their smaller body size and lighter-coloured coat. This herd winters on the tundra of the northern mainland, and stages on the coast in the spring in preparation for crossing the Coronation Gulf/*Qalgiuyap Taryunga* to their calving and summer ranges on Victoria Island/*Kiilliniq*. Difficult to count, the herd numbered roughly 18,000 individuals in 2015. Although harvest estimates are largely unknown, harvest is likely relatively high. The probability of high harvest, combined with population and health indications from local knowledge, suggest a declining trend in abundance since the late 1990s.

Inuit, through Inuit Quajimajatuqangit, have described migration and movement of caribou/*tuktuit,* and how these movements have changed important hunting areas over time.

Other ungulates present in the general Project area include muskoxen/*umingmait* and moose/*tuktuvait*. Muskoxen/*umingmait* are relatively evenly distributed. Moose/*tuktuvait* are present at very low densities, primarily between High Lake and the coast, and to a lesser degree near the treeline.

The dominant carnivores—grizzly bears/*akhait*, wolves/*amaqqut*, and wolverine/*qalviit*—occur at relatively low densities. Red fox/k*ayuqtut* and Arctic fox/*tiriganniat* are also present; however, red foxes/*kayuqtut* are much more ubiquitous. Inuit Quajaimajatuqangit indicates that grizzly bears/*akhait* and wolverine/*qalviit* have moved further north. Small mammals including Arctic hare/*ukalrit*, Arctic ground squirrel, voles, and shrews have an important role in the trophic dynamics of the Arctic ecosystem and are expected to occur throughout the GBRP Project area. Eskers and glaciofluvial deposits are important habitat features for many mammals in the region because the soil texture and drainage is ideal for den construction, prey species (e.g., Arctic ground squirrels) are readily available, and the elevated terrain allows for escape from insects and provides vantage points for predators.

Birds are dominated by Arctic breeding species; however, several additional species typically associated with the Boreal Forest reach the northern extent of their breeding range within the southern portions of the GBRP Project area. Breeding birds within the region consist of both migratory and resident species; however, relatively few species are present outside of the breeding period because long, cold winters and restricted food availability limit populations. Those species that remain include gyrfalcon/*kilgavikpait*, ptarmigan/*aqilgiit/aqilgiviit*, and common raven/*tulugait*. Migratory species include a variety of raptors, waterfowl, and tundra breeding birds. Common species include peregrine falcon/*kilgaviit*, long-tailed duck/*aahanngiit*, least sandpiper and a variety of passerine species such as Lapland longspur, savannah sparrow, American tree sparrow, horned lark, and common and hoary redpolls. Inuit Quajimajatuqangit identifies 25 key bird species, and indicates that the abundance, distribution and behavior of birds is changing.

Nesting for most species begins in June and continues through the month of July, although ravens/*tulugait*) and some raptors will begin nesting earlier, often in April. Fall migration of birds from the region begins in mid-July and extends through to about mid-September (Obst 2011), although waterfowl and seabirds may be present in open water areas along the coast until freeze up.

Field studies documented the presence of 59 bird species within the GBRP Project region, 27 of which have been confirmed breeding. An additional 25 species were assessed as potentially present, based on their known occurrence in the region and the availability of habitats. Species of conservation concern include peregrine falcon/*kilgaviit* (a common breeder), short-eared owl (documented infrequently), red-necked phalarope (observed in several locations) and red knot rufa subspecies, buff-breasted sandpiper, barn swallow and bank swallow (none of which have been observed to date).

Assessment of the marine regions determined that 46 species have the potential to occur within the area. Twenty-four species were confirmed during surveys undertaken by MMG and its predecessors in support of the ICP. Species of conservation concern include ivory gull and Ross's gull.

5.4 FRESHWATER ENVIRONMENT

5.4.1 Groundwater Resources

Baseline information on groundwater resources was compiled from available regional hydrogeological data, as well as data collected from 2004 to 2012 for other projects in the region, including the ICP. Groundwater and surface water systems are connected only through taliks beneath large lakes and rivers, where water depth is sufficient to prevent freezing to bottom during winter months. The GRBP Project has the potential to affect groundwater primarily through effects to shallow groundwater.

The GBRP Project area is located within the zone of continuous permafrost. Large surface waterbodies, including lakes and rivers, pass through taliks (i.e., areas of unfrozen ground beneath large lakes and rivers) that connect surface waterbodies with the sub-permafrost groundwater flow system. As such, lakes and rivers that pass through taliks are expected to control the regional groundwater flow system.

Three groundwater flow systems are expected, including the active layer, taliks (through and closed), and sub-permafrost. Based on information from the High Lake and Izok/*Qaumavaktuq* areas, the maximum active layer thicknesses may range from 4 m to 6 m, and permafrost is expected to be more than 400 m thick. Permafrost may be laterally extensive and restrict hydraulic communication between groundwater flow systems in the active layer and the sub-permafrost (i.e., area below the base of the permafrost). However, as demonstrated in the High Lake and Izok/*Qaumavaktuq* areas, hydraulic communication is expected to occur through taliks.

We have a substantial database of regional groundwater quality that indicates that both shallow and deep groundwater quality is highly variable at the regional scale. This information was collected primarily at active mine sites, and the influence of local ore bodies may be contributing to the variability in the groundwater quality data set.

5.4.2 Surface Water Resources

Baseline field investigations were completed and regional data compiled for the ICP. The Grays Bay Road will cross over 200 waterbodies, including 18 major crossings with single- or multi-span bridges—including Kennarctic River/*Qurluqtuaryuk* two crossings), James River, Frayed Knots River, Hood River/*Hivuraqhit*, and Burnside River/*Kiluhiktuq*, as well as numerous un-named watercourses. Field investigations for surface water and sediment quality were conducted in 2004, 2005, 2007, 2008 and 2012 for the proposed ICP. Additional investigations specific to the GBRP Project have not yet been completed. Components of the GRBP Project during both construction and operation have the potential to affect surface water resources.

Available regional climate data, obtained from eight stations, show that the mean monthly temperature reaches its maximum in July (around 9 to 17°C) and its minimum in January (around -33 to -27°C). Based on average annual temperature data, a slight temperature increase is evident over the past number of decades. Rain and snow precipitation ranges from 141 to 311 mm annually. August typically has the greatest precipitation, occurring as rain, while snowfall tends to be greatest in October. Generally, it was found that precipitation decreases northward towards the Coronation Gulf/*Qalgiuyap Taryunga* coast.

Regional streamflow data were available from 16 hydrometric stations. This information shows freshet flows typically occur in June, and range from 0.015 to 0.05 $m^3/s/km^2$. Summer and fall rain, through August and September, results in average monthly flows of about 0.01 $m^3/s/km^2$. Flood frequency analyses were completed for some stations to determine the 2-, 5-, 10-, 25-, 50- and 100-year instantaneous peak unit discharges. As expected, the stations with the smallest drainage areas had the highest unit flows, while those stations with larger drainage areas had smaller unit flows.

Ice thicknesses on lakes ranged from 1.8 m to 2.0 m. Snow surveys completed in 2004, 2005, and 2012 showed average snow depths ranging from approximately 11 cm to 109 cm, with snow-water equivalents ranging from 37 mm to 298 mm. There was some annual variability at sites surveyed over multiple years. It was expected that snow-water equivalents (the amount of water released during snowmelt) would decrease towards the coast, as was found with the analysis of historical precipitation data. However, this was not the case and may be related to the location of each snow survey site. More exposed terrain would result in a lower measurement and vice versa for more sheltered terrain.

Local streamflow gauging has occurred at nine stream or river study sites, with many sites have been monitored since 2008. The highest recorded peak flows occurred on the Hood River/*Hivuraqhit* 140 m^3/s to 160 m^3/s), followed by the Burnside River/*Kiluhiktuq* (75 m^3/s to 130 m^3/s), Frayed Knots River (60 m^3/s to 90 m^3/s), and the James River and an unnamed river (30 m^3/s to 41 m^3/s). Peak flows were not measured on Kennarctic River/*Qurluqtuaryuk*. Peak flows usually occurred from late May to late June, depending on the station, and flows decreased through the summer to minimums in August. A secondary peak was sometimes recorded at stations in late August or September, due to fall rains.

The 2-, 5-, 10-, 25-, 50- and 100-year flood frequency curves were derived for large (greater than 50 km^2) and small (less than 50 km^2) drainage areas, based on regional and local streamflow data. The amount of lakes present in a drainage basin affects the sensitivity of the flood frequency curves, particularly when lakes occupy more than 8% of the basin, though there are not enough data at present to fully assess this.

Based on water and sediment samples collected from 34 streams along the road alignment that were sampled from 2004 to 2012 for the ICP, most streams had neutral pH, very soft to soft water (low hardness, less than 60 mg/L), moderate to high sensitivity to acid deposition (low alkalinity, less than 10 mg/L), and were oligotrophic (low nutrients, less than 0.025 mg/L total phosphorus). Concentrations of total aluminum, cadmium, copper, iron and manganese (from natural sources) were typically above applicable Canadian Council of Ministers of the Environment (CCME) Freshwater Aquatic Life (FAL) guidelines, while pH was sometimes below the recommended CCME FAL range (i.e., pH 6.5 to 9.0).

Sediment accumulation in the streams was low, but where it did accumulate sufficient for sample collection, sediments were primarily made up of sand. Arsenic and copper concentrations were also typically elevated in stream sediments (above CCME interim sediment quality guidelines).

Baseline water and sediment quality data were compared to CCME water and sediment quality guidelines. Many of the streams had concentrations of metals such as aluminum and copper at concentrations above the CCME FAL guidelines. Metal concentrations above CCME FAL guidelines under baseline conditions have been observed in other studies in the region (e.g., for the Jericho Mine and Bathurst Inlet Port and Road), and are indicative of natural conditions. Results of samples collected along the Grays Bay Road further demonstrate this.

5.4.3 Fish and Fish Habitat

Field investigations of fish and fish habitat were completed by MMG in 2004, 2005, 2007, 2008, and 2012 for the proposed ICP. Additional investigations specific to the GBRP Project have not yet been completed. Activities during the construction and operation of the GBRP Project have the potential to affect fish and fish habitat.

Since 2001, watercourse assessments have been completed by MMG and predecessor developers at potential crossing locations along former and current alignments for the road corridor to Grays Bay/*Aariaq*. Watercourse study sites were grouped by drainage basin (from the south end of the corridor to the north): Burnside River/*Kiluhiktuq*, Hood River/*Hivuraqhit*, James River, Kennarctic River/*Qurluqtuaryuk*, and Arctic Ocean. Stream study sites included presence of intermittent streams, small permanent streams, and large permanent watercourses.

The dominant habitat type across all watercourse types was run habitat (average up to 60% of available habitat surveyed), although both run and flat habitat types were the dominant habitat types in intermittent streams. Subsurface flows were only present on intermittent and small permanent streams while rapids and cascades were only present on large permanent watercourses. Substrate composition was dependent on flow type: fines were the dominant substrate in intermittent streams, fines and boulders were co-dominant in small permanent streams, and boulders were dominant in large permanent watercourses.

Samples of benthic macroinvertebrates indicate that communities are largely dominated by only a few taxa typically dominated by chironomids (Chironomidae) of the Orthocladiinae and Tanytarsini groups. Roundworms (Nematoda) and aquatic mites (Acari) were also common or dominant at some sites. These study results will be reported as part of the baseline reports to be submitted.

Based on fish sampling events along the road corridor since 2001, fish habitat availability in most streams along the road corridor is generally rated as none (i.e., no fisheries value) to poor as most streams were considered ephemeral or intermittent. However, permanent streams likely provide some spring spawning, migration, and seasonal rearing habitat. Fish catch during stream sampling events identified seven species: lake trout/*ihuuqit* (*Salvelinus namaycush*), Arctic char/*iqalukpiit* (*Salvelinus alpinus*), Arctic grayling*/ihulukpaukkait* (*Thymallus arcticus*), burbot/*tiktaaliit* (*Lota lota*), round whitefish (*Prosopium cylindraceum*), Slimy sculpin (*Cottus cognatus*), and ninespine stickleback (*Pungitius pungitius*). Slimy sculpin were the most widespread species, followed by Arctic grayling/*hulukpaukkait*, comprising approximately 41% and 33% of the total catch, respectively.

Fish tissues (liver and muscle) were collected from lake trout/*ihuuqit* and Arctic char/*iqalukpiit* from Kennarctic River/*Qurluqtuaryuk* in 2004 and 2005 in support of the ICP. Tissue was analyzed for aluminum, arsenic, cadmium, copper, lead, mercury, nickel, selenium, and zinc. In general, concentrations of metals were higher in liver tissue than muscle tissue for both species. In both species, concentrations of cadmium, lead and nickel were primarily reported below detection limits in muscle tissue, as well as concentrations of nickel in liver tissue of both species. Concentrations of aluminum, arsenic, copper, mercury, selenium, and zinc were generally reported above detection limits in muscle and liver tissue, though concentrations of arsenic, lead, mercury, and selenium did not exceed their respective guidelines for human consumption in any tissues of either species. Guidelines are not available for aluminum or zinc.

5.5 MARINE ENVIRONMENT

5.5.1 Marine Water and Sediment Quality

Field investigations on marine water and sediment quality were completed in 2004, 2005, 2008, and 2012 for the proposed ICP, which proposed a port at the same location and of similar configuration to the GBRP Project. Additional investigations specific to the GBRP Project have not yet been completed. We understand the construction and operation of the Grays Bay Port has the potential affect marine and water and sediment quality.

Sediment quality is influenced by particle size distribution. Fine-grained sediments (silt and clay sized particles) are rare in shallow water up to 10–15 m depth but are the predominant sediment type in water deeper than 15 m. Fine grained sediments typically have higher concentrations of metals, and this was the case for sediment samples offshore of the proposed port in Grays Bay/*Aariaq*. Sediment samples had concentrations of arsenic, copper, and chromium that were greater than interim sediment quality guidelines. However, concentrations were not greater than not-probable-effects levels in the majority of samples collected. The concentrations appear to be from natural background conditions.

Water quality data collected for ICP indicated the Grays Bay/*Aariaq* port site is influenced by freshwater run-off from Kennarctic River/*Qurluqtuaryuk* to the east. There was a pronounced stratification with a freshwater layer, of about 1 m to 2 m, above the denser seawater in June. Melting sea ice in June would also contribute low salinity surface water. Towards the end of the open water season (September), stratification was much less pronounced than under ice. The nearly freshwater conditions observed in June 2012 was likely primarily river water from Kennarctic River/*Qurluqtuaryuk*, as indicated by the high total suspended solids (TSS) levels in the surface water. These study results will also be reported as part of the baseline reports to be submitted.

The suspended solid concentration will affect the concentration of some total metals in a water sample because metals are often bound to fine particles suspended in the water column. Elevated levels of aluminum, iron, copper, lead, nickel and zinc measured in surface water in June 2012 were associated with high TSS, likely due to the influence of river runoff. Copper concentrations approached regulatory CCME guidelines.

5.5.2 Marine Fish and Fish Habitat

Construction activities at the Grays Bay Port could affect marine habitat and the distribution and or health of marine fauna in Grays Bay/*Aariaq*, which includes marine finfish, marine and riparian plants and invertebrates. Various species of marine fish and planktonic and benthic invertebrates occur in Grays Bay/*Aariaq* and adjacent waters near the proposed port year round. In summer, the area provides feeding habitat for amphidromous fish species (e.g., arctic char).

Zooplankton are responsible for much of the secondary production that occurs in Arctic marine waters, forming a direct link between phytoplankton and higher vertebrate consumers. They are important in the diet of the Arctic cod/*hiuryuktuut/uugait*, which in turn is the prey of at least six marine mammal species and ten seabird species. Zooplankton are also consumed directly by marine mammals, especially bowhead whale/*arviat*. Zooplankton densities in samples from Grays Bay/*Aariaq* in support of the ICP (in 2004, the only year that zooplankton samples were collected) are within the ranges of densities previously reported for Coronation Gulf/*Qalgiuyap Taryunga* and elsewhere in the Canadian Arctic. The dominance of copepods in samples from Grays Bay/*Aariaq* is also consistent with results previously reported for Coronation Gulf/*Qalgiuyap Taryunga* and elsewhere in the Canadian Arctic, except for the upper, warm, brackish layer of water caused by Mackenzie River input to the west.

Arctic benthic communities, including infauna and epifauna, are important in the cycling of carbon and regeneration of nutrients and because they provide a direct food source for many fish species and some marine mammals and seabirds. Benthic infaunal densities varied with depth in Grays Bay/*Aariaq* over the three years that samples were collected in support of the ICP, and biomass results showed a similar trend in two of the years. At the shallowest depth sampled (5 m), density and biomass were low in the one year (2012) that samples were collected; the substrate was predominantly hard, resulting in very shallow penetration of the grab sampler. At depths of 10 m to 15 m, densities in 2004 were similar to those in 2005, and densities in 2012 were more than 10 times lower than in the earlier years. The same trend was evident for biomass, although the decrease in 2012 was not as pronounced. At depths of 20 m to 30 m, density and biomass differences were generally similar to, but less pronounced than, those at depths of 10 m to 15 m. There was little variability in group and species composition among years: in terms of numbers, polychaetes and cumaceans were the dominant group and the same species of polychaete and cumaceans were dominant in all three years.

Infaunal densities in samples collected for ICP near the proposed port site in Grays Bay/*Aariaq* in 2004, 2005, and 2012 ranged from 478/m^2 to 40,761/m^2. These are within the ranges of densities previously reported for Coronation Gulf/*Qalgiuyap Taryunga* near Cambridge Bay/*Iqaluktuuttiaq* in 1966–1969; in Roberts Bay, Melville Sound, in 1997 and 1998; and in Bathurst Inlet/*Kiluhiktuq* in 2001, 2002, and 2007). Similar variability in infaunal density (from tens to thousands/m^2) is evident in the results of published studies from elsewhere in the Canadian Arctic. Infaunal biomass was not reported in the other studies in the Coronation Gulf/*Qalgiuyap Taryunga*. The dominance of polychaetes in samples collected off the proposed site in Grays Bay/*Aariaq* in 2004 and 2012 is consistent with most results previously reported for Coronation Gulf/*Qalgiuyap Taryunga*. Other details of group composition varied among studies.

Twenty-one fish species were caught in the nearshore waters of Coronation Gulf/*Qalgiuyap Taryunga* during studies conducted for ICP near Kugluktuk/*Qurluqtuq* in 1981 and 1993, in Bathurst Inlet/*Kiluhiktuq* in 2001, and in Roberts Bay annually between 2002 and 2007 and in 2009. Included were twelve marine species, six anadromous or amphidromous species, and three freshwater species that occasionally occur in brackish water. Eight of the 21 species and another species not caught in those studies were caught in Grays Bay/*Aariaq*.

The most frequently caught species caught in fyke nets were the Arctic char/*iqalukpiit*, saffron cod, Arctic flounder, and fourhorn sculpin/*kanayuit*, all caught in both early- and late-summer sampling periods. The highest catch per unit effort (CPUE) was for the capelin/*angmagiat*, which was caught in fewer studies and only in July. Eight species, mostly anadromous, amphidromous or freshwater, were caught only near Kugluktuk/*Qurluqtuq* in 1993 (RL&L 1993). In 2012 in Grays Bay/*Aariaq*, the most abundant species caught were the saffron cod, fourhorn sculpin/*kanayuit*, and Arctic char/*iqalukpiit*.

The most frequent of the 16 species (caught in demersal gillnets) near Kugluktuk/*Qurluqtuq*, in Bathurst Inlet/*Kiluhiktuq*, and in Roberts Bay were the saffron cod, Arctic char/*iqalukpiit*, Pacific herring, fourhorn sculpin/*kanayuit*, starry flounder, and Arctic flounder, all during early- and late-summer sampling periods, with higher CPUEs in the latter. In Grays Bay/*Aariaq*, fewer species were caught in demersal gillnets (three or four per year, total of eight) than in previous studies in Coronation Gulf/*Qalgiuyap Taryunga.* Differing study results could indicate real differences in the fish fauna among locations in Coronation Gulf/*Qalgiuyap Taryunga* or could also be a result of differences sampling methods (such as the manner in which the nets were set), and low fishing effort in 2004 and 2005.

Comparisons of the numbers and species composition of zooplankton, benthos, and fish found in Grays Bay/*Aariaq* indicated that they were typical of those found in Coronation Gulf/*Qalgiuyap Taryunga* or elsewhere in the Canadian Arctic.

5.5.3 Marine Mammals

Five species of marine mammals are known to occur in the Grays Bay/*Aariaq* area. During the open water period (July to October), ringed seal/*nattiq* is most common. Other species, found in the area, as noted by Inuit Quajaimajatuqangit, include beluga/*qilalukkat*, bowhead whale/*arviat*, narwhal/*tuugaaliit* and polar bear/*nanuit*. In winter and spring, ringed seal/*nattiq* and *nanuit/* are expected to occur in Grays Bay/*Aariaq* and adjacent waters near the proposed port site. Other species are less likely to be present. These marine mammals have the potential to be affected by construction and operation activities at the port.

The ringed seal/*nattiiq* is the most abundant marine mammal in the Arctic ranging over all seasonally ice-covered regions. It hauls out on the ice in spring for pupping and moulting. In the summer, they disperse in the open water and are found along the coast and offshore. In autumn, ringed seals/*nattiq* open breathing holes in the forming ice and then maintain these holes throughout the ice-covered winter. Ringed seals/*nattiq* are harvested by many communities along the coast. Harvest levels are highest in Arctic Bay/*Ikpiaryuk*, Kugluktuk/*Qurluqtuq*, Resolute/*Qauyuittuq*, and Taloyoak/*Talurjuaq*; these communities harvest hundreds of ringed seals/*nattiq* each year. IQ holders reported that ringed seals/*nattiq* are hunted year-round in Grays Bay/*Aariaq* with a major hunt there in June. Ringed seals/*nattiq* are present in the Grays Bay/*Aariaq* area year-round.

Two beluga/*qilalukkat* populations occur in the Grays Bay/*Aariaq* area: the Eastern Beaufort Sea Stock, which summers in the Canadian Beaufort Sea, and the Eastern High Arctic-Baffin Bay Stock, which summers in the Canadian central High Arctic. In the west, beluga/*qilalukkat* occur in Amundsen Gulf and Dolphin and Union Strait in August to September. IQ holders have occasionally seen beluga/*qilalukkat* in Coronation Gulf/*Qalgiuyap Taryunga*, from Kugluktuk/*Qurluqtuq* to Cambridge Bay/*Iqaluktuuttiaq*. Sightings span the months May to September and date from the 1970s.

Beluga/*qilalukkat* may enter the Grays Bay/*Aariaq* area from the east, some migrating into Lancaster Sound as early as late April–May, with peak movement in June and July. Belugas/*Qilalukkat* summer in Admiralty Inlet, Prince Regent Inlet, Barrow Strait, and Peel Sound. Franklin Trench in Peel Sound has been identified as a probable feeding location. IQ holders have reported that the south end of Prince of Wales Island is a “sensitive” area for belugas/*qilalukkat*. Belugas/q*ilalukkat* typically migrate eastward in September. The outward migration occurs rapidly, and the timing of migration varies from year to year in response to ice conditions. Inuit Quajimajatuqangit indicates beluga/qilalukkat movement may be more variable. Kugluktuk/*Qurluqtuq* is the only community in Coronation Gulf/*Qalgiuyap Taryunga* with reported beluga/*qilalugaq* harvests, although more appear to be documented in Inuit Quajimajatuqangit.

Limited Inuit Quajimajatuqangit exists regarding bowhead whales/*arviat* in the Project area. Both the Bering-Chukchi-Beaufort (BCB) and the Eastern Canada-West Greenland (EC-WG) populations of the bowhead whale/*arviat* are found in the Grays Bay/*Aariaq* area. Bowhead whales/*arviat*) are found just to the west in Amundsen Gulf, in June to August. Most of the bowhead whale/*arviat* enter the area from the east through Lancaster Sound in June–July. They migrate west to summer in bays and passages in the eastern High Arctic in August–September. Bowhead whales/*arviat* summer in Admiralty Inlet, Prince Regent Inlet, Barrow Strait, Peel Sound, and Franklin Strait. Prince Regent Inlet has been reported as a major nursery area. The southward outward migration occurs in September–October. There have been three sightings of bowhead whales/*arviat*) near King William Island since 2000 and two sightings of bowhead whale/*arviat* near Kugluktuk/*Qurluqtuq*. One bowhead whale/*arviat* was harvested by Gjoa Haven/*Uqhuqtuuq* in 2006.

Three polar bear/*nanuit* subpopulations occur along Lancaster Sound (estimated subpopulation size 2,541), M'Clintock Channel/*Ualliayuk* (284), and Northern Beaufort Sea (1,200). The Lancaster Sound and Northern Beaufort Sea subpopulations are stable, and the M'Clintock Channel/*Ualliayuk* subpopulation is increasing. Inuit Quajimajatuqangit suggests increasing polar bear/*nanuit* numbers, especially near communities. Polar bear/*nanuit* occur throughout the Grays Bay/*Aariaq* area during much of the year. Their distribution is variable, and is strongly influenced by the presence and quality of sea ice because ice provides them access to their main prey species, the ringed seal/*nattiq*. In summer, polar bears/*nanuit* are mostly absent because they tend to remain with the multi-year pack ice. Inuit have reported summer observations of polar bears/*nanuit*: the coastal areas along Lancaster Sound have all been identified as summer "sanctuaries" when the ice retreats, and they may be particularly important for pregnant females and family groups. There have also been year-round observations of polar bears/*nanuit* in Dolphin and Union Strait and in the western end of Coronation Gulf/*Qalgiuyap Taryunga*. Polar bears/*nanuit* are much more common when the area is covered in ice. Communities report hunting polar bears/*nanuit* from August to May, and Inuit Quajimajatuqangit identifies coastal areas as important denning sites.

6.0 SOCIO-ECONOMIC ENVIRONMENT

This section provides an overview of the existing human environment into which the GBRP Project is proposed. Information has been drawn from sources including government statistics and our own data, as well as from the large volume of information collected by MMG Canada for the ICP in 2012 and 2013.

6.1 CO-PROPONENT'S FOREWORD

The Kitikmeot region is ancestral homeland of the Kitikmeot Inuit. The Kitikmeot Inuit and Nunavummiut have a culture and way of life that expresses itself in many distinct ways. These include through our Inuit languages, the harvesting and consumption of country foods, traditional clothing, and the way that we celebrate and share with each other.

Currently, the residents of this region are subject to challenging socio-economic circumstances. Poverty and food insecurity are widespread in the Kitikmeot region. Income levels are among the lowest in Nunavut, and unemployment rates among the highest. Our communities have among the youngest and most rapidly growing populations in Canada, with residents facing severe housing shortages and a cost of living much higher than that found in southern Canada.

We the co-proponents of the GBRP Project are pursuing this project because we believe it will help address the conditions that currently result in our communities being among the most deprived in Nunavut and Canada. Through the GBRP Project, we hope to create the conditions for long-term economic growth and diversification in the region.

6.2 COMMUNITY AND REGIONAL OVERVIEW

The Kitikmeot region of Nunavut encompasses 447,727 km^2 of the central Arctic, representing approximately 4.5% of Canada's land mass and a larger area than the Province of Newfoundland and Labrador. The region contains the southern and eastern parts of Victoria Island and the adjacent part of the mainland up to the Boothia Peninsula, along with King William Island and the southern portion of Prince of Wales Island.

The region is the ancestral home of the previously nomadic Kitikmeot Inuit, whose descendants primarily reside in five incorporated hamlets: Cambridge Bay/*Iqaluktuuttiaq*, Kugluktuk/*Qurluqtuq*, Gjoa Haven *Uqhuqtuuq*, Taloyoak/*Talurjuaq*, and Kugaaruk. Our region is also home to two unincorporated communities, Bathurst Inlet/*Qingauk* and Omingmaktok, where the populations have dwindled to the point where they are generally inhabited on a seasonal basis only. Our region is the westernmost of Nunavut's three administrative regions and the most isolated from the territory's capital of Iqaluit. Our communities are accessible only by air, or by sea during the short open-water season. There are no permanent roads connecting communities, or connecting us to southern Canada in any way.

6.2.1 Population

Nunavut's population increased by approximately one-third from1996 to 2016. As shown in Table 6-1, the Nunavut Bureau of Statistics reported the 2016 (census) population of the Kitikmeot region at 6,543 persons, representing approximately 18% of Nunavut's population. The communities with the largest populations are Cambridge Bay/*Iqaluktuuttiaq* (1,766 persons), Kugluktuk/*Qurluqtuq* (1,491 persons) and Gjoa Haven/*Uqhuqtuuq* (1,324 persons). From 2011 to 2016, the Kitikmeot region's population increased by 8% or 531 persons. All Kitikmeot communities have contributed to this growth, with the two smallest communities of Kugaaruk and Taloyoak experiencing the most rapid rates (approximately 17.0% and 12.5% respectively over the five-year period). Very little of the growth results from in-migration; most is the consequence of a high birth rate among Nunavummiut, the great majority of whom are Inuit. The high proportion of youth puts pressures on housing, education and other community infrastructure and services.

Table 6-1 Population in Nunavut and the Kitikmeot Region 1981–2016

	1981	1986	1991	1996	2001	2006	2011	2016
Nunavut	15,572	18,408	21,244	24,730	26,745	29,474	31,906	35,944
Kitikmeot	2,945	3,447	4,025	4,644	4,816	5,361	6,012	6,543
Bathurst Inlet	20	16	18	18	5	0	0	0
Cambridge Bay	815	1,002	1,116	1,351	1,309	1,477	1,608	1,766
Gjoa Haven	523	650	783	879	960	1,064	1,279	1,324
Kitikmeot Unorganized[1]	30	45	7	0	0	21	0	0
Kugaaruk	257	297	409	496	605	688	771	933
Kugluktuk	809	888	1,059	1,201	1,212	1,302	1,450	1,491
Taloyoak	431	488	580	648	720	809	899	1,029
Umingmaktok	60	61	53	51	5	0	5	0
SOURCE: Nunavut Bureau of Statistics 2016 - Nunavut Census Population by Region and Community								

While Inuit form the overwhelming majority of the region's population, there is variation among Kitikmeot communities (Table 6-2). For example, in the smallest community of Kugaaruk, 95.5% of the population are Inuit. In the largest community, the regional centre of Cambridge Bay/*Iqaluktuuttiaq*, Inuit are 79.3% of the population.

Table 6-2 Inuit and Non-Inuit for Nunavut and Kitikmeot Region Population, Percent, 2016

	% Inuit	% Non-Inuit
Nunavut	84.2	15.8
Kitikmeot Region	89.9	10.1
Cambridge Bay	79.3	20.7
Gjoa Haven	94.7	5.3
Kugaaruk	95.5	4.5
Kugluktuk	89.9	10.1
Taloyoak	95.1	4.9
SOURCE: Nunavut Bureau of Statistics - Nunavut Population Estimates by Inuit and Non-Inuit, Region and Community, 2001 to 2016.		

6.2.2 Language

Our region is home to two indigenous, Inuit languages; Inuinnaqtun which is mainly spoken in the western communities of Kugluktuk/*Qurluqtuq* and Cambridge Bay/*Iqaluktuuttiaq* and Inuktitut (Nattilingmiutut dialect) which is mainly spoken in the eastern communities of Gjoa Haven, Taloyoak and Kugaaruk. The ability of Inuit to understand and speak the Inuit language is an important feature of our cultural identify and commonly considered to be a very important aspect of promoting wellness. Speaking the Inuit Language is also a privileged instrument for practicing and conveying traditional culture, and for communicating with Elders, who serve as an important source of Inuit Qaujimanituqangit (Inuit traditional knowledge).

Language loss in the Kitikmeot region is occurring rapidly. Between 1996 and 2011, the use of an Inuit language as the main language at home declined in all five Kitikmeot communities. Compared to Inuit in the Kivalliq and Qikiqtani regions, Kitikmeot Inuit have the lowest retention levels of the Inuit Language (for both Inuktitut and Inuinnaqtun) (Table 6-3).

Table 6-3 Percentage of Homes in Kitikmeot Communities where the Inuktitut/Inuinnaqtun is Main Language (1996-2011)

	1996	2001	2006	2011
Cambridge Bay	10.0	6.5	7.5	6.3
Gjoa Haven	29.0	28.6	14.2	13.7
Kugaaruk	47.5	36.4	23.2	19.5
Kugluktuk	12.5	9.9	8.8	8.0
Taloyoak	33.3	22.2	20.4	16.1
SOURCE: Nunavut Bureau of Statistics 2016 - Nunavut Census Language by Community				

Both of us, the KIA and the GN, have a mandate to celebrate, protect and preserve the use of the Inuit language in the Kitikmeot region. The KIA delivers language and cultural programing, including support for Inuit language media and language training, while the GN's Department of Culture and Heritage delivers funding and programming under its Official Languages Program.

6.3 SOCIO-ECONOMIC VALUED COMPONENTS

As with biophysical VC's, the selection of socio-economic VC's is an important topic. The selection is based on numerous considerations including ongoing engagement, Inuit Quajimaiatuqangit and traditional knowledge, previous and relevant NIRB Environmental Impact Statement Guidelines, and professional judgement.

We propose the following VCs for the socio-economic environment:

- economy, employment and business
- community infrastructure, services, and wellbeing
- cultural resources

The following sections provide an overview of these VCs.

6.4 ECONOMIC ENVIRONMENT

6.4.1 Economy

Nunavut's economy continues to be heavily dominated by the public sector, both in terms of employment and funding. In 2016, Nunavut reported a gross domestic product (GDP) $2,039.6 M, with the second largest increase in GDP in Canada at 3.9%; much of this growth can be attributed to an increase in mining activity as the Mary River iron ore mine ramped up production. However, the GN receives approximately 90% of its total revenues via federal government transfers, determined by the Territorial Formula Financing (TFF) agreement (Table 6-4). For 2016–2017, the estimated transfer is $1,738 M. The TFF is an annual unconditional transfer from the Government of Canada to the three territorial governments to enable them to provide their residents with a range of public services comparable to those offered by provincial governments, at comparable levels of taxation. The TFF helps territorial governments fund essential public infrastructure and services, and recognizes the high cost of providing them in the North and with large numbers of small, isolated communities. The Government of Nunavut's primary own-source revenues come from income taxes, payroll taxes, property taxes, petroleum/fuel taxes, and tobacco taxes.

Direct government spending in Public Administration, Health Care and Social Assistance and Education represented about 33.3% of GDP. The influence of the public sector on the economy expands further when considering the indirect and induced effects from this spending on other economic sectors such as construction, which represented approximately 10.1% of Nunavut's total GDP in 2016.

Table 6-4 Estimated GN Revenue Sources 2016–2017

	Revenue Sources	Total Estimates 2016–2017 ($000)
Federal transfers	Formula financing arrangement	1,462,500
	Other federal transfer	
	Total federal transfer	**1,547,500**
Own source revenues	Personal income tax	31,800
	Corporate income tax	17,900
	Fuel tax	6,800
	Property tax	6,300
	Tobacco tax	17,100
	Payroll tax	26,800
	Insurance taxes	1,800
	Liquor commission, net cost of goods sold	4,845
	Petroleum products division, net cost of goods sold	34,355
	Rental recovery—staff housing	20,400
	Other revenues	22,400
	Recovery of prior years' expenditures	-
	Total own source revenue	**190,500**
Total Revenue		**1,738,000**
SOURCE: GN Department of Finance. 2016-17 Main Estimates.		

The largest private sector component of Nunavut's economy is mineral exploration and mining. In 2016, metal ore mining represented approximately 22.8% of Nunavut's GDP or $465 M. As of May 2017, there were three mines in varying stages of production in Nunavut: the Meadowbank Gold Mine (fully operational), owned and operated by Agnico-Eagle Mines in the Kivalliq region; Baffinland's Mary River iron ore mine in the Qikiqtani region (ramping up production); and the Hope Bay Belt Gold Project near Cambridge Bay (commencing early stage production). Substantial economic benefits have already been realized in communities near these mines. For example, at the Meadowbank mine, more than one third of employees are Inuit, almost all of them from the Kivalliq region (Stratos 2016). Meadowbank pays out $20 M in salaries to its Inuit employees each year. Mining projects also support regional and Inuit business development with tens of millions of dollars' worth of contracts being executed by these firms.

Outside of government, government-supported sectors, and mining, opportunities for economic growth, diversification and employment are limited and characterized by their relatively small scale. Food processing is a small but iconic export element within the Kitikmeot economy. However, the underlying commercial harvests required to supply the processing plant are both seasonal and resource-dependent. Tourism has provided for modest economic opportunities, including from increased cruise ship traffic through the Northwest Passage, but this traffic is episodic and provides limited windfalls for visited communities when passengers seek crafts or cultural tours. Other sectors of note include retail, transportation, and cultural industries. These are all currently small contributors to the economy relative to the public or mining sectors.

A range of organizations exist at various levels of government to coordinate, implement and fund economic development. They are supported and funded by the Nunavut Economic Developers Association and the Government of Nunavut, Department of Economic Development and Transportation. Kitikmeot communities also have community economic development plans. As the regional Inuit association, KIA promotes economic development in its region by delivering both employment and skills training programming, and business development programming. The KIA also has two subsidiaries, Kitikmeot Corporation, and Nunavut Resources Corporation, which are mandated to seek to create economic opportunity for beneficiaries.

Supporting development of the Kitikmeot region's mineral resources is a key focus for both the GN and the KIA. The Nunavut Economic Development Strategy includes strategies for mineral exploration and mining. Several base metal, gold, silver, and diamond deposits in the region are in various stages of exploration and development. Recent studies by the Geological Survey of Canada and the Geological Association of Canada confirm the substantial resource potential of western Nunavut. However, our region's very limited infrastructure has been a major obstacle for several developments, particularly base metals projects that lack direct access to tidewater.

6.4.2 Employment

The level of employment in a jurisdiction is a key indicator of its economic health. Table 6-5 provides labour force data for Nunavut; regional level information is not publicly available. The source population for the territory (those aged 15 and over and available for work) was 24,200 in March 2017. Of that number, 63.3% participated in the labour market, meaning they held jobs or were actively seeking work. The March 2017 unemployment rate, which is calculated from the labour force rather than the source population, was 15.2%. In comparison, Canada's unemployment rate was 7.1%.

Table 6-5 Labour Force and Employment Characteristics for People Aged 15 and Over, Nunavut, 2016 and 2017

	March 2016	March 2017
Total Population Aged 15 and Over	**24,100**	**24,200**
Labour force	15,800	15,300
Employment	13,100	13,000
Unemployment	2,700	2,300
Not in the labour force	8,300	8,900
Participation rate (%)	*65.6*	*63.3*
Employment rate (%)	*54.2*	*53.7*
Unemployment rate (%)	*17.4*	*15.2*
Inuit Population Aged 15 and Over	**19,300**	**19,300**
Labour force	11,500	11,100
Employment	8,900	8,900
Unemployment	2,600	2,200
Not in the labour force	7,700	8,300
Participation rate (%)	*59.8*	*57.2*
Employment rate (%)	*46.2*	*45.9*
Unemployment rate (%)	*22.8*	*19.8*
Non-Inuit Population Aged 15 and Over	**4,800**	**4,900**
Labour force	4,300	4,300
Employment	4,200	4,100
Unemployment	X	X
Not in the labour force	600	600
Participation rate (%)	*88.5*	*87.7*
Employment rate (%)	*86.2*	*84.8*
Unemployment rate (%)	*X*	*X*
SOURCE: Nunavut Bureau of Statistics. (2016). Labour Force Survey; three month moving averages		

Non-Inuit make up approximately 20% of the total source population, but represent 28% of the employed. Non-Inuit have a noticeably higher participation rate at 87.7% compared to Inuit participation of 57.2%, and an employment rate of 84.8% compared to Inuit employment of 45.9%. Geography and education are contributing factors in this discrepancy. Most non-Inuit live in Iqaluit where most employment opportunities are located. Most non-Inuit also have at least a high school education and according to 2006 Census, the majority of Nunavut's non-Inuit population (61%) had completed a postsecondary education program. Half of the Inuit population (51%) aged 25 to 64 years had less than a high school diploma in 2006, although 36% had a postsecondary diploma or degree (Statistics Canada 2008).

6.4.2.1 Employment Income

Income levels throughout Nunavut and the Kitikmeot Region closely mirror the employment data (Table 6-6). Income levels are the highest in Iqaluit, lowest in communities without decentralized government offices or resource development and in between for the regional centres and for those communities actively participating in the mining industry. Overall the Kitikmeot region has by far the lowest median employment income levels of the three regions.

Table 6-6 Total Median Employment Income by Region and Kitikmeot Community, 2009 to 2014

	2009 ($)	2010 ($)	2011 ($)	2012 ($)	2013 ($)	2014 ($)
Nunavut	25,140	25,520	26,500	27,470	28,580	29,550
Iqaluit	59,480	64,930	64,830	69,260	71,080	72,310
Baffin Region	30,260	31,160	31,950	34,020	36,030	37,750
Kivalliq Region	22,040	22,230	23,820	24,390	25,110	25,010
Kitikmeot Region	17,300	18,510	18,900	17,860	17,490	18,440
Cambridge Bay	26,070	30,620	32,780	29,800	28,800	28,960
Gjoa Haven	12,690	14,360	14,220	14,700	14,070	17,250
Kugaaruk	11,780	13,990	12,330	10,560	10,250	11,100
Kugluktuk	18,720	19,610	22,520	19,340	15,540	17,420
Taloyoak	13,200	12,830	13,280	10,890	13,040	14,580
NOTE: Employment income includes wages and salaries, commissions from employment, training allowances, tips and gratuities, and self-employment income.						
SOURCE: Nunavut Bureau of Statistics. (2014). Website: http://www.stats.gov.nu.ca/Publications/census/Income/Nunavut%20Taxfilers%20with%20Employment%20Income%20by%20Region%20and%20Community,%202006%20to%202014.xls						

6.4.3 Business

In the Kitikmeot region, a strong base of Inuit-owned business operations has developed, especially in Cambridge Bay. Many of these regional businesses are well positioned to take advantage of new opportunities, including the GBRP Project, and the future economic development it is expected to encourage.

Table 6-7 provides the number of Inuit-owned businesses based in the Kitikmeot region of March 2017. These businesses are included as part of the KIA's Kitikmeot Inuit Business Listing.

Table 6-7 Number of Kitikmeot Inuit Businesses by Community

Community	Number of Local Businesses
Cambridge Bay	62
Gjoa Haven	2
Kugaaruk	1
Kugluktuk	12
Taloyoak	12
Total	**89**
SOURCE: Kitikmeot Inuit Association 2017	

6.4.4 Traditional Economy

The number of hunters and the frequency of traditional activities have been declining in Nunavut. Hunting and trapping has recorded mixed results for harvest data between 1996 and 2001 (Priest and Usher 2004), which has led the GN to develop programs to encourage traditional economic pursuits on the land. The GN and Nunavut Tunngavik Incorporated (NTI) are involved in supporting Inuit hunters and trappers with their financial needs. There are several different programs, policies in place to support hunters and trappers. The key program is the Nunavut Harvesters Support Program, delivered by NTI, which is intended to relieve poverty among Inuit in Nunavut, and preserve and advance Inuit harvesting culture, heritage and traditional ways of life by providing Inuit in need with funding assistance for harvesting activities.

6.5 COMMUNITY INFRASTRUCTURE, SERVICES, AND WELLBEING

The five permanent Kitikmeot communities have access to water, wastewater, and solid waste services with sufficient capacity. The Government of Nunavut provides funding to keep these systems operating effectively. Electrical power and fuel supply also are sufficient given the small population of communities. Satellite communications systems are in place in all communities to provide phone, television, and internet services. However, there is a significant gap in the quality of telecom service available to Kitikmeot communities when compared to that available to southern Canada in terms of reliability, speed, volume capacity and technological capacity.

The rest of this section discusses the baseline for housing, education and training, health and healthcare, emergency services, recreation, and transportation.

6.5.1 Housing

The public housing stock in Nunavut is managed by the Nunavut Housing Corporation (NHC). Established in 2000, the NHC coordinates and administers housing programs that provide "fair access to a range of affordable housing options to families and individuals in Nunavut." (Nunavut Housing Corporation 2017). Specifically, NHC is responsible for the provision of public and GN staff housing within the territory.

Within this mandate, the NHC completed a Nunavut Housing Needs Survey in 2011 to assist it in planning and providing housing. Table 6-8 indicates the number of units in the Kitikmeot and its major communities in 2001 and 2011.

Table 6-8 Housing Stock in the Kitikmeot Region 2001–2011

Year	Overall Kitikmeot Region	Cambridge Bay	Kugluktuk	Gjoa Haven	Taloyoak	Kugaaruk
2001	1060	315	310	160	140	135
2011	1600	540	430	230	220	170
Percent Change	51%	71%	39%	44%	57%	26%
SOURCE: Nunavut Bureau of Statistics. (2011)/ Source: Statistics Canada 2001						
NOTE: No information was available for the communities of Bathurst Inlet and Omingmaktok						

Despite the increase in housing stock, there remains a lengthy waiting list for available units. The housing needs survey found that a substantial majority of the Inuit population live in overcrowded conditions. Housing quality also has the potential for diminished community wellbeing because the percentage of Inuit homes classified as inadequate increased from 15% to 23% between 2001 and 2006, while 22% of dwellings in Nunavut and 26% in the Kitikmeot Region required major repairs. As with all infrastructure in the territory, the costs of maintaining housing in Nunavut are high relative to other jurisdictions. This, combined with the fact that 80% of Nunavut's housing is supported by the GN, means that it spends a greater share of its total revenue on housing than does any other province or territory.

The Nunavut Housing Corporation continues to invest in new public housing projects at an increasing rate, and is undertaking a variety of initiatives to increase home ownership; however, the need for housing continues to exceed availability. With limited alternative types of housing, public housing is currently the catch-all for all needs. To move away from this dependency on public housing, Nunavut requires a range of affordable and appropriate options. To this end, Nunavut Housing Corporation has tabled *The Blueprint for Action on Housing - Implementation Plan for the GN Long-Term Comprehensive Housing and Homelessness Strategy,* which identifies 60 actions to be implemented over the next ten years.

6.5.2 Education and Training

In the Kitikmeot region, the provision of kindergarten through to post-secondary schooling is the responsibility of the Government of Nunavut. K-12 schooling is available in each Kitikmeot community.

Graduation rates for secondary school students in Nunavut are among the lowest in Canada, although they have been gradually increasing over time. At the territorial level, the Kitikmeot region, as noted in Table 6-9, has the lowest graduation rates of the three regions. Also, proportionally, the Kitikmeot region is graduating fewer high school students than its share of territorial population; between 2010 and 2015, Kitikmeot graduates represented between 8.8% to 16.5% of Nunavut's total graduates despite the region having about 18% of the territory's population.

Table 6-9 Nunavut Secondary School Gross Graduation Rate by Region, 2010 to 2015

	2010	2011	2012	2013	2014	2015
Nunavut						
Total Graduates, Nunavut	237	229	239	218	206	208
Graduation Rate	36.2	33.9	34.9	32.5	31.6	33.7
Kitikmeot						
Total Graduates, Kitikmeot	30	24	21	21	34	31
% of Territory's Graduates	12.66	10.48	8.79	9.63	16.50	14.90
Graduation Rate	22.6	18.4	16.7	16.0	26.8	24.9
Kivalliq						
Total Graduates, Kivalliq	81	86	94	76	86	82
% of Territory's Graduates	34.18	37.55	39.33	34.86	41.75	39.42
Graduation Rate	38.7	40.6	46.1	38.6	43.1	42.4
Qikiqtani						
Total Graduates, Qikiqtaaluk	126	119	124	119	86	95
% of Territory's Graduates	53.16	51.97	51.88	54.59	41.75	45.67
Graduation Rate	40.3	35.6	35.0	34.8	26.5	31.8

NOTE:
Gross Graduation Rate is calculated by dividing the number of graduates by the average of estimated 17 and 18 year-old populations (as the typical age of graduation).

SOURCE: Nunavut Bureau of Statistics - Nunavut Secondary School Graduates by Community, 1999-2015

Nunavut Arctic College (NAC) offers post-secondary education programs at its Kitikmeot Campus in Cambridge Bay. NAC also has Community Learning Centres in the four other Kitikmeot communities, but program offerings are fairly limited at these facilities. While many of the courses NAC offers focus on academic upgrading in advance of further training, the college does offer single and multi-year certificate and diploma programs. Some university courses and other special programming are delivered in partnership with university and college institutions from outside of Nunavut. Students pursuing post-secondary education beyond what NAC offers must either move south, or enroll in distance education programs.

The KIA provides programming that equips Inuit to better participate in the regional economy and offers career development services and sponsors training programs that are intended to lead to direct employment. KIA has managed and delivered the *Aboriginal Skills and Employment Training Strategy* on behalf of the Federal Government since 2012. Opportunities in the mining and minerals sector are a key focus for KIA, and it is working with partners in industry and government to develop and deliver training programs relevant to this sector.

The KIA also supports and rewards Kitikmeot Inuit who aspire to higher education and employment training. To this end, KIA offers the *KIA Scholarship and Graduation Award Program* which provides financial assistance to KIA beneficiaries who are enrolled full time in a recognized university, college or technical school leading to the successful completion of a post-secondary certificate, diploma, or degree program. Graduation awards are provided to beneficiaries who have successfully completed training or courses of study ranging from Grade 12 (or equivalent) to a completed PhD program.

6.5.3 Health and Healthcare

The provision of health care in Nunavut is primarily the responsibility of the GN's Department of Health and Social Services. Access to health care in Kitikmeot communities is limited. All five communities have Health Centres, but with the exception of Cambridge Bay, doctors are typically available only on a rotating basis. Cambridge Bay is home to the Kitikmeot Regional Medical Centre, which is usually staffed with a resident doctor, and equipped with facilities that can provide a higher standard of care than is available in the other four communities. However, for most specialized health services, residents from our region must travel to Yellowknife or southern Canada. Cambridge Bay also has a pharmacy that provides prescription medication to the region's residents.

A 2016 report by the GN's Office of the Chief Medical Officer of Health provides the following summary of the health and wellbeing of Nunavummiut:

- A high proportion of Nunavummiut reported that their sense of belonging to their local community was very or somewhat strong—85.3% versus 66.2% for other Canadians. This sense of connection to community is a key strength among residents of the territory.
- There continues to be a significant gap between the life expectancy of Nunavummiut and other Canadians with this difference reported as ranging from 7 to 10 years between 2000 and 2009.

- The proportion of Nunavummiut who smoke is 60.6%, much higher than the 18.7% of other Canadians who smoke. This important risk factor contributes to higher rates of lung cancer, respiratory diseases, and potentially avoidable mortality as well as to a lower life expectancy.
- The proportion of Nunavummiut who report that their mental health status is very good or excellent is 54.6% versus 71.1% for other Canadians. This poorer mental health status may be a factor in the higher rates of hospitalization due to self-injury, deaths due to suicide, and potentially avoidable mortality among residents of the territory. Suicide rates for men in the territory are much higher than rates among women. The rates of suicide for both Nunavummiut men and women are higher than those in the rest of Canada.
- Infant mortality rates are higher in the territory than in the rest of Canada—in 2012 the rate was 21.4 per 1,000 births in comparison to 4.8 in Canada. Infant mortality is a long-established measure of the wellbeing of a society, the health care of a population, and the attention paid to maternal child health.

Source: Department of Health, Government of Nunavut Health Profile, Nunavut: Information to 2014 http://www.gov.nu.ca/sites/default/files/files/health_profile_nunavut.pdf

Food security is a significant factor in individual, family, and community wellness. In 2014, rates of food insecurity in Nunavut affected 46.8% of households, including 19.3% of households that experienced severe food insecurity, and 60% of Nunavut's children lived in food-insecure households. In Nunavut, the relationship between un- or under-employment and food security was strong, with 83.3% of households reliant on social assistance reporting being food insecure. Very high food prices contribute to the extreme levels of food insecurity experienced in the Kitikmeot region. According to the 2016 Food Survey conducted by the Nunavut Bureau of Statistics (Nunavut Bureau of Statistics (2016)—2016 Nunavut Food Price Survey, Comparison of Nunavut and Canada CPI Food Price Basket Items), a comparison of Nunavut and Canada CPI Food Price Basket Items showed a very significant disparity in costs, especially for healthy fresh foods. For example, the average costs of celery, carrots and bananas in the Kitikmeot were respectively 4.29, 3.63 and 3.25 times those of the average Canadian retail prices. Other factors, such as the costs associated with harvesting country foods, and the availability of such foods, also contribute to food insecurity.

6.5.4 Emergency Services

A variety of health, social service and emergency response services are available within Kitikmeot communities. These services are provided either by the agencies and departments of the Government of Nunavut (e.g., Health and Social Services, Community and Government Services), or by the local (hamlet) municipal governments.

All Kitikmeot communities have access to an air ambulance service to transport people requiring emergency health care to facilities in Yellowknife or beyond. Terrestrial ambulance services are available in Cambridge Bay. Each of the five Kitikmeot communities has a Royal Canadian Mounted Police (RCMP) detachment and a firefighting service provided by a volunteer force.

6.5.5 Recreation

The Kitikmeot communities each have basic recreation facilities, including gymnasiums, community halls, swimming pools and ice rinks. The current exception to this is Kugaaruk, where several community facilities, including the school, were destroyed in a fire in February 2017. Hamlets and community members continue to organize and participate in a variety of community festivals, activities, and events that support community cohesion and overall wellbeing.

The Nunavut Agreement ensures that the Inuit can continue to do everything they could do on the land before it was signed. In particular, Inuit can continue to hunt and fish in parks, and they also have a role in decision making related to harvesting, carving stone, and the management of parks and conservation areas (Government of Nunavut 2002). There are three official Nunavut Territorial Parks in the Kitikmeot Region: Kugluk/Bloody Falls Territorial Park, Ovayok (Mount Pelly) Park, and Northwest Passage Trail.

6.5.6 Transportation

Communities in Nunavut are separated by large distances. Additional transportation challenges are posed by Nunavut's distance and isolation from population centres in southern Canada, as well as a lack of highway and rail links. Long supply lines impose additional costs on goods readily available in other parts of Canada. Once-a-year sealift options are used to move bulk, non-perishable goods to the Kitikmeot region. Air transportation is the only other option for both perishable and expedited bulk and non-perishable goods. As a consequence, high costs can be an important limitation to travel and economic development.

Sealift is currently the most economical way to transport bulk goods to the Arctic, and goods can often range from construction materials and non-perishable goods to larger items such as vehicles and heavy equipment. Sealift typically takes place between late June and late October when shipping is possible in much of Nunavut. The Government of Nunavut contracts operation of the sealift system, while the Department of Community and Government Services is responsible for annual dry cargo re-supply and Petroleum Products Division is responsible for bulk fuel re-supply.

There is very limited road infrastructure in Nunavut. Except for the all-season road between Iqaluit and Apex, there are no public roads linking communities, and there are no all-weather roads connecting Nunavut with other parts of Canada. It is also the only jurisdiction in North America that is entirely isolated from the National Highway System and the North American Trade Corridor. However, a network of ice roads help supply some Nunavut communities and mining projects. The Tibbitt to Contwoyto Winter Road is a major ice highway that starts 70 km north of Yellowknife and traverses 600 km before currently terminating near the Diavik diamond mine. When the Lupin Mine in Nunavut was operating, the winter road extended another 150 km north of the diamond mines. Since the Lupin Mine closed, this portion of the winter road has only been open sporadically.

With the exception of Bathurst Inlet/*Qingauk* and Omingmaktok in the Kitikmeot Region, all Nunavut communities are served by Transport Canada certified or registered airports. There are also several special purpose or private airstrips developed to serve the resource projects in isolated areas. The costs of air travel are high.

6.6 CULTURAL ENVIRONMENT

6.6.1 Heritage Resources

The Nunavut Agreement both outlines requirements for archaeology principles, permits and Inuit participation, and establishes the Inuit Heritage Trust to support, encourage, and facilitate the conservation, maintenance, restoration, and display of archaeological sites and materials. The Government of Nunavut and the Inuit Heritage Trust jointly own all archaeological specimens found within the Nunavut Settlement Area (Government of Nunavut 1999). The Department of Culture and Heritage maintains the Nunavut Archaeological Program to administer permitting and research in accordance with the Nunavut Archaeological and Palaeontological Sites Regulations (Government of Nunavut Department of Culture and Heritage 2012).

Archaeological permits are required to search for, survey, excavate, alter, or otherwise disturb an archaeological site. Each permit application is reviewed by the Department of Culture and Heritage and the Inuit Heritage Trust, and is then forwarded to nearby communities. The Nunavut Planning Commission also plays an important role in providing a preliminary understanding of the location of known archaeological sites. The Commission's website includes an interactive map of the sites in relation to regional boundaries and communities. (Nunavut Planning Commission 2012).

Baseline information on Project-related historical resources has been compiled from data collected for the Izok Corridor Project, and we will update or supplement this information as required. Archaeological sites are distributed primarily along major water features, such as the coastline, James River and Kennarctic River/*Qurluqtuaryuk*. Fieldwork conducted along the peninsula and coastline in Grays Bay/*Aariaq* found sites that contained multiple stone features representing probable tent rings, skin drying rings, caches, hearths/windbreaks, inukshuks, and stone box traps.

Several sites were recorded near Kennarctic River/*Qurluqtuaryuk*. Most of these contained stone features such as circles and semi-circles of various sizes, and various types of stone clusters, and there was also one small lithic scatter. Sites near James River also contained stone features comprising circles and rock piles, in addition to an extensive lithic scatter on a James River terrace.

6.6.1.1 Grays Bay Road

Previous studies related to High Lake project, the Izok Mine project and the Bathurst Inlet Port and Road project resulted in the recording of over 100 archaeological sites along potential road routes. Revisits were conducted in 2008 of all the sites (approximately 50) judged to be near the proposed road route (Prager 2009). In addition, ground reconnaissance conducted in 2008 recorded an additional 46 archaeological sites, all within or adjacent to the roads as proposed at that time. However, the currently proposed route differs in places from the once assessed during the 2008 archaeological field work.

The only portion of road that has received intensive archaeological investigations to date is the portion extending 12 km north of High Lake Mine site to the Sand Lake airstrip (Prager 2007). That assessment involved ground reconnaissance of most of the road and associated borrow sources, as well as detailed assessment or systematic data recovery at seven sites (MiNu-5, MiNu-6, MiNu-7, MiNu-8, MiNu-10, MiNu-11, MiNu-12).

6.6.1.2 Grays Bay Port

At the Grays Bay Port site, the entire peninsula was extensively covered by foot traverses in 2004 (Bussey 2005), 2005 (Prager 2006), and 2006 (Prager 2007). Two large sites, MkNu-2, MkNu-4, are situated in the lower northwestern portion of this landform. Four sites (MkNu-4, 5, 6, 10, 12) were recorded in the pass. Two sites (MkNu-3, MkNu-8) are in the high, central part of the headland, and one (MkNh-7) is situated on the lower rocky west side. All nine sites are located within or near the current proposed port footprint.

The archaeological sites in the vicinity of the Grays Bay Port site range from small to large, all contain stone features, and two also contain stone artifacts indicating considerable age. The two biggest sites (MkNu-2 and MkNu-4) contain a large quantity and wide variety of stone alignments and stone clusters. The suggested functions include tent rings, skin drying circles, caches, and support rocks for drying racks or kayaks. Various artifacts of wood, bone, antler and possibly ivory are present. The differences in the feature locations, shapes and sizes and construction methods suggest occupation at different periods of time, although seasonal use or different functions may also account for some of the variety. In general, the use of this portion of coastline appears most intensive during the Copper Inuit historic period, but evidence of use as early as 3,500 years ago was found on the higher portion of the landform.

6.6.2 Traditional Land and Resource Use

Historically, the harvesting of terrestrial and marine mammals, vegetation, and fish species has provided sustainable livelihoods for Inuit across the Kitikmeot Region and Nunavut. Today, the lands and waters of Nunavut continue to provide us with resources for sustenance, which helps support Inuit health and overall wellbeing. Country foods are a key element of our household nutrition. Moreover, the harvest and land use methods employed by Inuit and the knowledge they hold are considered a crucial means of passing hunting and trapping traditions along to the next generation.

Inuit Qaujimajatuqangit refers to knowledge about the environment, landscape, resource use, and customs based on experience that is passed down from generation to generation. Today, as in the past, undertaking traditional activities helps to strengthen relationships between our Elders and the younger generation. Carving, weaving, storytelling and other arts survive in both traditional forms and contemporary ones. These arts, including Inuit games, also help preserve our Inuit culture and language and reinforce a sense of community identity.

Traditional livelihoods in the North focus on pursuing resources in the places and at the times in which they are most abundant and easiest or least costly to get; this is referred to as the seasonal round. As an example:

> “Inuit of the Coronation Gulf area would begin the round in the spring with the seal hunting and jigging for fish, followed by the summer hunting caribou and fishing inland. Fall would bring the people to the Arctic char runs and the caribou migration, and in the winter, would see more sealing on the sea ice.” (Senes Consultants 2008).

7.0 POTENTIAL PROJECT EFFECTS ON THE BIOPHYSICAL ENVIRONMENT

A detailed assessment of the potential effects of the Grays Bay Road and Port Project on the environment will be presented in the draft environmental impact statement. The approach proposed for the DEIS is summarized in Section 7.1.

As per the NIRB's Project Specific Information Requirements (PSIR), the potential effects of the GBRP Project on the biophysical and human environment are presented in Sections 7.2 and 8.0, respectively. Potential effects, as well as a summary of possible mitigation measures and monitoring programs are described for each VC. A summary of potential effects on both the biophysical and human environment is also provided in Appendix 7A, following NIRB's PSIR (Part 2 Form). Cumulative effects are described in Section 9.0.

7.1 ENVIRONMENTAL ASSESSMENT APPROACH

The environmental assessment process will be finalized in EIS Guidelines issued by NIRB. Our preliminary proposal is that this process should use agreed-upon VCs to assess project effects and cumulative environmental effects. Project effects are changes to the biophysical or human environment that are caused solely because of the proposed project's principal works and activities, as defined in the Project Description (Sections **Error! Reference source not found.** and 4.0). Cumulative environmental effects are changes to the biophysical or human environment that are caused by the Project in whole or in part, in combination with other past, present or reasonably foreseeable future projects that have been or will be carried out.

Once VCs are selected, as described in Section 5.1, measurable indicators and criteria will be identified along with a description of temporal and spatial boundaries of the effects assessment for each VC. This will be based on carrying one project alternative – the GBRP Project as described, through the assessment.

Following the characterization of the baseline condition of each VC, the assessment will include descriptions of how an environmental effect may occur or how the GBRP Project will interact with the environment. Mitigation and environmental protection measures intended to reduce or eliminate the environmental effects will be identified. Residual environmental effects (those effects that remain after mitigation has been applied) will be characterized for both the construction and operation phases. Cumulative environmental effects will be identified in consideration of other reasonably foreseeable future projects or activities (as presented in Section 9.0).

Our proposed approach will also address the significance of project effects and cumulative environmental effects on VCs. Subject to discussions with NIRB and input from stakeholders leading to finalization of EIS Guidelines, we anticipate using an approach that is based on previous NIRB guidance and established environmental assessment approaches in Canada. In particular, appropriate benchmarks, based on western science and traditional knowledge will be established to determine the significance of environmental effects to those VCs.

The environmental effects assessment method that we propose to use to assess the project effects will be presented in detail in the DEIS. We look forward to working with NIRB on the Draft EIS Guidelines that will guide the presentation of information for the review of this project.

7.2 IDENTIFICATION OF PROJECT POTENTIAL EFFECTS ON THE BIOPHYSICAL ENVIRONMENT

The GBRP Project has the potential to affect the biophysical and human environment through the activities and infrastructure associated with the construction and operation of the road and port. The following sections provide a preliminary identification of potential GRBP Project effects on the biophysical environment. Each section identifies effects, describes effects pathways and summarizes our current thinking on potential mitigation and monitoring. Potential effects on the human environment are presented in Section 8.0.

We will develop detailed management plans that describe environmental protection measures to avoid or reduce potential effects during construction and operation of the GBRP Project for inclusion in the DEIS, as they will be used to assess the residual effects (i.e., effects after mitigation) of the Project on the environment. We will base these management plans on regulatory requirements, guidelines and best practice, as is typically required, but additional input from local knowledge holders will be used to augment this content. Specifically, the feedback we obtain through consultation with regulators, HTO, communities and Inuit and other Indigenous groups will be important to defining protection measures that will address the most important issues of concern, such as caribou/*tuktuit*. The following sections provide proposed mitigation that would be included in such plans.

7.3 ATMOSPHERIC ENVIRONMENT

7.3.1 Potential Changes to Air Quality

7.3.1.1 Potential Effects

Potential effects of the Project on air quality are:

- change in ambient air quality
- contribution to anthropogenic greenhouse gas

7.3.1.2 Effects Pathways

Changes in ambient air quality can be expressed collectively or singly by a change in the following: ambient concentration of criteria air contaminants (CACs) including sulphur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2,), total suspended particulate (TSP), fine particulate matter of 2.5 microns (µm) in diameter or less ($PM_{2.5}$), particulate matter of 10 µm in diameter or less (PM_{10}), and volatile organic compounds (VOCs).

Activities during both construction and operation have the potential to change ambient air quality and to contribute to greenhouse gas emissions. Emissions sources during construction could include creation of dust from grading, blasting, excavation, crushing, quarry development, fuel combustion from vehicle and equipment use, camp operations, vehicle movement and incineration of waste. Emissions sources during operation include creation of dust and fuel combustion resulting from road maintenance activities, facilities resupply and equipment and camp operation at Grays Bay (*Aariaq*) Port and Jericho Station.

7.3.1.3 Potential Mitigation

Mitigation measures will be incorporated into the design of the GBRP Project facilities to reduce atmospheric emissions where practicable. In addition to design mitigation, we will consider the following mitigation:

- Alternative sources of fuel and energy will be investigated for economically viable application to all activities that involve combustion of fossil fuels.
- Traffic speed limits will be implemented on GBRP Project roads.
- All GRBP Project vehicles and equipment will be maintained and inspected regularly.
- Low sulphur diesel will be used in construction and operational vehicles to reduce emissions of SO_2.
- A Road Management Plan, which includes dust mitigation measures, will be implemented.

7.3.1.4 Potential Monitoring

We will implement an Air Quality Management Plan for construction and operations to ensure compliance with applicable regulations. Ambient air quality monitoring could be implemented at the Grays Bay Port site if deemed necessary.

7.3.2 Potential Changes to the Acoustic Environment

7.3.2.1 Potential Effects

Potential effects of the Project on the acoustic environment are:

- change in ambient noise levels
- change in vibration levels

7.3.2.2 Effects Pathways

Changes to ambient noise levels and vibration levels have the potential to affect wildlife receptors, through disturbance and possible displacement, and human receptors via annoyance and disturbance. However, given that the nearest communities to the GBRP Project are a significant distance from the GBRP Project, disturbance to human receptors will likely be limited to those individuals using the road or hunting/camping close to the road or port.

During construction, localized noise and vibration levels will increase because of heavy equipment use, blasting, quarry operations, construction of infrastructure, air traffic and construction vehicles.

During operations, noise sources will include operations and maintenance of the road and airstrip, operations at Grays Bay Port and Jericho Station, and intermittent blasting at permanent quarries.

Underwater noise effects due to Grays Bay Port construction are discussed in relation to marine wildlife in Section 7.6.

7.3.2.3 Potential Mitigation

We will incorporate mitigation measures into the design to reduce the potential for noise and vibration disturbance (e.g., enclosing noisy stationary equipment inside buildings).

In addition to design measures, mitigation includes:

- All GBRP Project vehicles and equipment will be maintained and inspected regularly.
- Speed limits will be implemented on GBRP Project roads.
- Blasting at quarry sites will follow blasting guidelines.
- Storage, handling and use of explosives will be conducted in accordance with the Explosives Management Plan.
- Blasting plans will be provided to Fisheries and Oceans Canada (DFO) for review to ensure appropriate best practices are followed.
- DFO Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters will be followed.
- GBRP Project-associated aircraft will adhere to prescribed altitudes and flight corridors to reduce noise disturbance to wildlife.

7.3.2.4 Potential Monitoring

Potential monitoring programs could include ambient noise surveys and noise monitoring to determine the need for further mitigation at GRBP Project infrastructure.

7.3.3 Potential Changes to Ambient Light

7.3.3.1 Potential Effects

Potential effects of the GBRP Project on ambient light are:

- change in ambient light

7.3.3.2 Effects Pathways

Activities during both construction and operation have the potential to change ambient light conditions. During construction, light sources will include construction equipment, traffic, construction camps and lighting used to illuminate construction sites during dusk and night-time conditions as variably required throughout the year. During operation, the Grays Bay Port and the Jericho Station will require external lighting on structures for navigation, operation and safety requirements, and will have internal lighting at facilities where personnel are resident. Permanent lighting will not be installed along the Grays Bay Road.

7.3.3.3 Potential Mitigation

We will incorporate mitigation measures into the design of the GBRP Project facilities to reduce effects on ambient light levels where practicable. In addition to design mitigation, we will consider the following mitigation:

- Lights will be positioned so that the luminaires can be pointed downward so that only the working area is illuminated.
- As much as is possible, lighting will be located such that unavoidable light spill off the working area is not directed toward any receptors outside the working area.
- Lighting at the Grays Bay Port will be located so that the lights are not directed toward oncoming traffic from the road or sea except as required for navigation.
- Lights will be designed to avoid excessive use of the mobile flood lighting units and reduce potential effects by turning off lighting when they are not required.
- Adherence to lighting design guidelines, such as the International Commission on Illumination (CIE), International Dark Sky Association (IDA), Illuminating Engineering Society (IES), and the lighting requirements for workspaces as enforced by Labour Canada.

7.4 TERRESTRIAL ENVIRONMENT

7.4.1 Potential Changes to Soils and Terrain

7.4.1.1 Potential Effects

Potential effects of the Project on soils and terrain are:

- change in soil quality
- change in soil quantity
- change in landforms (topography diversity)
- loss of unique landforms

7.4.1.2 Effects Pathways

Changes to soil quality may result from compacting, admixing during construction and erosion during both construction and operation. Soil compaction may occur as the result of movement of heavy construction equipment or the storage of construction material. Admixing of soil layers can affect soil texture and structures, as well as organic carbon. Soil erosion may occur at areas where vegetation has been disturbed for the placement of infrastructure (e.g., stream crossings, road, port infrastructure, or for quarrying activities). Dust mobilization during both construction and operation could affect areas beyond the immediate GBRP Project footprint through transport of dust with differing chemical properties than the soil it eventually interacts with.

During construction, the key sources of direct disturbance to soil quantity include soil stripping or burial, soil movement and surface soil erosion. Activities during both construction and operation have the potential to affect terrain that may result in a change in landforms or loss of unique landforms. Direct changes to landforms may principally occur as a result of quarry activities and cut-type embankment construction.

Indirect changes to landforms could result from a change in terrain stability and permafrost conditions. Changes to terrain stability and permafrost conditions could occur because of construction activities along the road, quarry locations and Grays Bay Port. Site preparation, grading and excavation activities related to both terrestrial and in-water construction have the potential to affect permafrost regimes and terrain stability. A loss of terrain stability and effects on permafrost may result in slope instability, shoreline erosion and subsidence.

7.4.1.3 Potential Mitigation

Mitigation measures to reduce potential effects on soils and terrain will likely include:

- reduce the construction or disturbance footprint size (e.g., size of quarries, temporary work sites, port infrastructure, etc.) as much as possible without compromising the ability to safely construct the GRBP Project
- keep all equipment within the approved GBRP Project footprint
- limit soil stripping outside of the direct footprint
- implement dust suppression measures during construction and operation
- reclaim temporary work areas not needed for GBRP Project operations
- use of Inuit Environmental Monitors to oversee construction activities to ensure mitigation measures are followed
- implement a Quarry Management Plan that will provide specific erosion control measures and reclamation to be implemented at quarry sites
- local and regional climatic conditions and terrain constraints will be incorporated into the design and siting of all GBRP Project components
- unique or challenging (regarding engineering design) landforms such as eskers, steep terrain, wetlands and shorelines will be avoided where possible. If such landforms cannot be completely avoided, then activities (such as cut width) in such areas will be minimized
- reduce surface disturbance in areas of high ice-content soils
- drainage around infrastructure will be managed and designed to reduce the potential for surface water pooling
- implement a Road Operations and Maintenance Plan that will include erosion control measures, dust control and relevant maintenance activities

7.4.1.4 Potential Monitoring

Potential monitoring programs for soils could entail regular inspections of sites to confirm mitigation measures are in place and, if required, recommend adaptive management measures.

We will implement a monitoring program that includes regular inspections of sites and infrastructure (road, port facilities, borrow pits and quarry sites) to identify any signs of terrain or permafrost degradation and ensure prompt mitigation is implemented.

7.4.2 Potential Changes to Vegetation

7.4.2.1 Potential Effects

Potential effects of the Project on vegetation are:

- change in species diversity
- change in community diversity

7.4.2.2 Effects Pathways

During construction, the key source of direct disturbance will be vegetation clearing, quarry development and site grading. Air emissions and dust created by vehicles during construction and operation have the potential to affect plant health and vegetation communities. Indirect effects may also occur as a result of changes to surface hydrology, substrate composition and compaction because of construction activities. Vehicles, equipment and supplies brought into the area have the potential to transport invasive species, which can detrimentally affect native species and communities.

7.4.2.3 Potential Mitigation

Mitigation measures to reduce potential effects on vegetation include:

- avoid siting infrastructure or quarries in sensitive and unique vegetation communities, where feasible. If such communities cannot be completely avoided, then disturbance will be minimized.
- reduce the construction and disturbance foot print size (e.g., size of quarries, temporary work sites, port infrastructure), to the extent practicable
- no vegetation will be stripped outside of the areas to be developed
- implement dust mitigation measures
- all equipment remains within the approved GBRP Project footprint
- limit disturbance near riparian areas and lake shores
- construction vehicles and equipment will be clean when entering the area to reduce the potential for introduction of invasive species

Mitigation measures listed under Section 7.4.1.3 for soils and terrain are also applicable to vegetation.

7.4.2.4 Potential Monitoring

We will examine whether monitoring programs could be implemented for areas that have been reclaimed. Results of monitoring would identify any other areas of concern and inform the need for any further mitigation and management.

7.4.3 Potential Changes to Wildlife and Wildlife Habitat

7.4.3.1 Potential Effects

Potential effects of the GBRP Project on wildlife and wildlife habitat, including terrestrial birds, are:

- change in habitat
- change in mortality risk
- change in movement and distribution

7.4.3.2 Effects Pathways

Construction activities will result in direct habitat loss from the footprint of the road, temporary and permanent quarries (including any permanent access roads) and the Grays Bay Port. Indirect habitat loss may occur as a result of a GBRP Project-related activities that displace wildlife from an area due to sensory disturbance, thus reducing effectiveness of adjacent habitat. Such activities would include noise from blasting, vehicle and aircraft noise and human presence near key habitats (e.g., calving areas/*irniurviit*, bird nesting sites).

Wildlife mortality risk relates primarily to potential human-wildlife interactions that that may result in the injury or death of the animal. The primary sources of risk relate to vehicle collisions with wildlife, destruction of nests, and lethal control of problem wildlife. Wildlife may be attracted to the Grays Bay Port site as a source of food (human food waste) or shelter. Infrastructure lighting at the Grays Bay Port may attract migrating birds, resulting in possible collisions with infrastructure. This same infrastructure may also create preferential nesting habitat for certain species.

The presence and use of the infrastructure may result in wildlife species altering their movement patterns (either to avoid or because they are attracted to infrastructure). Such behavior could alter wildlife movement patterns to the extent that feeding and breeding grounds are avoided, or the timing of their use is altered. This is a key consideration for caribou/*tuktuit* and other ungulates that migrate large distances and have historical calving grounds/*irniurviit*. Sources that may affect movement patterns include vehicle and aircraft operation (during both construction and operation), blasting during construction and permanent and temporary infrastructure (roads, quarries, construction lay down areas, Grays Bay Port, equipment storage).

7.4.3.3 Potential Mitigation

We will develop a Wildlife Mitigation and Monitoring Plan in consultation with affected stakeholders and management authorities. A key component to the plan will be the incorporation and consideration of Inuit Qaujimajatuqangit and traditional knowledge. In addition, feedback and information received during the public engagement program for the GBRP Project will be incorporated into the plan. The plan will present mitigation, management practices and monitoring programs to reduce potential effects on wildlife and wildlife habitat.

The following presents some general mitigation measures, applicable to most wildlife species, that we will likely be include within the Wildlife Mitigation and Monitoring Plan.

General Mitigation Measures

- All GBRP Project personnel will be provided with wildlife awareness training.
- Access to the GBRP will be managed on a seasonal basis, taking into consideration human safety and sensitive periods for caribou.

Habitat Effects—Mitigation:

- restrict temporary and permanent surface footprints to the smallest area necessary
- limit disturbance near water.
- GBRP Project-related aircraft will adhere to prescribed altitudes and flight corridors
- Implement dust control measures
- where necessary for construction, reduce the length of overland winter roads
- avoid sensitive and unique wildlife habitat, where practical
- report and clean up spills immediately

Mortality Risk—Mitigation:

- Wildlife awareness and sensitivity training (especially caribou/*tuktuit* and bear awareness training) will be provided for all on-site personnel to familiarize them with an ecologically responsible code of ethics regarding wildlife and wildlife habitat.
- GBRP Project personnel will be prohibited from feeding, harassing or harvesting wildlife.
- Hunting by GBRP Project personnel will not be permitted.
- A “no shooting” buffer will be implemented along the road for safety reasons.
- Pre-construction nest surveys will be undertaken by a qualified wildlife biologist in areas where disturbance during the nesting season is unavoidable. Localized measures will then be implemented to reduce effects on active nests.
- We will implement a waste management plan to minimize the presence of attractants such as garbage and waste food.
- GBRP Project vehicles will be subject to speed limits.

- Buildings will be designed to discourage use as animal shelter/habitat.
- Blasting activities will be suspended when wildlife is in the area.

Movement and Distribution Effects—Mitigation:

- We will implement a wildlife right-of-way policy.
- Flight altitude guidelines will be implemented specific to areas of migratory birds and caribou.
- Vehicle use will be limited to designated roads and prepared work areas.
- GBRP Project vehicles will be subject to speed limits.
- Subject to safety requirements, lighting and use of lights at the Grays Bay (*Aariaq*) Port site will be designed to minimize the disturbance of lights on wildlife.
- Embankment toe slopes will be reduced in areas of known caribou crossings.
- Snow bank heights will be limited.
- Speed restrictions will be implemented for all inbound marine vessels to reduce wakes.
- Signage will be used along the road and at Grays Bay Port to warn of high frequency wildlife areas.

Caribou/tuktuit-Specific Mitigation Measures

Specific mitigation measures for caribou/*tuktuit* will focus on reducing the potential for sensory disturbance, vehicle-animal collisions and impacts to animal movement. Mitigation measures will be part of a Wildlife Mitigation and Monitoring Plan developed in consultation with affected Inuit, other Indigenous groups and the Government of Nunavut. We will ensure that this plan will incorporate Inuit Quajimajatuqangit and traditional knowledge. The Wildlife Mitigation and Monitoring Plan will detail proposed adaptive mitigation and monitoring measures. Examples of potential mitigation include the following:

- manage timing of construction activities in areas that are affected during the migration, calving/*irniurniit* and post-calving activities and seasons. Management protocols will be detailed in the Wildlife Mitigation and Monitoring Plan and may include limiting or cessation of non-essential construction activities during certain time periods.
- limit disturbance of key habitat features such as eskers
- provide signage of known and frequently used crossings, or in areas where animals reside near roads
- develop protocols for radio traffic communication
- management of speed limits for construction vehicles
- establish deterrent measures
- minimize road embankment height and road profile
- caribou/*tuktuit* crossings will be a part of road design and will be placed in appropriate sites
- locate construction infrastructure (i.e., constructions camps, fuel caches) to avoid key caribou migration/*tuktuit aullayaaqtut* points (i.e., identified water crossings)
- operational road management may include road closures when caribou/*tuktuit* are moving across and near the road during spring migration/*atiqtat*, calving/*irniurniit* and post-calving

- port operations restricted to the ice-free season to reduce conflict with migrating Dolphin and Union caribou
- manage timing of construction activities or operations at the Grays Bay Port site to reduce potential effects on caribou. Management protocols will be detailed in the Wildlife Mitigation and Monitoring Plan and may include limiting or cessation of non-essential construction activities during certain time periods.

7.4.3.4 Potential Monitoring

The Wildlife Mitigation and Monitoring Plan will describe wildlife monitoring programs for key species. Caribou/*tuktuit* will be a focal species for monitoring. Potential caribou/*tuktuit* monitoring includes:

- monitor harvester use of the road
- regular surveys within a defined study area, with a focus along the road and at the Grays Bay Port site, to document caribou presence and habitat use patterns
- documentation of GBRP Project interactions with caribou/*tuktuit* and all caribou/*tuktuit* sightings and analysis of the results to help determine if additional mitigation measures are required at specific geographic locations (e.g., road crossings)
- winter tracking surveys along the road and at the Grays Bay Port site to identify any key caribou/*tuktuit* movement locations

7.5 FRESHWATER ENVIRONMENT

7.5.1 Potential Changes to Groundwater Resources

7.5.1.1 Potential Effects

Potential effects of the GBRP Project on ground water resources are:

- change in groundwater quantity
- change in groundwater quality

7.5.1.2 Effects Pathways

Where continuous permafrost is present, two groundwater flow systems are present: one is located near ground surface within the seasonally thawed active layer and the second flow system is located beneath permafrost. Groundwater and surface water systems are connected only through taliks beneath large lakes and rivers, where water depth is sufficient to prevent freezing to bottom during winter months.

The potential for the GRBP Project to affect groundwater is primarily through effects to shallow groundwater. Construction activities such as grading, quarry and borrow pit development, ground disturbance for Grays Bay Port infrastructure have the potential to affect shallow groundwater. During both construction and operation there is the potential for accidental releases of hazardous materials; that is, fuel and chemicals which, depending on season and terrain conditions, may affect shallow groundwater.

Indirect changes to groundwater (both shallow and deep) could result due to a change in permafrost conditions. Changes to permafrost conditions could occur because of construction activities along the road, quarry locations and Grays Bay Port. Site preparation, contouring and excavation activities related to both terrestrial and in-water construction have the potential to affect permafrost regimes and terrain stability through the change in surface and subsurface flow.

7.5.1.3 Potential Mitigation

Potential mitigation measures to address concerns related to groundwater resources include:

- Local and regional climatic conditions and terrain constraints will be incorporated into the design and siting of all GBRP Project components.
- Surface disturbance will be reduced in areas of high ground ice.
- Drainage around infrastructure will be managed and designed to reduce the potential for surface erosion and water pooling.
- A Quarry Management Plan will be implemented. The plan will describe erosion control measures to be implemented at quarry sites.
- A Road Management Plan will be implemented with erosion control measures and maintenance activities.
- A Spill Contingency Plan will be implemented.
- An Emergency Response Plan will be developed, and crews will be trained to implement the response in the event of an accident or malfunction.

7.5.1.4 Potential Monitoring

It is not anticipated that the GBRP Project will require monitoring of groundwater resources. However, if the DEIS determines the potential for groundwater issues, monitoring measures will be evaluated.

7.5.2 Potential Changes to Surface Water Resources

7.5.2.1 Potential Effects

Potential effects of the GBRP Project on surface water resources are:

- change in hydrological and sediment transport regime
- change in surface water and sediment quality

7.5.2.2 Effects Pathways

Construction—in particular, river and stream crossings for both the Grays Bay road and access roads to temporary and permanent quarry sites; and the Grays Bay Port—have the potential to affect surface water, in the form of increased turbidity and sedimentation due to either near shore or in-water construction. Quarry development and rock cuts in certain rock types required for road and port development have the potential to result in acid rock drainage and metal leaching (ARD/ML).

Freshwater will be required for potable water requirements, dust suppression, general construction needs and fire-fighting needs. Freshwater will be sourced from local water bodies.

During both construction and operation, there is the potential for accidental releases of hazardous materials (e.g., fuel and chemicals) which dependent on season and terrain conditions may affect surface water bodies.

7.5.2.3 Potential Mitigation

Mitigation measures to address potential effects to surface water resources include the following:

- We will withdraw water in accordance with DFO's Protocol for Water Withdrawal from Ice-covered Waterbodies in the Northwest Territories and Nunavut.
- We will design all watercourse crossing structures to meet 1:100-year flood events and requirements related to fish passage and fisheries protection where applicable.
- We will develop and implement a Waste Water Management Plan for the management of sewage and gray water at Grays Bay Port.
- We will implement a Quarry Management Plan. The plan will provide erosion control measures to be implemented at quarry sites.
- We will implement a Road Management Plan with erosion control measures and maintenance activities.
- We will put in place a Spill Contingency Plan during construction and operations.
- We will develop an Emergency Response Plan, and crews will be trained to implement the response in the event of an accident or malfunction.
- We will not store fuel within 100 m of a water body.
- We will not carry out any excavation or terrain disturbance activities within 50 m of any waterbody except for water crossing sites.
- We will avoid quarrying in areas of high ARD/ML potential, where practicable.

7.5.2.4 Potential Monitoring

Surface water quality monitoring if required, includes:

- turbidity monitoring during construction activities
- effluent monitoring during construction and operations to assess discharge water quality
- water quality monitoring at permanent quarry sites

7.5.3 Potential Changes to Freshwater Fish and Fish Habitat

7.5.3.1 Potential Effects

Potential effects of the GBRP Project on freshwater fish and fish habitat are:

- permanent alteration of fish habitat
- destruction of fish habitat
- fish mortality

7.5.3.2 Effects Pathways

In stream works such as culvert placement and bridge crossings have the potential to result in direct mortality to fish species, disrupt fish passage and alter habitat. Such activities may also result in the direct loss of fish habitat. Fish habitat may also be affected by altered sediment and water quality because of increased sedimentation from construction and operations, effluent discharge and site run off. Changes to water and sediment quality have the potential to affect fish health. Water withdrawal for construction and operation has the potential to reduce fish habitat quality in the lakes from which water is withdrawn. Water withdrawal from lakes resulting in lower water volumes can lead to reduced dissolved oxygen (DO) levels due to the increased effect of decay of organic matter or respiration by aquatic organisms.

During both construction and operation, there is the potential for accidental releases of hazardous materials (e.g., accidental releases of fuel or chemicals could enter waterbodies and thus affect fish and fish habitat).

7.5.3.3 Potential Mitigation

DFO's *Fisheries Protection Policy Statement* applies to all activities in or near water that could result in serious harm to fish by chemical, physical or biological means. The guiding principle of this policy is to "maintain" or "improve" the productive capacity of fisheries. A *Fisheries Act* authorization is required for any activities that will result in serious harm to fish and requires that offsetting be provided through habitat creation, restoration or enhancement. Potential mitigation measures to address potential effects on freshwater fish and fish habitat include:

- We will design all watercourse crossing structures to meet 1:100-year flood events and requirements related to fish passage and fisheries protection where applicable.
- We will withdraw water in accordance with DFO's Protocol for Water Withdrawal from Ice-covered Waterbodies in the Northwest Territories and Nunavut.
- We will use screens for water withdrawal that will be designed and operated according to the DFO Freshwater Intake End-of-pipe Fish Screen Guidelines and Fish Screen Design Criteria for Flood and Water Truck Pumps.
- We will develop and implement a Sedimentation and Erosion Control Plan for construction and ongoing maintenance of watercourse crossings.
- We will develop and implement a Waste Water Management Plan for the management of sewage and greywater at Grays Bay Port.
- We will implement a Quarry Management Plan. The plan will provide erosion control measures to be implemented at quarry sites.
- We will implement a Road Management Plan with erosion control measures and maintenance activities.
- We will put in place a Spill Contingency Plan during construction and operations.
- We will develop an Emergency Response Plan, and crews will be trained to implement the response in the event of an accident or malfunction.
- No fuel will be stored within 100 m of a water body.
- No excavation or terrain disturbance activities will be carried out within 50 m of any waterbody except for water crossing sites.

7.5.3.4 Potential Monitoring

An Aquatic Effects Monitoring Program (AEMP) will be developed and implemented for construction and operation. The AEMP will be designed to confirm the predictions of the environmental assessment and the effectiveness of mitigation. It will provide a framework for implementing additional actions to mitigate unforeseen changes, if required.

7.6 MARINE ENVIRONMENT

7.6.1 Potential Changes to Marine Water and Sediment Quality

7.6.1.1 Potential Effects

The GBRP Project has the potential to affect marine water and sediment quality, which in turn, may affect the health of marine organisms.

7.6.1.2 Effects Pathways

During construction, in-water activities such as pile driving, blasting and dredging have the potential to increase turbidity and sedimentation near the activities. In addition, terrestrial port construction activities may result in increased suspended sediment concentrations in the marine environment from site runoff.

During operations, terrestrial site runoff and maintenance dredging (if required) have the potential to affect turbidity and sedimentation. During both construction and operation, there is the potential for accidental releases of hazardous materials (e.g., fuel and chemicals).

7.6.1.3 Potential Mitigation

We will develop a spill contingency and emergency response plan for potential spills at the Grays Bay Port, as discussed in Section 11.

Other mitigation measures that we will use to address potential effects on marine water and sediment quality include:

- sediment and erosion control measures during land-based construction and operations such as silt traps and silt fences
- use of silt curtains or other means during blasting and dredging

7.6.1.4 Potential Monitoring

Marine water and sediment quality monitoring programs, if required, include:

- turbidity monitoring during construction activities at the Grays Bay Port location
- effluent monitoring during construction and operations to assess discharge water quality
- water and sediment quality monitoring in the immediate vicinity of the Grays Bay Port

7.6.2 Potential Changes to Marine Fish and Fish Habitat

7.6.2.1 Potential Effects

Potential effects of the GBRP Project on marine fish and fish habitat are:

- change in habitat
- change in behavior
- change in mortality risk
- change in health

In this context, the definition of marine fish includes marine finfish, marine and riparian plants and invertebrates.

7.6.2.2 Effects Pathways

The primary sources of disturbance to marine fish and fish habitat will occur during construction activities at the Grays Bay Port, this includes blasting, dredging, construction activities in the littoral zone, and accidental spills of hazardous materials. Direct loss of fish habitat will occur within the dock footprint and any filled portion of the bay. Alteration or disruption of fish habitat (including substrate and sessile organisms) might occur around the dock site because of changes in turbidity, sedimentation and underwater noise from blasting and dredging. These construction activities may also result in changes to behavior and health of marine fish. Construction activities, blasting and dredging specifically, have the potential to result in direct and indirect fish mortality.

During operations, changes in water or sediment quality as a result of vessel operations may affect fish habitat, behavior and health. Underwater noise from operations has the potential to affect fish behavior and health.

7.6.2.3 Potential Mitigation

We will carry out all blasting operations in accordance with applicable guidelines and regulations, and details will be agreed with DFO at the *Fisheries Act* authorization application stage. DFO's *Fisheries Protection Policy Statement* applies to all activities in or near water that could result in serious harm to fish by chemical, physical or biological means. The guiding principle of this policy is to 'maintain' or 'improve' the productive capacity of fisheries. A *Fisheries Act* authorization is required for any activities that will result in serious harm to fish and requires that offsetting be provided through habitat creation, restoration or enhancement.

Other mitigation measures to address potential effects on marine fish and fish habitat include implementation of a Nearshore Construction Management Plan that will specify mitigation measures to reduce effects of noise, vibration and light on the environment.

Mitigation measures listed under Section 7.6.1.3 for marine water and sediment quality are also applicable to marine fish and fish habitat.

7.6.2.4 Potential Monitoring

A Fish and Fish Habitat Monitoring program will be developed and implemented to monitor potential effects on marine fish and fish habitat.

7.6.3 Potential Changes to Marine Mammals

7.6.3.1 Potential Effects

Potential effects of the GBRP Project on marine mammals are:

- change in habitat
- change in behavior
- change in mortality risk
- change in health

7.6.3.2 Effects Pathways

The primary source of disturbance to marine mammals by the GBRP Project is underwater noise generated during construction activities, noise generated by port resupply vessels during operations, and the operation of vessels within the immediate area of the port. Underwater blasting, dredging and pile driving during construction will generate underwater noise and vibration that could affect marine mammal behavior resulting in temporary avoidance of the area. Underwater noise also has the potential to result in hearing impairment dependent upon the volume and duration of the noise source and the relative location of the marine mammal. Noise generated by port resupply vessels during operations could result in a change in distribution of marine mammals due to avoidance behavior.

Waste management activities at the port have the potential to be an attractant to marine mammals, e.g., polar bears/*nanuit*.

7.6.3.3 Potential Mitigation

All blasting operations will be carried out in accordance with applicable DFO Blasting Guidelines, including enforcing a safety radius of 500 m and ensuring marine mammals are not present in the safety radius prior to blasting. We will put in place a Waste Management Plan at the port site that will reduce the risk of animal attraction.

Other mitigation measures to address potential effects on marine mammals include:

- We will implement a Nearshore Construction Management Plan specifying mitigation to reduce effects of noise, vibration and light on the environment
- We will enforce vessel speed and course restrictions during construction and operations at the Grays Bay Port and approaches
- We will use onboard marine mammal observers (MMOs) during construction operations
- We will require aircraft using the airstrip at Grays Bay Port to adhere to prescribed altitudes and flight corridors
- We will implement a Waste Management Plan to minimize the presence of attractants such as garbage and waste food

Mitigation measures listed under Section 7.6.1.3 for marine water and sediment quality are also applicable to marine mammals.

7.6.3.4 Potential Monitoring

An onboard marine mammal observer program may be implemented during construction to monitor marine mammal (and other wildlife) behavior. Monitoring of underwater noise may be implemented during pile driving to confirm effectiveness of mitigation and predicted effects on marine mammals.

7.6.4 Potential Changes to Marine Birds

7.6.4.1 Potential Effects

Potential effects of the GBRP Project on marine birds are:

- change in habitat
- change in behavior
- change in mortality risk
- change in health

In this context, the definition of marine birds includes seabirds and land birds that utilize coastal habitat for feeding, breeding, nesting, or migration and may be affected by marine based activities.

7.6.4.2 Effects Pathways

Construction of the dock and port facilities may result in direct habitat loss, while vessel activity and wake may affect marine bird distribution, foraging, and shoreline nesting habitat. Such changes to habitat and behavior may result in effects to breeding success and energetics.

Operational activities at the Grays Bay Port—including human activity, lighting, facility operations and waste management—will affect habitat and may result in changes to marine bird behavior, health and mortality risk.

7.6.4.3 Potential Mitigation

We will put in place a Waste Management Plan in place at the Grays Bay Port site that will reduce the risk of animal attraction. Infrastructure lighting will be designed to reduce the potential for marine bird collisions. A Spill Contingency Plan will be implemented.

Other mitigation measures that we will consider to address potential effects on marine birds include:

- We will avoid known key seabird habitats (e.g., key nesting, rafting or foraging areas), where possible
- We will develop a nest-specific management plans for all active seabird nests within 200 m of construction activities
- We will establish flight corridors and minimum aircraft cruising altitudes to avoid known concentrations of seabirds
- Vessel speed and course restrictions will be put into effect during construction and operations at the Grays Bay Port and approaches
- We will prohibit of harassment of seabirds by vessels, crew and aircraft

Mitigation measures listed under Section 7.6.1.3 for marine water and sediment quality are also applicable to marine birds.

7.6.4.4 Potential Monitoring

A seabird monitoring program may be implemented if the GBRP Project is determined to affect important habitat near the port.

8.0 POTENTIAL EFFECTS ON THE SOCIO-ECONOMIC ENVIRONMENT

8.1 INTRODUCTION

This section introduces our approach to assessing Project effects on the socio-economic environment.

A detailed assessment of potential effects of the Project and development of appropriate effects management will be conducted as part of the feasibility study and environmental assessment phase, and presented in the DEIS. It is anticipated that the proposed list of VCs will be refined through consideration of ongoing engagement, additional Inuit Quajimajatuqangit and traditional knowledge, previous relevant EIS Guidelines, and public input during the scoping process undertaken by the NIRB as part of the development of the Project EIS Guidelines.

The main assessment area for economic and infrastructure, services and wellbeing effects encompasses the Kitikmeot communities and Yellowknife, but also considers the broader potential socio-economic effects on Nunavut and the Northwest Territories. The assessment area for cultural resources includes the areas of, and adjacent to, the project sites.

8.2 CO-PROPONENT'S APPROACH TO ASSESSMENT

As a public government (GN) and regional Inuit association (KIA), we are well equipped and positioned to help ensure that any potential positive and adverse effects on the human environment are adequately and effectively managed and monitored.

We both help to coordinate, implement and fund economic development initiatives, including through employment and skills training programming, and business development programming. The KIA also has two subsidiaries, Kitikmeot Corporation, and Nunavut Resources Corporation, which are mandated to pursue economic opportunities for KIA's membership. Having all these resources in place prior to construction and operation will help Kitikmeot communities to maximize their economic benefit from the Project.

The GN is the key provider of housing, health, emergency response, and social services in the Kitikmeot region. It has at its disposal a variety of policy and programming tools, as well as management and front-line staff resources, that it can deploy to respond to adverse socio-economic effects that are attributed to the Project.

Given its prominence and presence within the Kitikmeot region, we expect the KIA to serve as a "listening post" that receives and responds to community interests and concerns that may be generated by the Project. In such a role, KIA could help to direct attention and resources towards these issues, and we will work together with GN departments and other stakeholders to address them. KIA already has extensive experience with such a role through its implementation of Inuit Impact and Benefit Agreements (IIBAs) and with similar agreements with industry. Social impacts on families and communities have previously been tabled and addressed at IIBA implementation committees. This experience will prove valuable in seeking to enhance positive and mitigate adverse socio-economic effects of the GBRP Project.

Finally, as the preeminent holder of Inuit traditional knowledge, Inuit Qaujimajatuqangit, we believe that KIA is well placed to understand the potential impacts of the Project on Inuit traditional land use, and set out ways to mitigate adverse impacts. Central to this is the recognition of the trust that KIA has with its Inuit membership in helping to manage and apply TK to the planning, monitoring and management of development projects. No other entity in the Kitikmeot region will be better positioned to tackle such issues.

8.3 ECONOMY, EMPLOYMENT AND BUSINESS

8.3.1 Potential Effects

Potential effects on the economy, employment and business are:

- change in economy
- change in employment

8.3.2 Change in Business Effects Pathways

8.3.2.1 Economy

With an estimated total capital cost of around $500 million over a four-year period, Project construction will provide short-term employment and business opportunities for people and companies in the region, and contribute to the Nunavut economy and GDP. With estimated annual operating costs of up to $3 million, Project operations will have much smaller economic effects although, as discussed below, the existence of the road and port are expected to have substantial secondary effects through stimulating new mining and other economic activity.

The presence of the completed Project will help lower the costs of goods delivered to the Kitikmeot region, resulting in cost-of-living improvements. Currently bulk and durable goods re-supply to Kitikmeot communities occurs by sealift during the limited open water season (August to October). The existence of the Project would extend the period over which community re-supply for bulk and durable goods is possible. With a combination of the air strip, all season road and port and winter road network, it is possible that freight could reach Kitikmeot communities on a near year-round basis.

Kitikmeot residents could also purchase equipment (e.g., snowmobiles, all-terrain vehicles (ATVs), boats) and bulk goods in Yellowknife or other locations, and have them transported up the road and shipped from the Grays Bay Port to their home community. This would provide less expensive access to such equipment and supplies, as well as increased business to companies in Yellowknife.

As has been discussed in Section 1.5.2, an important strategic driver for proposing the Project is facilitating mineral exploration and construction of new mining projects. This would lead to an expansion in the capacity, capabilities and experience of the Kitikmeot, Yellowknife, Nunavut, and Northwest Territories labour forces and businesses, with an accompanying increase of GDP.

For example, according to MMG's economic impact assessment for the ICP, the development of its two key deposits, plus the road and port, was expected to generate 33,000 person-years of employment and increase labour income by $2.9 billion. The ICP mines, coupled with the road and the port are expected to add $5.1 billion to Nunavut's GDP over a 15-year period.

Such mining projects would make an important contribution to government revenues and the economy of Nunavut, and assist in paying for public sector effects management initiatives (e.g., training, business development and public education programs) and community infrastructure and services. Spin off benefits of the development would likely extend beyond Nunavut, with the Northwest Territories and Alberta also being major beneficiaries of development in the Kitikmeot.

Given such new mining projects, inbound vessels coming to the Port to transport concentrate out would likely have excess deck space/hold capacity that could also accommodate community resupply goods at a relatively low back-haul rate. Goods landed at Grays Bay could then be distributed to Kitikmeot communities through new tug and barge services.

The Kitikmeot Inuit Association is also likely to financially benefit from its ownership of the Project. A dividend may be available to KIA from the Project, once priority O&M expenses and financing costs have been addressed. KIA would also benefit from the financial provisions of any IIBAs and surface access rights leases related to new mining projects. Most of these revenues would be retained within the Kitikmeot Trust. The Trust was established as a vehicle to manage dividends received and revenues secured from IIBAs and from the use of Inuit Owned Lands surface and mineral rights by resource developers. The Trust was structured to help safeguard such wealth for the benefit of current and future generations of Kitikmeot Inuit. Funds that the Trust would distribute back to KIA are intended to be used to enhance the existing social and cultural services and programs that it delivers to its membership, or serve as future equity investment in new infrastructure that serves KIA's social and cultural objectives.

While local companies and their employees will benefit from the additional income, training and experience received from Project construction work, the duration of this activity and relatively small scale of operations mean that it is unlikely to result in regional or local wage or price inflation. The inflationary potential of any subsequent new mining and road construction activity will be dependent on its scale, duration, and timing; inflation is most likely to occur if more than one new mine development project occurs at the same time.

Because the potential economic development and community supply effects are important strategic drivers for the Project, and have been the focus of engagement and other discussion of it, they will be important components of the DEIS. Effects management will seek to ensure that the Project delivers sustainable economic, employment and business benefits, including increasing Inuit and Northern involvement in the Project. However, the DEIS will also consider potential adverse effects, including inflation and increased dependence of Kitikmeot communities on the commercial economy.

8.3.2.2 Employment

With an estimated total capital cost of around $500 million, and estimated annual operating costs of up to $3 million, the GBRP Project will employ 200 to 250 people per year during the four years of construction, and 10 to 20 people during permanent operations. Construction workers will be employed on a rotational basis, living in 40 to 70-person capacity temporary mobile work camps. Road and port operations workers will also be employed on a rotational schedule, based in a permanent camp at the Grays Bay Port. Regional employment on the Project will also be facilitated by the rotational work schedule, which will allow workers to divide their time between the worksite and life in their home communities.

Most or all operations workers are anticipated to be residents of Kitikmeot communities. However, construction will require larger numbers of workers, some with particular skills (for example, specialized port construction contractors/workers), with skills only required for a short period, or existing employees of non-local contracting companies, who are expected to come from outside the region.

8.3.2.3 Business

Our regional businesses are expected to benefit directly from Project construction and operation, especially in the areas of construction, trucking, fuel supply, air support, logistics, and catering. We also anticipate that the presence of the completed Project will lead to the creation of new business opportunities and businesses. This includes opportunities related to barging for community re-supply, support for mineral exploration activities (including on Inuit-owned lands), tourism, and regional logistics and expediting. An expanded regional economy may also lead to opportunities in professional services, such as bookkeeping and engineering, that are currently mostly provided from offices in Yellowknife or southern Canada.

8.3.2.4 Traditional Economy

Improvements to diet and food security may be realized because rotational work at the Project will allow construction and operations workers the time and money to be able to participate in the harvesting of country food during their time off. However, personal wealth generated through employment on the Project and any subsequent road construction and minerals activities also could reduce the interest and hence participation of Kitikmeot residents in the traditional non-wage economy.

8.3.3 Effects Management

To increase Inuit and northern involvement in the Project, and its contribution to the Nunavut economy, the proponents will implement benefits policies and initiatives in the areas of employment (e.g., training, apprenticeships, skills development, recruitment, and retention) and business (e.g., supplier development, procurement and contracting).

8.4 COMMUNITY INFRASTRUCTURE, SERVICES AND WELLBEING

8.4.1 Potential Effects

Potential effects on community infrastructure, services and wellbeing are associated with:

- housing
- education and training
- health and healthcare
- emergency services
- recreation
- transportation

Construction of the Project will be short-term (i.e., up to four years) and largely executed by a fly-in fly-out (FIFO) workforce living in work camps. Project operations are anticipated to employ a small number of Inuit and other Nunavut residents, again on a FIFO basis. As such, the Project will result in little if any in-migration of Project workers and families to the region, and hence few additional demands on community and regional infrastructure and services.

The FIFO rotational schedule will have construction and operations workers alternating between living in work camps and their home communities. In the former case, the camps will provide basic healthcare, emergency and recreation facilities and services; as a result, workers will seldom need or be able to access community facilities and services. When workers are in their home communities, which may be within or outside Nunavut, they will be placing few if any additional demands on community infrastructure and services.

8.4.2 Effects Pathways

8.4.2.1 Housing

Construction will be short-term and largely executed by a workforce that will live in temporary work camps. During both construction and operations, the workforce will work under a FIFO rotational system. Consequently, the Project will likely not have direct adverse effects on housing. Instead, construction and operation of the Project may improve housing availability in two principle ways. First, it will increase individual and family wealth due to employment or business income from Project. This would help support purchase or construction of privately-owned housing. Second, more new units may be constructed with equivalent funding because the completed Project will reduce the cost of bringing in construction materials.

8.4.2.2 Education and Training

The potential effects of the Project on education and training are change in skill and employment training and change in educational achievement levels.

Our Project's demand for labour will create opportunities for both of us and other key stakeholders involved in delivery of education and training programs to work together to help create a qualified local workforce that can fully operate the Project over the long term.

In general, the outlook for implementing skills and employment training programs to support the Project workforce is very favourable, given that Project infrastructure is intended to be permanent. The existence of the road and port are expected to have substantial secondary effects through stimulating new mining exploration and potentially development activity. Long-term employment opportunities will improve outcomes for Inuit- and government-led training programs as the permanent nature of the proposed infrastructure lowers risk that jobs for trainees will disappear before longer term employment can occur. Longer term operations phase opportunities generated by the Project should justify businesses investing more in training and advancement of their employees. Greater business activity and long-term opportunities should also motivate individuals to invest time and/or money to advance their own education and training.

The Project could contribute to the expansion of the regional skills base by serving as a catalyst for increased enrollment in post-secondary educational programs that provide degrees or certificates and other training programs that support certification in skilled trades.

8.4.2.3 Health and Healthcare

Employment and business income associated with the Project that stays in the region will contribute to an increase in the standard of living and therefore also likely to lead to an improvement in the health and wellbeing of these workers and their family members from our region and within Nunavut. However, this is dependent on individual and family behavior; it is possible that there could be adverse effects on health and wellbeing due to an increase in alcohol and drug consumption and gambling because of increased disposable income. Education and counselling services for workers and their families will help prevent negative outcomes and promote positive ones.

Occupational health and safety (OHS) is a concern with respect to all workplaces, but especially isolated ones. In the case of construction sites, road and port operations, and work camps, accidents and unhealthy behaviors will be reduced using appropriate human resource and OHS policies and practices, as well as the provision of first aid onsite facilities and staff to deal any injuries and illness. As needed, workers will be evacuated to the nearest medical facility. The Grays Bay Port and its airstrip could support search-and-rescue activity, thereby contributing to the health and wellbeing of both Kitikmeot residents and visitors to the region.

As has been indicated above, construction and operations workers will be housed in isolated work camps. Because of this, there will be very little opportunity for adverse interactions (e.g., harassment, and the transmission of sexually transmitted diseases) between these out-of-region workers and Kitikmeot community residents.

The use of FIFO rotational employment during the construction and operation of the Project will require workers to spend regular periods separated from family and absent from home communities. In the case of construction, this weekly work pattern and absences may last months to a few years. The operation of the port would involve decades of availability of such employment. For any duration, this work pattern can have adverse impacts on workers, family members and community life. The most likely sources of regional labour are Cambridge Bay and Kugluktuk, which are the closest communities to the port site. Their proximity to the site will likely have a mitigating effect on the sense of isolation workers may feel. In addition, many workers from these communities will be familiar with the Project area prior to its development. Nonetheless, it will be important for us to provide workers with education and counselling support to minimize any feelings of displacement.

Community resupply options that the Project will provide will reduce living costs and increase the availability of fresher and more nutritious foods while lowering their cost of delivery in Kitikmeot communities during extended periods throughout the year. This generally would be beneficial for the health and wellbeing of their residents, although it is possible that there will be some substitution of country foods for less-healthy processed foods.

FIFO rotational work on the Project may afford participating workers both the time and money to participate in the harvesting of healthy country food during their time off. However, employment on the Project may alternatively reduce the participation of Kitikmeot residents in traditional non-wage economy (e.g., harvesting). This could erode traditional culture and knowledge with adverse effects on some individuals' wellbeing.

Given the above potential health and wellbeing effects, we will ensure that the DEIS focuses on occupational health and safety, rotational employment, living standards, and change in diet, nutrition and traditional culture and knowledge.

8.4.2.4 Emergency Services

As was noted above, OHS is an important concern at isolated workplaces. In the case of Project construction sites, road and port operations, and work camps, onsite personnel and facilities will handle security, first aid, and firefighting requirements, and deal with any health emergencies. As needed, workers will be evacuated to the nearest medical facility.

The Grays Bay Port and its airstrip could be important in support of search-and-rescue activity, thereby contributing to the health and wellbeing of both Kitikmeot residents and visitors to the region.

8.4.2.5 Recreation

The construction and operations labour forces will work on a FIFO rotational schedule, alternating between time in work camps and their home communities. In the former case, the work camps will provide basic recreation facilities and workers on site will not be able to access local communities or hence their recreation facilities. When workers are in their home communities, which may be within or outside Nunavut, they will have additional time available for recreation, but it is not expected that their use of community recreation facilities, parks or protected areas will result in their capacity being exceeded.

8.4.2.6 Transportation

The shipment of equipment, materials, and workers to the construction sites will also be of limited size and short duration. Therefore, the capacity of existing regional transportation and infrastructure is not expected to be exceeded because of the Project's construction activities.

When completed, the Grays Bay Road's connection to the existing Tibbitt to Contwoyto Winter Road at the Jericho mine site will allow for seasonal access to the south, including seasonal trucking of bulk goods to a laydown area at the port site. If the economics make sense, an ice-road network between the port and Kitikmeot communities could provide terrestrial re-supply of bulk and perishable goods during the winter versus extremely expensive re-supply by air. The Port would facilitate marine transport to the communities immediately upon ice-out. This would significantly extend the construction season in Kitikmeot communities, potentially saving a year in construction schedules by allowing material deliveries in early summer versus waiting for the annual sealift in September when winter is beginning to descend.

The Grays Bay Road would also provide a corridor that would offer right-of-way opportunities for development of linear infrastructure connecting to southern grids including, in the shorter-term, an all-weather road to Yellowknife and fibre-optic cable or microwave towers. In the longer term, natural gas pipelines and electricity transmission lines could be built along the corridor. The Grays Bay Port could provide important new infrastructure for transportation activities including sealift, community boat travelers, military, search and rescue services and tourism (e.g., cruise ships).

8.4.3 Effects Management

The Project has several potential positive effects on Community Infrastructure, Services, and Wellbeing. However, there are also potential adverse effects that can be mitigated by the initiatives described below.

The use of a FIFO workforce during both construction and operations will be a primary mitigation of potential adverse effects on housing availability.

Providing education and counselling services for workers and their families, including employee assistance programs, will help reduce adverse effects on health and wellbeing due to an increase in alcohol and drug consumption and gambling because of increased disposable income, while also promoting positive behavior and outcomes through extended periods of employment, and wage economy participation. Such initiatives will also mitigate the sense of isolation from home communities FIFO workers may feel.

We will reduce workplace accidents and unhealthy behaviors by using appropriate human resource and OHS policies and practices, and provision of onsite security, first aid and firefighting facilities and staff to deal with emergencies.

We will equip work camps to provide basic recreation facilities to assist the health and fitness of the Project construction and operations labour forces.

We will communicate regularly with government departments and other agencies responsible for the provision of community services and infrastructure, to inform them of evolving Project plans and assist them in their own planning.

8.5 CULTURAL RESOURCES

The effects on the cultural resources are divided between heritage resources and traditional land and resource use.

8.5.1 Heritage Resources

8.5.1.1 Potential Effects

Potential effects on heritage resources may occur during construction and operations.

8.5.1.2 Effects Pathways

Ground disturbing activities during construction and operation have the potential to directly affect heritage resources. The highest potential for disturbance to heritage sites occurs during the construction phase. Construction activities with the potential to affect heritage resources include site clearing, construction of the Grays Bay Road, quarrying, vehicular movements, airstrip construction at the Grays Bay Port and construction of the Grays Bay Port.

During operations, road maintenance activities have the potential to affect heritage resources. Permanent quarries along the road will be used for ongoing road operations and maintenance such as surfacing and repair. Quarries would be expected to be located on bedrock outcrops. Such sites have elevated potential for heritage resources, particularly when sited near lakeshores or watercourses.

8.5.1.3 Mitigation

Mitigation for potential effects on heritage resources takes two forms: design mitigation and site-specific mitigation.

Mitigation by design primarily relates to avoidance of known heritage sites or areas with high heritage potential as identified through surveys and Inuit Quajimajatuqangit. We will design and align the road and Grays Bay Port to avoid known heritage sites and areas of high potential (i.e., eskers), where possible. If mitigation by design is not possible, then Project-specific mitigation related to either site protection or site documentation will be implemented.

Site protection measures may be applied when construction or operations activities occur near a known heritage resource. Protection measures range from implementation of buffer zones around resources to prevent activities within a certain distance of a site to erection of physical barriers to protect sites. Additionally, if sensitive sites are identified close to construction areas, we will ensure that a qualified archaeologist is onsite to supervise construction activities that occur near known heritage sites or sites with a high potential for heritage resources. All construction and maintenance staff will be made aware of sensitive sites and the importance of avoiding those areas. Buffer zones and protection barriers may be temporary in the case of construction but may also be permanent if a heritage site is identified close to the road or port.

If site protection is not possible, a process of systematic data recovery will be implemented. Data recovery will include fieldwork to map, collect and document heritage resources as appropriate. We expect that particularly significant sites such as burial grounds or important gathering locations will need to be preserved.

Article 33 of the Agreement covers Archaeology principles, permits and Inuit participation. The Inuit Heritage Trust was established under the agreement to support, encourage, and facilitate the conservation, maintenance, restoration, and display of archaeological sites and materials. The Government of Nunavut and the Trust jointly own all archaeological specimens found within the Nunavut Settlement Area. Mitigation measures that involve data recovery and documentation will be undertaken in consultation with the appropriate government departments.

8.5.1.4 Monitoring

We will prepare a Heritage Resource Management Plan that will document the status of known heritage sites within the study area, general and site-specific mitigation measures, and monitoring recommendations.

Monitoring recommendations may include periodic site-specific monitoring. This monitoring would occur at sites identified near the road, permanent quarry locations and access roads and the port. Site-specific monitoring will be undertaken by a qualified archaeologist. Should it be identified that Project activities are affecting heritage sites, further mitigation measures will be implemented.

8.5.2 Traditional Land and Resource Use

As noted in Section 6.0, Inuit Quajimajatuqangit reports were produced for the IPC. In October 2016, the KIA provided us with authorization to use those reports for consideration in planning the Project. The information within these reports—such as knowledge of historical land use areas, information acquired during the public engagement program and publicly available information will be used to guide the assessment of potential effects on traditional land and resource use (TLRU).

8.5.2.1 Potential Effects

Potential effects on traditional land and resource use are:

- change to availability of harvested wildlife species and access to harvesting areas and activities
- change to availability of fish species and access to fishing areas and activities
- change to availability of plant species and access to plant harvesting sites and activities
- change to cultural or spiritual practices, sites, or areas

Of note, the Inuit Quajimajatuqagit studies completed for the ICP cannot directly be used for the GBRP Project without additional verification. We will complete this verification and integrate the information into the DEIS. However, existing Inuit Quajimajatuqangit is useful for the identification of potential Project effects at a screening level, given the similarities between *some* of the components of the ICP and GBRP Project. For example, potential effects to caribou/tuktuit from disturbances such as noise and pollution, injury from large sharp rocks along the road, and calves being separated from their mothers and habituation were identified as potential effects. Inuit Quajimajatuqangit also indicates that Inuit across the

Arctic continue to rely on the benefits from the marine environment for sustenance, travel, habitation, clothing, and construction materials.

8.5.2.2 Effects Pathways

The primary source of direct disturbance to harvested species are noise, light and vehicular movement during both construction and operation. Potential effects on wildlife, both terrestrial and marine, will be separately assessed as biophysical VCs and the results of that assessment will help inform the assessment of effects on TLRU. The road and port would provide new access for traditional activities into areas that previously might have been too far or too difficult for reasonable access.

Employment on the Project, together with new developments, would reduce the need for our residents to participate in, and could reduce their interest in participating in, the traditional non-wage economy. Any such reduction would increase the economic dependence of these communities on the commercial economy and potentially have adverse effects on diet, health, and culture. However, given that fuel and equipment are among the most expensive barriers to participating in the traditional economy, rotational work and increased income may also provide workers with the time and resources to increase their involvement and success in the traditional non-wage economy.

8.5.2.3 Mitigation and Monitoring

Inuit Quajimajatuqangit will be important to developing recommendations for mitigation and monitoring for key terrestrial and marine species that are harvested.

We will use information gained through engagement with Inuit organizations and government agencies to develop mitigation and monitoring programs for traditional land and resource use.

9.0 CUMULATIVE EFFECTS

The NuPPAA provides that for an environmental review of a project, the NIRB must take into account the "cumulative ecosystemic and socio-economic impacts" related to the project (s.103(1)). Additionally, NIRB guidance (Part 2 details) provides that project proposals to be screened by the NIRB will include general information on potential cumulative effects.

Thus, cumulative effects will be a key consideration in future discussions with NIRB and stakeholder consultations to finalize EIS Guidelines for this Project. To provide background for these future discussions and consultations, the following section provides an overview of the potential cumulative effects of the GBRP Project in combination with other past, present and reasonably foreseeable projects at a screening level. A more comprehensive cumulative effects assessment based on accepted methods and guidance will be presented for the anticipated environmental review of the Project.

9.1 GBRP PROJECT AS AN ACCESS CORRIDOR

As co-proponents, the KIA and GN are proposing the GBRP Project as a means to fulfill our respective mandates as provided in the Nunavut Agreement and *Sivumut Abluqta*. The economic and social benefits that the Project is expected to achieve will in part come through exploration and development of mineral resources known to occur in the Slave Geological Province, including those IOLs that are along and proximal to the Grays Bay Road, which were specifically selected in the Nunavut Agreement for their mineral potential. It is anticipated that these areas will become attractive for additional mineral exploration and in the future, development, as the GBRP infrastructure will facilitate the movement of equipment, materials and product in and out of this previously remote and unconnected area of Nunavut.

While the GBRP Project will create an access corridor, third parties, other than the public, will be responsible for obtaining their own approvals to access areas of interest, and for payments to KIA to use the road and port infrastructure. It is this model of future access and use that will generate the benefits that Kitikmeot Inuit strive to achieve from this development. Use of the road and port by the public and MMG's Izok Corridor Project (ICP) are examples of reasonably foreseeable activities and projects that may use the GBRP infrastructure.

Balanced with the desire for resource-based economic development in the region, the KIA and GN also each have responsibilities for the sustainable management and conservation of land, wildlife and other resources. They do this through implementing legislative and other means to protect the environment and cultural resources. The GBRP Project, over its 232 km length, overlaps with several biophysical and cultural environments identified in traditional knowledge and western science as being potentially sensitive to human disturbance. A central and important strategy to the GN and KIA achieving their goals for this Project will be the ongoing adaptive management of GBRP Project effects and cumulative effects using innovative tools and approaches founded in traditional knowledge and Inuit Quajimajatuqangit, integrated with science-based methods and frameworks towards ensuring sustainable development.

9.2 PROJECT CUMULATIVE EFFECTS ASSESSMENT

9.2.1 Basis of Assessment

A cumulative effect can occur when the effect on a VC caused by the GBRP Project interacts with the same effect on the same VC from other past, present and reasonably foreseeable projects. The assessment of cumulative effects for the GBRP Project will be based on the EIS guidelines issued for the review, and will consider applicable Canadian regulatory guidance and findings of recent relevant EAs in Nunavut and Northwest Territories (e.g., Back River Project, Jay Pipe Project, Kiggavik Project). The general approach proposed to assess the cumulative effects of the GBRP Project is outlined below

In our assessment of cumulative effects, we will take into account the assessment of potential effects of the Project on VCs in the existing environment (as has been discussed in Sections 7.0 and 8.0). Inherently, the existing environment reflects the effects to the environment that have occurred because of past, and any ongoing physical works and activities in the study area. These effects also have potential to act cumulatively with the effects of other potential future projects that have not yet been undertaken.

9.2.2 Methods

9.2.2.1 Geographic and Temporal Scope

The scope of the cumulative effects assessment will be based on geographic and temporal boundaries. The geographic scope of the cumulative effects assessment will be determined by identifying a regional assessment area (RAA) for each of the environmental VCs.

These RAAs for VCs may be established based on various considerations, including:

- Project footprint (disturbance area)
- a physiographic boundary, such as a watershed
- an area of movement of a far-ranging VC, such as wildlife
- an area of dispersion, for example dust or noise
- geopolitical boundaries

A temporal (time) boundary for the cumulative effects assessment will be established to reflect the length of time into the future that the Project's effects could be reasonably measured, taking into account the approximate extent to which reasonably foreseeable projects can be characterized into the future with sufficient detail to be included in the assessment.

9.2.2.2 Defined List of Other Projects to be Considered

The cumulative effects assessment will include the identification of other projects (other physical works or physical activities) that may cause effects that interact with the GBRP Project within the RAA and temporal boundaries selected for the assessment. Projects to be considered for inclusion in the cumulative effects assessment include:

- Past projects—those projects that are no longer operational but which still do or may have effects that contribute to the characterization of existing environment in the RAA. These include, for example, abandoned and decommissioned sites, such as old mines or exploration camps.
- Current projects—those projects whose effects on VCs are ongoing in the RAA at the time of the assessment. Examples of current projects are active mines, projects under construction, or roads.
- Reasonably foreseeable projects—those projects that are already approved (at the time of preparation of this Project Proposal), are currently under regulatory review, or are already approved in concept in a policy or plan. In all cases, a certain minimum amount of information describing the project is necessary (e.g., where it is, how “big” it is, what kind of activities it entails) to allow it to be assessed.

It is essential that there be clear definition of these types of projects in the future EIS Guidelines. Substantial information in maps and other sources such as public registries is already available to identify and characterize projects in the RAA. Not all projects considered for inclusion in the assessment will be carried through for assessment of cumulative effects. Only those projects whose effects on VCs overlap geographically and temporally with those of GBRP will be carried through to conduct the cumulative effects assessment.

Examples of past and present projects that may need to be considered for cumulative effects in the EIS Guidelines include:

- active mines (e.g., Ekati Mine, Diavik Mine, Hope Bay Phase I)
- abandoned or inactive mines (e.g., Jericho Mine, Colomac Mine and Lupin Mine)
- formerly active exploration properties (numerous; e.g., Ulu, High Lake, Izok)
- other (e.g., TCWR, Bluefish Hydro Facility)

Examples of reasonably foreseeable future projects that may need to be considered for cumulative effects in the EIS Guidelines include:

- proposed mines (e.g., Izok Corridor Project, Hope Bay Phase II, Back River Project, Hackett River Project)
- public and public government use (e.g., private vehicle traffic, coast guard and research vessels)
- other (e.g., Bathurst Inlet Port and Road, Slave Geological Province Road to Lockhart)

Of all the aforementioned projects, MMG's proposed ICP is particularly important because of its advanced planning, physical proximity to the GBRP Project, and anticipated use of GBRP facilities, namely, use of the port and road for transport and shipment of materials during the construction and operation of the ICP. This situation will be considered in more detail in the environmental assessment.

9.2.3 Assessment of Potential Cumulative Effects

For further background on cumulative effects, the following provides a preliminary consideration of potential cumulative effects on VCs. No conclusions are made in characterizing these effects (e.g., magnitude)—only the potential for there to be a cumulative effect. A more comprehensive assessment of cumulative effects will be provided in an EIS.

With a few exceptions (such as public use and ICP), most projects that may be considered for their cumulative effects are distant from the GBRP Project and relatively widely dispersed from each other. The remote location of the GBRP Project in a largely undisturbed landscape (both terrestrial and marine) reduces the potential that GBRP's residual effects will interact with the effects of most other projects in a cumulative way.

Our preliminary consideration of the *potential* for cumulative effects is as follows:

- low if the GBRP Project effect is local to that project's footprint and has low potential to occur and therefore interact further
- moderate if the GBRP Project effect is local but the effect may interact regionally (e.g., a regionally shared resource, or the VC moves large distances)
- high if the GBRP Project effect has potential to occur regionally (e.g., human activity or a wildlife species moves and interacts over large distances) and therefore interact with other projects' effects within a large geographic area

In the following sections, we identify 13 VCs to have a low potential for cumulative effects. We also identify six VCs to have a moderate or high potential for cumulative effects. These preliminary predictions are discussed below.

9.2.3.1 VCs of Low Potential for Cumulative Effects

Most residual effects on VCs from the GBRP Project have potential to only occur during its four-year construction phase. Therefore, these potential Project effects are anticipated to diminish after the Project facilities are commissioned and operational. Furthermore, during construction, there will be no third party use of Project facilities such as the road and port, thereby minimizing the potential for cumulative effects. When the Project is commissioned and operational, some activities of the GBRP Project will decrease considerably (i.e., staging, drilling, blasting, hauling, grading and dredging). Most Project-specific effects will also markedly decrease. After construction is complete, third parties, such as MMG may begin to have access to the GBRP Project infrastructure and facilities for their own activities such as staging and

construction. Notably, the GBRP Project itself will have minimal shipping activities during operations (limited to port resupply). Owing to this lack of temporal overlap with reasonably foreseeable projects and local extent of Project effects, the potential for cumulative effects for the following VCs is considered low, and no additional mitigation for cumulative effects are proposed:

- air quality
- noise and vibration
- light
- soils and terrain
- vegetation
- groundwater resources
- surface water resources
- freshwater fish and fish habitat
- marine water and sediment quality
- marine fish and fish habitat
- marine mammals
- marine birds
- heritage resources

9.2.3.2 Wildlife and Wildlife Habitat

The potential for cumulative effects on wildlife and wildlife habitat is moderate to high during construction and less during operations with the application of proposed mitigation. Four indicator terrestrial wildlife species (caribou/*tuktuit*, grizzly bear/*akhiat*, muskoxen/*umingmait*, wolverine/*qaluit*) are known to occupy the anticipated GBRP Project RAAs for wildlife at least at certain times of the year. This is particularly so for both the Bathurst and the Dolphin and Union caribou herds/*tuktuit,* which each may have an RAA that extends to most of their annual ranges (calving, post-calving, summer and fall migration range in the case of Bathurst caribou*/tuktuit*, and winter range for the Dolphin Union caribou/*tuktuit*). Potential cumulative effects include each of the three effects assessed for wildlife in Section 7.4.3 (change in habitat, mortality risk and movement and distribution).

The most likely dominant contribution to these effects are those cumulative effects arising from sensory disturbance (such as noise) and dust, as is discussed in Section 7.3.2, and the physical footprint of the project and that of foreseeable developments. Although the GBRP Project is located in a remote location in a largely undisturbed landscape, movement of species for this VC across the GBRP Project and beyond increases the potential for interactions, hence cumulative effects, with other projects. The mitigation of potential effects and cumulative effects to caribou/*tuktuit* has been raised as a concern during engagement with Inuit and Northwest Territories groups and communities, and will be a key focus of the EA.

The potential of cumulative effects to other species of wildlife and their habitat, such as birds, is considered low. GBRP Project effects will be localized to the footprint and most disturbance will occur during construction. Peregrine falcons/*kilgaviit*, as a species of Special Concern (Committee on the Status of Endangered Wildlife in Canada (COSEWIC)), could be affected by the GBRP Project and cumulatively in the region, due to their use of rocky ledges for nesting; such areas which may be candidates for quarry material by GBRP and future projects.

9.2.3.3 Economy, Employment, and Business

The potential for *positive* cumulative effects for economy, employment, and business will extend through GBRP Project construction and operations. This is based on the intent that the GBRP and reasonably foreseeable projects will require a trained workforce and procurement of supplies and equipment, with materials and workforce sourced throughout the region. Reasonably foreseeable projects will contribute taxes, royalties and the growth of the overall GDP.

9.2.3.4 Community Infrastructure, Services and Wellbeing

Possible negative cumulative effects on infrastructure and services will be mitigated in anticipation that the GBRP Project and reasonably foreseeable projects would engage a FIFO workforce sourced primarily from communities in the Kitikmeot Region and Yellowknife without influx of additional workers.

9.2.3.5 Cultural Resources

There is potential for cumulative effects to cultural resources; however, the remote location of the GBRP Project in a largely undisturbed landscape decreases the potential for cumulative effects. Traditional land and resource use of certain portions of the Project area, such as the coastal areas and Contwoyto Lake/*Tahiryuaq/Kǫk'èetì* are well documented in traditional knowledge and Inuit Quajimajatuqangit. Since traditional land use of the area by Inuit or other traditional land users typically involves travel over large distances across the land, the users have a reasonable chance of encountering other projects. The potential effects of the Project on resource use are expected to, on balance, be positive because the Project will provide increased access to traditional resources.

9.2.3.6 Transboundary Effects

Transboundary effects are effects by the GBRP Project that extend beyond Nunavut into another adjacent administrative region. Potential transboundary effects include:

- effects and cumulative effects on Bathurst caribou/*tuktuit* within the areas of spring and fall migration to and from their wintering range in Northwest Territories
- effects and cumulative effects on health and wellbeing of residents of certain communities of Northwest Territories who may be employed during the construction of the Project

- increased economic and employment opportunities associated with sourcing and movement of materials, equipment, fuel, labour and supplies from Northwest Territories
- economic (business) relationships and use of public services in and from Northwest Territories during construction
- effects to traditional land use by traditional land users who practice traditional activities on both sides of the Nunavut-Northwest Territories border

9.3 MANAGEMENT OF CUMULATIVE EFFECTS

The initial assessment (as discussed above) of potential cumulative effects from the GBRP Project in combination with past, present and reasonably foreseeable activities, indicates that both positive and negative cumulative effects on biophysical and human environment VCs in Nunavut and Northwest Territories are possible. We, the GBRP Project proponents—the KIA and GN, as stewards of their lands and resources—recognize that the mitigation of cumulative effects is an inherent responsibility arising from our respective mandates. The effective mitigation of cumulative effects from the GBRP Project will be based on western science, combined with Inuit Quajimajatuqangit and traditional knowledge. Our proposed mitigation will be adaptively managed to continuously evaluate their effectiveness, identify new technologies or knowledge for possible modification of mitigation, and to identify any changes to the effects from what were predicted.

We have the unique ability to create policies and legislation that will permit the ongoing adaptive management of GBRP Project effects and cumulative effects using innovative tools and approaches within a framework that integrates the principles of environmental stewardship. The various plans proposed to be included in the project's Environmental Protection Plan, as discussed in Section 11.0, will detail the information, rules and tools that will provide regulators, future proponents and us with increased confidence that cumulative effects can be managed.

10.0 ACCIDENTS AND MALFUNCTIONS

The topic of accidents and malfunctions is not a mandatory factor of assessment under the NuPPAA; nevertheless, NIRB guidance has provided that proponents address this topic. As safety is a key objective for all aspects of this project, we therefore anticipate discussing the topic of accidents and malfunctions with NIRB to finalize the appropriate approach to be set out in the EIS Guidelines.

To provide background on this topic, we begin by noting the range of scenarios relevant to this Project. For example, different scenarios arise in relation to ground-based transportation (i.e., vehicle use of the road), as compared to use of the port (e.g., vessel collision or spill).

One step in this process is to identify what types of accidents and malfunctions might occur during construction and operations of the GBRP Project. A second step is to identify potential risks associated with each scenario, the likelihood and frequency of occurrence, mitigation measures in place to manage the risk (including emergency response if applicable and required), and potential effects on the biophysical and human environment (i.e., consequence). Depending on the results of the first two steps, a third step might be the detailed assessment of scenarios with greater likelihood to occur and of higher potential consequence.

Where required, a future risk assessment will rely on 1) the experience of the Grays Bay Engineering and Environmental Consultants (GBEEC) with construction and operation of similar projects; 2) a review of previous accidents and malfunctions associated with similar types of projects, as well as 3) consideration of community and regulatory agency concerns.

Similarly, depending on what is required, the assessment of accidents and malfunctions may contribute to the development of emergency response plans for the GBRP Project, as well as preventive measures to reduce the likelihood of an incident occurring.

11.0 ENVIRONMENTAL PROTECTION PLAN

An Environmental Protection Plan consists of individual management plans that describe measures to avoid or reduce potential effects to the environment during construction and operation of the GBRP Project. Our overall plan is intended to provide GBRP Project personnel and sub-contractors with an understanding of the general environmental and cultural setting, the requirements for mitigation measures, as well as means to report on performance. The following subsections describe the approach that we will pursue to develop, use, and modify the Environmental Protection Plan (EPP) during the assessment, construction and operation of the Project.

11.1 THE RESPONSIBILITIES OF THE PROPONENTS

We, the proponents, are proposing to develop the GBRP Project to fulfill our respective mandates as provided in the Nunavut Agreement and *Sivumut Abluqta*. Balanced with the desire for resource-based economic development in the region, we also each have responsibilities for the sustainable management and conservation of land, wildlife, and other resources. We can and will do this through implementing legislative and other means to protect the environment and cultural resources. A central and important strategy to the our achieving our goals for this Project will be the ongoing adaptive management of Project effects and cumulative effects using innovative tools and approaches founded in traditional knowledge and Inuit Quajimajatuqangit, integrated with science-based methods and frameworks that promote sustainable development.

Under the Nunavut Agreement, we both have the ability to regulate and enforce conditions related to land access and use, resource use, wildlife habitat, public health and safety, and heritage resources within their respective jurisdictions. Our ability to make, modify and enforce regulations sets the us apart from other proponents in Nunavut. We both have a long-term responsibility for performance that is ultimately measured by our constituents. It is this unique responsibility, combined with existing regulatory requirements, that is the context for the Environmental Protection Plan.

11.2 PLAN DEVELOPMENT

Subject to discussions with NIRB and consultation with stakeholders, we anticipate discussion on the focus and scope of environmental management plans in the development and finalization of EIS Guidelines.

For background, it is our general intention to develop detailed management plans that describe environmental protection measures to avoid or reduce potential effects during construction and operation of the GBRP Project. Based on details set out in the EIS Guidelines, these plans would be part of the DEIS. The description of these measures is important to inform Inuit, Nunavummiut, residents of the Northwest Territories, government agencies, and others of the measures that will be used. This work may also be required to assess the residual effects (i.e., effects after mitigation) of the Project on the environment. We anticipate that these management plans will be based on regulatory requirements, guidelines, best practice, and experience from previous projects in Nunavut and the Northwest Territories, as well as input from local knowledge holders. Specifically, feedback obtained through consultation with regulators, HTOs, communities and Inuit and other Indigenous groups will be important to defining protection measures that will address the most important issues of concern, such as caribou/*tuktuit*.

The EPP will be developed to be a “living” document: it will be refined and revised based on regulatory changes, regular management reviews, and feedback from adaptive monitoring and management programs.

The following ten management plans will be developed. Additional plans may be developed if the need is identified.

Air Quality Management Plan

We will develop an Air Quality Management Plan to ensure compliance with applicable regulations, including strategies to reduce and control emissions generated during construction and operation.

Explosives Management Plan

Ammonium nitrate and diesel fluid (ANFO) are the primary explosives that will be used at the quarry locations for drilling and blasting of rock. The Explosives Management Plan will outline the management practices that are aimed to reduce the environmental and safety risks of manufacturing, transporting, storing, handling and use of these explosives.

Quarry Management Plan

Rock fill will be obtained from quarries located, if possible, within 500 m of the road. Material from the quarries will be used for construction of the road (e.g., embankment and surfacing), as well as ongoing maintenance during operations. While most quarries will be for temporary use, approximately one in three quarries developed during construction will be retained for permanent operations. We will develop a Quarry Management Plan to guide the site preparation, development and closure (where required). Site-specific mitigation measures will also be included, if required.

Road Management Plan

We will develop a Road Management Plan for construction and operations for reducing potential effects on air quality, watercourses, wildlife and sensitive landforms. The Road Management Plan will describe measures to manage access to the road, including seasonal restrictions on vehicle access to reduce effects on caribou/*tuktuit.* The Plan will also include measures to reduce the potential for accidents and malfunctions associated with road use.

Sedimentation and Erosion Control Plan

The Sediment and Erosion Control Plan will describe mitigation measures to avoid or reduce the potential for erosion and sedimentation from construction and operations activities and will ensure compliance with applicable regulations.

Spill Contingency Plan

We will develop a Spill Contingency Plan to address spills from petroleum-based products, as well as other hazardous materials. The plan will address potential situations associated with the overland road, landside port facilities, and nearshore marine operations, and will include lines of authority and responsibility, establish proper reporting and communication procedures, and an action plan for implementation in the event of a spill.

Waste Management Plan

The Waste Management Plan will provide guidelines for dealing with the generation of waste. Measures will be described to ensure that wastes are procured, handled, stored and disposed of in an environmentally responsible manner. This plan will reduce the likelihood of an accidental release of potentially hazardous waste products into the environment during construction and operations.

Wastewater Management Plan

We will develop and implement a Waste Water Management Plan for the management of sewage and gray water at Grays Bay Port and Jericho Station. This plan will include the proposed collection, treatment, and disposal of sewage and grey water generated during construction and operations.

Wildlife Mitigation and Monitoring Plan

The Wildlife Mitigation and Monitoring Plan will provide procedures and best management practices to avoid or reduce effects on wildlife and wildlife habitat. The plan will take applicable regulations and guidelines into consideration that apply to species or habitats potentially encountered. We will ensure that the plan will be strongly influenced by input from traditional knowledge holders and wildlife management organizations such as HTOs.

Nearshore Construction Management Plan

We will develop a Nearshore Construction Management Plan to address potential effects to the marine environment from construction and operation activities. If required, site-specific areas to be managed and monitored will be identified in the plan. Mitigation measures that will be outlined in the plan include:

- blasting guidelines
- in-water pile driving guidelines
- dredging guidelines
- sediment and erosion control
- marine mammal observer guidelines

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Appendix 1A LETTER FROM MMG TO GBRP PROPONENTS

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May 24, 2017

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Dear Mr. Anablak and Mr. Hawkins

MMG use of Grays Bay Road and Port

In recognition of the recent initiation of the Nunavut regulatory review process for the Grays Bay Road and Port (GBRP) by Government of Nunavut (GN) and the Kitikmeot Inuit Association (KIA), MMG wishes to provide clarification regarding the Izok Corridor Project.

As you know, MMG submitted a project proposal for the Izok Corridor Project to the Nunavut Impact Review Board (NIRB) in August 2012 (File#: 12MN043). Subsequently, on April 8th 2013, the Minister of Aboriginal Affairs and Northern Development Canada (AANDC) directed the NIRB to review the Izok Corridor Project subject to Part 5, Article 12 of the Nunavut Land Claim Agreement (NLCA). Shortly thereafter, on April 16th 2013, MMG requested that the NIRB not advance the review further until MMG submitted a revised project description. MMG made this request because the preliminary results of the feasibility study for the project confirmed that the costs of the regional infrastructure required to support the development of this project were more than the project could bear.

As you know, MMG is substantially involved in the Grays Bay Road and Port project process and sees access to this infrastructure as a means to maximize the potential for the Izok Corridor Project to become a feasible mine development. MMG confirms that any future project design for the Izok Corridor Project will take the proposed Grays Bay Road and Port into consideration, focusing on MMG's use of the road and port. Specifically, MMG will not duplicate any of the infrastructure components of the Grays Bay Road and Port project.

Sincerely,

Sahba Safavi
President MMG Canada

Appendix 7A INTERACTION MATRIX

		ENVIRONMENTAL COMPONENTS	BIOPHYSICAL ENVIRONMENT	Air Quality	Noise and Vibration	Soils and Terrain	Vegetation	Wildlife and Wildlife Habitat	Groundwater Resources	Surface Water Resources	Freshwater Fish and Fish Habitat	Marine Water and Sediment Quality	Marine Fish and Fish Habitat	Marine Mammals	HUMAN ENVIRONMENT	Economy, Employment, and Business	Infrastructure and Services	Community Health and Wellbeing	Heritage Resources	Traditional Land and Resource Use
PROJECT ACTIVITIES																				
Marine infrastructure construction	Marine dredging			-	M	M		M				M	M	M		P			U	M
	Sheet pile driving and infilling			M	M	-	-	M				M	M	M		P			M	M
	Barge landing and small-craft ramp construction			M	M	M	M	M				M	M	M		P			M	M
	Breakwater construction			M	M			M				M	M	M		P			U	M
Land infrastructure construction	Site preparation (stripping, drilling, blasting, grading)			M	M	M	M	M	M	M		M	M			P			M	M
	Earthworks (pads and berms)			M	M	M	M	M	M	M						P			M	M
	Quarry development and operation			M	M	M	M	M	M	M	M					P			M	M
	Watercourse crossings construction			-	M	M	M	M	M	M	M					P			M	M
	Building and facilities construction			M	M	-	-	M	-	-						P			-	M
	Embankment construction			M	M	M	M	M		M	M					P			M	M
	Airstrip construction			M	M	M	M	M	U	M						P			U	M
	Temporary winter roads construction			-	M	M	M	-		M	M					P			U	M
	Reclamation (areas not required for ongoing operations and maintenance)			-	-	-	-	-		M	M					P			-	M
Support activities and infrastructure	Materials and equipment staging and re-supply (Road)			M	M	-	-	M		-						P				M
	Materials and equipment staging and re-supply (Marine)			M	M	-	-	M		-		M	M	M		P				M
	Air transport of personnel			M	M			M						M		P				M
	Camp operation			M	M			M		M				M		P				M
	Water supply and management							M	M	M	M					P				
	Waste management			M	M		M	M		M		M	M	M		P				M
	Fuel transportation and storage			M	M			M				M	M			P				M
	Power generation			M	M		-	M								P				M

		ENVIRONMENTAL COMPONENTS	BIOPHYSICAL ENVIRONMENT	Air Quality	Noise and Vibration	Soils and Terrain	Vegetation	Wildlife and Wildlife Habitat	Groundwater Resources	Surface Water Resources	Freshwater Fish and Fish Habitat	Marine Water and Sediment Quality	Marine Fish and Fish Habitat	Marine Mammals	HUMAN ENVIRONMENT	Economy, Employment, and Business	Infrastructure and Services	Community Health and Wellbeing	Heritage Resources	Traditional Land and Resource Use
Operational activities	Grading and repair of the embankment			M	M	M	M	M		M						P				M
	Culvert and bridge maintenance			M	M	M	M	M			M					P				M
	Quarry operation			M	M	M	M	M	M	M						P				M
	Port operations and maintenance (materials handling, storage, transshipment and transloading)			M	M			M				M	M	M		P	P	P/M		M
	Small craft harbour operations and maintenance			M	M			M				M	M	M		P	P	P/M		M
	Permanent accommodation, service facilities operation and maintenance including re-supply of the port and Jericho station			M	M			M		M				M		P	P	P/M		M
	Public use of infrastructure			M	M			M						M		P	P	P/M		M

NOTES:
P = Positive
N = Negative and non-mitigatable
M = Negative and mitigatable
U = Unknown
If no impact is expected the cell is blank.