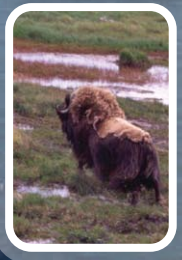
Bathurst Inlet Port and Road Project

Draft Environmental Impact Statement

Volume IX - Information Request Responses



Prepared by:
Rescan™
Engineers and Scientists
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ACRONYMS AND ABBREVIATIONS

Acronyms and Abbreviations

ADCP	Acoustic Doppler Current Profiler
AMMA	Australian Mines and Metals Association
ANFO	Ammonium Nitrate Fuel Oil
AQEMP	Air Quality and Emissions Management Plan
ARD	Acid rock drainage
ATV	All terrain vehicle
BAT	Best Available Technology
BIPR	Bathurst Inlet Port and Road
BMPs	Best Management Practices
C&R	Closure and Reclamation
CARC	Canadian Arctic Resources Committee
CCME	Canadian Council of Ministers of the Environment
CLEY	Department of Culture, Language, Elders and Youth
COPCs	contaminants of potential concern
CPUE	Catch-per-unit-effort
CTD	Conductivity-Temperature-Depth
DEIS	Draft Environmental Impact Statement
DFO	Fisheries and Oceans Canada
EBA	EBA Engineering Consultants Ltd
EC	Environment Canada
ED&T	Government of Nunavut's Department of Economic Development and Transportation

Acronyms and Abbreviations

EIS	Environmental Impact Statement
EMT	Emergency Medical Technician
ERD	Explosives Regulatory Division
GBPR	Grays Bay Port and Road
GDP	Gross Domestic Product
GHGs	Greenhouse gases
Golder	Golder Associates Ltd
GN	Government of Nunavut
HADD	harmful alteration, disruption or destruction
HDPE	high density polyethylene
HSI	habitat suitability index
HVAC	heating, ventilation and air conditioning
INAC	Indian and Northern Affairs Canada
IOL	Inuit Owned Land
IPCC	Intergovernmental Panel on Climate Change
IR	Information Request
LDC	long distance commuting
LSA	Local study area
LWD	Large woody debris
ML	Metal leaching
MLA	Member of Legislative Assembly
MMS	U.S. Mineral Managements Service

MSDS	Material Safety Data Sheets
MTSR	Marine Transportation Security Regulations
NIRB	Nunavut Impact Review Board
NOC	National Occupational Classification
NPC	Nunavut Planning Commission
NPRI	National Pollutant Release Inventory
NRCan	Natural Resources Canada
NSMA	North Slave Métis Alliance
NTCL	Northern Transportation Company Limited
NTKP	Naonaiyaotit Traditional Knowledge Project
NWT	Northwest Territories
PAG	Potentially acid generating
PAH	Polynuclear Aromatic Hydrocarbons
PM	Particulate Matter
RCMP	Royal Canadian Mounted Police
RSA	Regional study area
SEIA	Socio-economic impact assessment
SGP	Slave Geological Province
SSPC	steel sheet pile cells
STP	sewage treatment plant
TCWR	Tibbitt Contwoyto Winter Road
TK	Traditional Knowledge

TSP	Total Suspended Particulate
WMP	Waste Management Plan
Wolfden	Wolfden Resources Inc.
WSC	Water Survey of Canada
UV	Ultraviolet
VEC	Valued Ecosystem Component
VFR	visual flight rules
VSEC	Valued Social and Economic Components

1. INTRODUCTION

1. Introduction

This volume is a compilation of all intervenor's information requests with regard to the Bathurst Inlet Port and Road Project DEIS, and the proponent's responses to them. Each chapter contains all questions from an intervenor, including: Canadian Arctic Resources Committee, Environment Canada, Fisheries and Oceans Canada, the Government of Nunavut, Health Canada, Indian and Northern Affairs Canada, Natural Resources Canada, the North Slave Métis Alliance, and Transport Canada. The Information Requests document provided by these intervenors are presented in Appendix 1-1 of this volume for ease of reference. The information requests have been reproduced in full and directly from the intervenor's submitted documents. Following each intervenor's request, the proponent's response is provided. Some discrepancies may arise between sub-headings in each chapter, as intervenors submitted variable request layouts (*e.g.*, concerns, rationales, issues). Included in this introductory chapter is a table of concordance (Table 1-1) that groups information requests together by intervenor, providing a quick reference for the reader.

Table 1-1
Table of Concordance

Intervenor	IR Request Number	Issue	Section Number	Page Number
Canadian Arctic Resources Canada				
	-	Transboundary Effects	2.2.1	2-1
Environment Canada				
	1	Wildlife	3.6.1	3-17
	EC-1	Closure and Reclamation	3.2.1	3-1
	EC-2	Closure and Reclamation	3.2.2	3-2
	EC-3	Closure and Reclamation	3.2.3	3-4
	EC-4	Closure and Reclamation	3.2.4	3-5
	EC-5	Closure and Reclamation	3.2.5	3-6
	EC-6	Closure and Reclamation	3.2.6	3-8
	EC-7	Marine Water Quality	3.3.1	3-10
	EC-8	Marine Water Quality	3.3.2	3-10
	EC-9	Air Quality and Emissions	3.4.1	3-12
	EC-10	Waste Management	3.5.1	3-14
	EC-11	Waste Management	3.5.2	3-16
Fisheries and Oceans Canada				
	1	Project Alternatives	4.2.2	4-1
	2	Project Alternatives	4.2.3	4-2
	3	Project Alternatives	4.2.4	4-3
	4	Project Alternatives	4.2.5	4-4
	5	Project Alternatives	4.2.6	4-6

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Table 1-1
Table of Concordance (continued)

Intervenor	IR Request Number	Issue	Section Number	Page Number
Fisheries and Oceans Canada				
	6	Sediment Quality Monitoring	4.3.2	4-7
	7	Marine Aquatic Resources Baseline Data	4.4.2	4-8
	8	Marine Aquatic Resources Monitoring	4.4.3	4-8
	9	Marine Fish and Fish Habitat Baseline Studies	4.4.4	4-9
	10	Marine Aquatic Resources VECs	4.4.6	4-10
	11	Marine Aquatic Resources	4.4.7	4-11
	12	Marine Fish and Fish Habitat VECs	4.4.8	4-12
	13	Marine Fish and Fish Habitat - Dredging	4.4.9	4-13
	14	Fish and Fish Habitat Water Footprint and Design	4.4.10	4-13
	15	Marine Fish and Fish Habitat - Mitigation	4.4.11	4-14
	16	Marine Mammals	4.4.12	4-16
	17	Marine Processes	4.4.13	4-17
	18	Coastal Processes	4.4.14	4-20
	19	Fish-bearing Waters	4.5.2	4-22
	20	Crossing Structures	4.5.4	1-22
	21	Arctic Grayling	4.5.5	4-24
	22	Flood Events and Fish	4.5.6	4-24
	23	Crossing Sites	4.5.7	4-25
	24	Lake Shoreline	4.5.8	4-25
	25	Fish Monitoring	4.6.2	4-26
Government of Nunavut				
	1	Hold Times for Sample Water	5.2.1	5-1
	2	Air Quality Effects Assessment	5.3.1	5-1
	3	Air Quality Mitigation and Management	5.3.2	5-3
	4	Monitoring	5.3.3	5-4
	5	Air Quality Effects Assessment	5.3.4	5-4
	6	Air Effects Assessment	5.3.5	5-5
	7	Air Effects Assessment	5.3.6	5-6
	8	Air Effects Assessment	5.3.7	5-7
	9	Air Effects Assessment	5.3.8	5-8

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Table 1-1
Table of Concordance (continued)

Intervenor	IR Request Number	Issue	Section Number	Page Number
Government of Nunavut				
	10	Air Effects Assessment	5.3.9	5-9
	11	Air Quality Monitoring	5.3.10	5-10
	12	Sound Level Setting	5.4.1	5-11
	13	Sound Methodology	5.4.2	5-12
	14	Sound Effects Assessment	5.4.3	5-13
	15	Transboundary Effects	5.5.1	5-13
	16	Project Alternatives	5.6.1	5-15
	17	Legislation	5.7.1	5-16
	18	Missing Appendix	5.8.1	5-18
	19	Climate	5.9.1	5-18
	20	Air Quality	5.9.2	5-19
	21	Noise Models	5.9.3	5-20
	22	Spill Planning & Response	5.10.1	5-20
	23	Sewage Sludge Management	5.11.1	5-21
	24	Solid Waste Management	5.11.2	5-22
	25	Hazardous Materials Management	5.12.1	5-23
	26	Work Rotations	5.13.1	5-23
	27	Area of Influence	5.13.2	5-26
	28	Framework	5.13.3	5-28
	29	Commitments	5.13.4	5-29
	30	Nunavummiut	5.13.5	5-30
	31	Project Life	5.13.6	5-31
	32	Literature Use	5.13.7	5-31
	33	Project Impacts	5.13.8	5-32
	34	Traditional Harvesting	5.13.9	5-37
	35	Road Control and Monitoring	5.13.10	5-37
	36	Wildlife Officers	5.13.11	5-39
	37	Tourism	5.13.12	5-39
	38	Transportation Patterns	5.13.13	5-45
	39	West Kitikmeot Barge Service	5.13.14	5-46
	40	Traditional Land Use Patterns	5.13.15	5-47
	41	Employment	5.13.16	5-50
	42	Employment	5.13.17	5-51

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Table of Concordance (continued)

Intervenor	IR Request Number	Issue	Section Number	Page Number
Government of Nunavut				
	43	Employment	5.13.18	5-52
	44	Training	5.13.19	5-53
	45	Data and References	5.13.20	5-54
	46	Survey	5.13.21	5-55
	47	Archaeology Survey	5.14.1	5-56
	48	Archaeological Sites	5.14.2	5-57
	49	Archaeological Protection	5.14.3	5-57
Health Canada				
	1	Country Foods	6.2.1	6-1
	2	Country Foods	6.2.1	6-1
	3	Country Foods	6.2.1	6-1
	4	Country Foods	6.2.1	6-1
	5	Country Foods	6.2.1	6-1
	6	Country Foods	6.2.1	6-1
Indian and Northern Affairs Canada				
	2.1	Project Rationale	7.2.1	7-1
	3.1	Project Alternatives	7.3.1	7-2
	4.1	Materials and the Port	7.4.1	7-7
	4.2	Additional Areas	7.4.2	7-9
	4.3	Road Traffic	7.4.3	7-10
	4.4	Construction Design	7.4.4	7-13
	4.5	Road Alignment	7.4.5	7-14
	4.6	Airstrip	7.4.6	7-15
	4.7	Spills	7.4.7	7-16
	4.8	Fuel and Spill Plans	7.4.8	7-16
	4.9	Utilities	7.4.9	7-18
	5.1	Landforms and Permafrost Features	7.5.1	7-19
	5.2	Climate Change	7.6.1	7-24
	6.1	Noise Effects	7.7.1	7-29
	7.1	Water Extraction	7.8.1	7-33
	7.2	Hydrological Data	7.8.2	7-34
	7.3	Wetlands and Flow	7.8.3	7-38
	7.4	Culverts and Bridges	7.8.4	7-39
	7.5	Fords	7.8.5	7-40

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Table 1-1
Table of Concordance (continued)

Intervenor	IR Request Number	Issue	Section Number	Page Number
Indian and Northern Affairs Canada				
	7.6	Surface Water Monitoring	7.8.6	7-40
	8.1	Crossings	7.9.1	7-41
	8.2	Crossings	7.9.2	7-42
	8.3	Water Management	7.9.3	7-44
	8.4	PAG Materials	7.9.4	7-44
	8.5	Water Quality Data	7.9.5	7-55
	8.6	Water Quality Data	7.9.5	7-55
	9.1	Freshwater Life	7.10.1	7-56
	10.1	Esker Materials	7.11.1	7-58
	10.2	Grain Size Analysis	7.11.2	7-59
	10.3	Ice Core Eskers	7.11.3	7-59
	10.4	ML/ARD	7.11.4	7-60
	10.5	Quarry Sites	7.11.5	7-62
	10.6	Soils	7.11.6	7-63
	10.7	Permafrost	7.11.7	7-65
	10.8	Soils/Geology	7.11.8	7-68
	11.1	Plants	7.12.1	7-69
	11.2	Spatial Boundaries	7.12.2	7-69
	12.1	Marine Transport	7.13.1	7-71
	12.2	Marine Spills	7.13.2	7-75
	12.3	Marine Facilities	7.13.3	7-77
	13.1	Transboundary Effects	7.14.1	7-78
	14.1	Accidents and Malfunctions	7.15.1	7-81
	15.1	Cumulative Effects	7.16.1	7-102
	16.1	Sustainability	7.17.1	7-103
	17	Mapping	7.18.1	7-111
	18.1	Public Consultations	7.19.1	7-113
	18.2	Community Support	7.19.2	7-114
	18.3	Consultation Materials	7.19.3	7-118
	18.4	Organizations	7.19.4	7-119
	18.5	Sustainability	7.19.5	7-123
	18.6	Tourism	7.19.6	7-123
	18.7	Tourism	7.19.7	7-127
	18.8	Transportation Patterns	7.19.8	7-130

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Table 1-1
Table of Concordance (continued)

Intervenor	IR Request Number	Issue	Section Number	Page Number
Indian and Northern Affairs Canada				
	18.9	Transboundary Issues	7.19.9	7-131
	18.10	Cumulative Effects	7.19.10	7-133
Natural Resources Canada				
	#1	Marine Processes	8.2.1	8-1
	#2	Sea Ice Action	8.2.2	8-2
	#3	Shoreline	8.2.3	8-3
	#4	Marine Clays	8.2.4	8-6
	#5	Sediment	8.2.5	8-6
	#6	Shoreline Mapping	8.2.6	8-7
	#7	Bathymetry	8.2.7	8-7
	#8	Explosives	8.3.1	8-8
	#9	Explosives	8.3.2	8-9
North Slave Métis Alliance				
	1A	Heritage Resources	9.2.1.1	9-1
	1B	Métis Culture	9.2.1.2	9-1
	1C	Métis Sites	9.2.1.3	9-2
	3A	Mapping	9.2.2.1	9-2
	3B	Socio-Economic Effects	9.2.2.2	9-2
	4A	Métis Heritage Values	9.2.3.1	9-3
	4B	Métis Heritage Values	9.2.3.2	9-3
	4C	Methodology	9.2.3.3	9-4
	4D	Methodology	9.2.3.4	9-4
	4E	Methodology	9.2.3.5	9-4
	4F	Community Consultation	9.2.3.6	9-5
	4G	Heritage Resources Assessment	9.2.3.7	9-5
	4	Archaeology	9.2.3.8	9-5
	5A	Effects Assessment	9.2.4.1	9-7
	5B	Archaeology	9.2.4.2	9-7
	5C	Community Consultation	9.2.4.3	9-7
	6A	Community Involvement	9.2.5.1	9-8
	6B	Community Involvement	9.2.6.1	9-8

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Table 1-1
Table of Concordance (completed)

Intervenor	IR Request Number	Issue	Section Number	Page Number
Transport Canada				
	#1	Marine Security	10.2.1	10-1
	#2	Dangerous Goods	10.2.2	10-1
	#3	Public Private Partnership	10.3.1	10-3

2. CANADIAN ARCTIC RESOURCES COMMITTEE

2. Canadian Arctic Resources Committee

2.1 Introduction

This chapter contains the rationale and information request from the Canadian Arctic Resources Committee, and the Proponent's response.

2.2 Issue – Trans-boundary Effects Analysis

2.2.1 Information Request

Volume VIII Appendix G-3 The "Trans-Boundary Effects Analysis" contains no information on trans-boundary effects from other users of the Bathurst Caribou herd and shows no evidence of consultation with the Governments of the Northwest Territories, Nunavut, Saskatchewan or Aboriginal management bodies created by land claims. Nor does the analysis consider international trans-boundary effects.

2.2.1.1 Rationale

The proponent is required to according to the DEIS do the following:

1. Consider as stated in Volume II Table of Concordance PDF page 3, 2.1 NIRB Principle bullet 4 "**The well-being of residents of Canada outside the Nunavut Settlement Area must be taken into account**. Significant Trans-boundary Biophysical and Socio-economic Effects directly related to this Project must be included in the EIS in order to ensure the NIRB's assessment of the well being of Canadians outside of the Nunavut Settlement Area. Further to this, the Minister of Indian Affairs and Northern Development identified trans-boundary effects as an issue for NIRB to consider in the review of the Project in his letter to NIRB, dated May 4, 2004."

2. Consult as stated in Volume 1 Draft Environmental Impact Statement – Executive Summary, Socio-Economics PDF pages17, 18, 19 "…Fifteen communities within Nunavut and the NWT may be affected by the Project. As the proposed Project has generated economic interest in both territories, these communities are a potential source of labour, services, and supplies. NIRB has identified these communities for inclusion in the consultation process to ensure that public concerns are properly addressed, whether within or outside the Nunavut Settlement Area. All fifteen communities constitute the area of influence for this Project (Figure 2).

Communities located within the West Kitikmeot Region include Bathurst Inlet, Omingmaktok, Cambridge Bay, Kugluktuk, Taloyoak and Gjoa Haven. The Akaitcho Dene First Nation inhabits the Traditional Akaitcho Treaty 8 Territory. The communities of interest for the Project within the Akaitcho Region are Yellowknife and Lutselk'e.

The Tlicho or Dogrib Region is located within the North Slave Region of the NWT. The communities of Rae-Edzo (Behchokò), Rae Lakes (Gamètì), Whatì, and Wekweètì make up this geographic area and are all communities within the Project's area of influence

The Sahtu Dene and Métis Comprehensive Land Claim Area are located to the northwest of the Tlicho Region and to the north of the Dehcho Region, touching the Yukon border. The community of importance in this region is Déline.

The small community of Reliance is located close to the community of Lutselk'e on the eastern end of Great Slave Lake. Holman is located on the western side of Victoria Island, on Amundsen Gulf and is approximately 925 km north of Yellowknife. Both are within the Project's area of influence."

3. Information is lacking in Volume II Section A4 Community Consultation -The proponent made enquiries about the socio economic benefits to community representatives but requested no information about the trans-boundary use of the caribou to the individuals nor to the respective wildlife bodies managing the harvesting activities of the users of the caribou herds on the impact of BIPAR in Nunavut nor the Northwest Territories.

4. Information is lacking in Volume VIII Additional Reports, Appendix G 3 Trans-boundary Effects Analysis -The proponent consulted no agencies responsible for caribou management in Nunavut, Northwest Territories nor Saskatchewan to examine domestic or international issues affecting caribou management.

2.2.1.2 Request

To address these deficiencies and address the NIRB trans-boundary effect's principle at the local, regional, provincial, territorial, and at the national and international level we request the proponent to:

1. Please provide additional information from the communities named in the above "Rationale", from the three territorial/provincial governments, and caribou management bodies, i.e. the Nunavut Wildlife Management Board, involved in the management of caribou herds identified in the DEIS about domestic and international issues raised by the BIPAR DEIS in Nunavut, Northwest Territories and Saskatchewan.

2. Please provide additional information from the Government of Canada Department of Foreign Affairs, Indian and Northern Affairs Canada, Parks Canada, Environment Canada and the Privy Council Office with respect to position of the Government of Canada on whether the BIPAR road through the Bathurst Caribou calving grounds would affect Canada and the Aboriginal peoples position on no development on the Porcupine caribou calving grounds in the Alaska Arctic National Wildlife Reserve.

3. Please provide additional information from the International Porcupine Caribou Board, and the Porcupine Caribou Management Board on how the BIPR proposal for a road through the Bathurst Caribou herd calving grounds will affect the position that there should be no

development in Porcupine Caribou heard calving grounds in the Alaska Arctic National Wildlife Reserve.

2.2.1.3 Response

The Proponent regards the core issue in this Information Request to be outside the scope of the Final EIS Guidelines for the Review of the Proposed Bathurst Inlet Port and Road Project – December 2004. Nevertheless, the findings of the DEIS as they relate to the Bathurst caribou herd are reviewed below.

The Project is within the historic range of the Bathurst herd.

The potential interactions between caribou of the Bathurst Herd and the Project were examined and the potential effects assessed and reported in the DEIS. The findings of the assessment with respect to the effects on Bathurst caribou are:

Aspect assessed	Effects rating
Habitat Loss	Low
Disruption to Movement	Low
Disturbance	Low
Features Acting as Attractants	Low
Direct Mortality	Negligible
Indirect Mortality	Negligible
Reduction in Reproductive Productivity	Low

No direct interactions between the Project and the Porcupine herd were found in the course of assessing potential effects of the Project on other caribou herds. The cumulative effects assessment of the Project followed the guidelines issued by NIRB. These guidelines did not identify or suggest that the herd or range occupied by the Porcupine caribou herd, nor the communities that harvest this herd, be included in the cumulative effects assessment.

The Proponent has consulted extensively and has received responses and concerns from most communities referred to it by NIRB and/or the Minister as described in Appendix A-4, Section 1.1.2 of the DEIS. Further public consultation meetings are planned and pending. Public consultation remains an important vehicle to address questions and concerns the public may have regarding the Project. However, consultation is not a substitute for the environmental review in which governments and management agencies should participate if they have concerns. The DEIS is available to all parties mentioned above and has been sent directly to most. The environmental review process is intended and designed to provide a forum for all affected parties to raise questions with respect to the interactions between the project and their interests and concerns. The Proponent will continue to consult with interested parties, particularly those participating in the Project's environmental review process.

The cumulative effects assessment in the BIPR DEIS (as discussed above) did not find any potential interactions by the Project with caribou herds outside the Project area.

3. ENVIRONMENT CANADA

3. Environment Canada

3.1 Introduction

This chapter includes the issues as described by Environment Canada, their rationales and requests, and the Proponent's responses.

3.2 Issue – Closure and Reclamation

3.2.1 Information Request EC-1

3.2.1.1 Rationale

The C&R Plan states a number of objectives:

1. to protect the environment through sound reclamation practices
2. to restore the land to its original state as closely as possible.
3. to restore land uses
4. to minimize effects to aquatic habitat and water quality with proper engineering
5. to ensure that reclaimed and abandoned areas are safe and do not pose health and safety risks

In order to achieve all of these objectives, it is critical that the proponent have a clear understanding of existing background environmental conditions throughout the entire footprint of this project. It isn't clear from the C&R Plan that adequate background studies have been completed that ensure the aquatic, terrestrial and atmospheric conditions at both the Port Site and the areas affected by road construction have been adequately characterized.

3.2.1.2 Request

EC requests that information detailing work done to characterize this site be presented, or, if not done, be carried out prior to any construction. A description of upcoming work should be provided.

3.2.1.3 Response

The information characterizing the site in terms of aquatic, terrestrial, and atmospheric conditions at the Port site and the areas affected by road construction are included in appendices attached to the DEIS. These are included as baseline reports that indicate the current conditions. Detailed information on aquatic resources include both freshwater resources and the marine resources. The detailed reports on the baseline studies on freshwater resources are included in Volume IVb: Freshwater Environment. This includes three separate documents:

- Appendix C-6 of the DEIS: *Freshwater Environment Baseline Studies, 2001*;
- Appendix C-7 of the DEIS: *Freshwater Environment Baseline Studies, 2002*; and
- Appendix C-8 of the DEIS: *Freshwater Baseline Study, 2007*.

The baseline report for marine aquatic environment are included in Appendix E-7 of the DEIS, *Marine Environment Baseline Studies, 2001-2002*.

The detailed baseline studies on the terrestrial environment are included in Volume Vb: Terrestrial Environment. These include:

- AppendixD-4 of the DEIS: *Surficial Geology, Soils and Ecosystem Mapping*;
- Appendix D-5 of the DEIS: *Preliminary Bedrock Geology Characterization*;
- Appendix D-6 of the DEIS: *Environmental Geochemistry of Surficial Materials*;
- Appendix D-7 of the DEIS: *Wildlife Baseline Studies, 2001-2002*;
- Appendix D-8 of the DEIS: *Habitat Suitability Ratings Baseline Report*;
- Appendix D-9 of the DEIS: *Caribou and Muskox Baseline Study, 2007*;
- Appendix D-10 of the DEIS: *Songbird and Shorebird Baseline Study, 2007*; and
- Appendix D-11 of the DEIS: *Baseline Plant Tissue Chemistry*.

The detailed atmospheric studies are included in Volume III: *Atmospheric Environment*. These include: Appendix B-4, *Air Quality Modelling Study* and Appendix B-5, *Meteorology Baseline Study, 2001-2002*.

These reports provide detailed descriptions that characterize the environmental conditions.

3.2.2 Information Request EC-2

3.2.2.1 Rationale

The C&R Plan states a number of closure objectives. The Plan does not however provide any detail on what criteria will be used to determine when these closure objectives have been satisfied. In order to ensure that the C&R plan is comprehensive and able to meet it's final objectives, the Plan will need to include more detail and describe the criteria.

3.2.2.2 Request

The proponent is requested to provide additional information that demonstrates what criteria will be used to assess whether the stated closure objectives have been met.

3.2.2.3 Response

The criteria and details below will be used to assess whether the stated closure objectives have been met and will include specific indicators. These can be considered in concert with the sections in the DEIS on the key performance indicators, monitoring, and evaluation, and the management plans presented in Appendix D-2 of the DEIS, *Bedrock Geology, Surficial Material, and Soils Effects Assessment*.

Landform Stability

Quarries and other sites designated for closure and reclamation will be assessed by qualified personnel who will conduct a detailed assessment. A report indicating that the site slopes and landforms are stable will be produced and signed off by a qualified engineer. Areas showing potential instability will be treated to address this problem. All such areas will be located with a GPS, photographed, and a detailed report prepared. Sites showing instability will be monitored and all information will be kept in a permanent record book to be available as required.

Removal of All Structures

As soon as a site has been cleared of buildings and structures, the site manager or other designated person will inspect the site to ensure removal is complete. Sites will also be inspected for contaminated soils. All contaminated soils will be documented and located using a GPS. The treatment/disposal method will be documented. Soils samples will be collected and analyzed following cleanup to ensure that the site meets standards. Photographs of the general sites will be taken, illustrating that all structures and equipment have been removed, and a report prepared.

Reclaimed Areas

Areas that will be re-vegetated will require several steps. A qualified person will be on-site to check the surface. The soil cover or planting surface will require proper handling and will be inspected by a qualified person to ensure it is suitable for plant establishment. Native seed will be broadcast seeded or planted in the early spring. Vegetation establishment will be monitored and percent plant cover recorded. Bare areas or places of poor establishment will be photographed, measured, and located with a GPS. The information will be recorded and made available upon request by the site manager or other designated personnel. These sites will be ameliorated as required and reseeded. All treatments will be recorded.

All signs of animal presence or visits will be recorded. Regular use of reclaimed areas by wildlife will suggest a return to pre-Project use, providing proof of objective fulfillment.

Roads

Upon closure, road surfaces will be checked for fuel spills by a designated person. All contaminated areas will be located using a GPS, photographed, measured, located on a map, and recorded. The contaminated material will then be removed and remediated by bio-remediation or other cost-effective technique. The roads will be inspected by a qualified person such as an engineer to determine areas requiring re-grading to minimize erosion and ensure stability. These will be marked on a map. The re-grading will occur under the direction of a qualified person.

The roads will be inspected by a qualified person for signs of slumping, failure, instability, or erosion. Areas requiring additional treatment will be located using a GPS, located on a map, photographed, and the issues documented. This information will be kept as a permanent record to be available to the site manager or others, as determined. All treatments will be recorded. The road will be re-inspected until the sites have stabilized.

Unless designated to remain in place, all culverts will be removed under the direction of a qualified person. Natural drainage will be re-established. These areas will be inspected for signs

of flooding or impeded drainage and will be rectified as required. All issues and treatments will be documented and the records kept.

All bridges will be removed unless designated to remain in place by regulators and landowners. All bridge areas will be inspected before removal to plan for closure, such as ensuring riprap or other treatments are available where required. This information will be recorded and made available during the dismantling operation. During this operation, erosion cloth or other sediment barrier material will be available to ensure sediment does not enter waterways. The waterways will be inspected downstream of the bridge areas to check for visible sediment in the water. Any signs of sediment will trigger site re-inspections and immediate amelioration. The waterways will be monitored for sediment. Any signs of sediment in the water will be rectified immediately and traced back to the source and area. All such occurrences and treatments will be recorded (dated, located, photographed, and described).

3.2.3 Information Request EC-3

3.2.3.1 Rationale

The proponent has stated that the road will likely be constructed by end-dumping onto the tundra. This means of road construction will not allow for soil salvage that would be invaluable in final reclamation.

3.2.3.2 Request

Environment Canada requests that the proponent includes in the plan to conserve as much organic soil suitable for reseeding the roadbed as possible during the road construction process. Any salvaged soil should be protected from erosion by seeding until it is needed in the final reclamation stage.

EC also recommends that monitoring be carried out in areas where stockpiled soils (organic and topsoil) have been seeded to prevent erosion prior to any final remediation/revegetation efforts of the roadways. In addition, EC requests that monitoring be carried out to ensure the vegetation mat is sufficient to control erosion on any reclaimed areas (in both progressively reclaimed and in final reclamation areas of both roadways and port site facilities).

3.2.3.3 Response

The Project area is on continuous permafrost; general construction practice is to minimize excavating or disturbing the tundra. The Project is generally designed to protect permafrost as is presented in the DEIS in the Permafrost Management Plan (Appendix D-2 of the DEIS). Because of this, most of the buildings constructed for the Project will not have excavated foundations (Appendix D-2 of the DEIS, Section 4.2.3 Permafrost). The salvage of soil where scraped for reclamation is generally a recommended practice. However, the salvage of soil in this region may cause more environmental issues due to the projected time the road will be in operation. If the projected road use was for one or two years, salvage of the soil for closure may be an option as special liners and practices could be used for a short time to protect the tundra on which the salvaged soil would be stored. In this case, any soil salvaged would be required to be stockpiled on the adjacent tundra for many years. This will kill the tundra vegetation under the

stockpiled soil and result in increased loss of wildlife habitat and browse. The harsh climate causes tundra plants to be fragile and slow-growing, such that disturbance to the tundra plants should be minimized as much as possible. As well, salvage of the soil could expose the permafrost below the road bed to melting such that the road base may need more maintenance due to increased slumping. This would require more traffic to the site during the summer months when maintenance will be conducted. Maximum protection of the permafrost will reduce the effects of permafrost melting under the road, and therefore reduce the amount of maintenance required. Based on this information, end-dumping is proposed, similar to that presented in Plate 3.2-1.

Plate 3.2-1. View of road construction on tundra using end dumping method.

3.2.4 Information Request EC-4

3.2.4.1 Rationale

The proponent has not indicated how excess fuel will be treated post-closure, i.e., shipped out, incinerated etc. If incineration is required, EC suggest that an appropriate incineration device be selected in consultation with regulatory experts and that the proponent ensure diligent operation and maintenance of the incineration device and that appropriate training is provided to the personnel operating and maintaining the incinerator.

3.2.4.2 Request

EC requests that the proponent indicate and discuss how excess fuel will be treated post-closure.

3.2.4.3 Response

All excess fuel will be shipped off-site and sold or used for another operation.

3.2.5 Information Request EC-5

3.2.5.1 Rationale

The C&R Plan states that the Port Site (at 159 ha) will include a 200 person camp with services, a 200+ million litre fuel tank farm, a diesel power plant, ammonium nitrate storage, two sedimentation ponds, a truck and trailer maintenance shop, a sewage treatment plant, a fuel disposal area, a heliport, an airstrip, a landfill/soil stockpile area, and two quarries.

Very little information is provided in this C&R Plan that outlines how all of these facilities will be decommissioned and the site subsequently reclaimed.

3.2.5.2 Request

Environment Canada requests that substantially more information be provided such that an assessment of the success of final reclamation can be determined for all of these facilities. For example:

1. What are the technical details concerning the sewage treatment plant? What will be the fate of this facility at closure?
2. Where does the proponent intend to establish a soil bioremediation facility? What will be the capacity and the technical specifications? Will there be an area to treat petroleum hydrocarbon contaminated snow and ice?
3. What is the nature of the sedimentation ponds and will the proponent ensure there are no deleterious substances contained therein that can migrate to the receiving environment?
4. There is no discussion of the management of hazardous and/or waste materials at this site. Environment Canada recommends that a waste inventory or audit be implemented that outlines the nature, extent and eventual fate of all waste materials brought to, used and generated at this site. This type of audit will be helpful in determining appropriate landfill contents vs. items that **must** be moved offsite. Such a waste management plan should include, but not be limited to:
   - Purchasing policies that focus on reduced packaging,
   - A hazardous materials management plan for the site that ensures that all hazardous wastes, including waste oil, receive proper treatment and disposal at an approved facility.
   - On-site diversion and segregation programs (*i.e.*, the separation of non-food waste items, non-combustible solid wastes *etc.*, suitable for storage and subsequent transport and disposal or recycling).

3.2.5.3 Response

The Sewage Treatment Plant will be skid mounted and employ membrane bioreactor technology. The membrane bioreactor technology combines the biological step and the solid–liquid

separation step into a single process. The membrane modules are submerged in the activated sludge and acts as a barrier to microorganisms and eliminates the secondary clarifier and allows the activated sludge to be more concentrated. UV disinfection system, if required, will be used prior to effluent discharge.

At closure this facility will be decommissioned and removed in accordance with the closure plan.

The exact location of the soil bioremediation facility has not been determined; its position will be based on the capacity required. The goal will be to minimize fuel- (hydrocarbon) contaminated soils by immediate cleanup of spills and the use of liners in dispensing and equipment storage areas. The capacity and technical specifications of the bioremediation facility will be determined based on the volume of material that will be required. These facilities do not require highly technical specifications or specialized equipment, and therefore a long lead time will not be required if it is determined that such a facility is required.

Snow and ice contaminated with petroleum hydrocarbons will be put in drums equipped with an oil/water separator. The hydrocarbons will then be treated in the soil bioremediation facility or taken off-site and disposed of in a regulated facility. Such tanks will be stored within the berm of the tank farm or other lined facility until disposal/treatment is performed.

A land fill will be on the flats adjacent to No Name Creek. An HDPE containment will be constructed to contain contaminated soil and store hazardous waste. The sediment ponds will have oil separators which will collect any hydrocarbons from contaminated water (from snow and ice melt) at the port site. Oil will be periodically removed and contained for shipment to an off-site location.

Waste Management

Waste management will include separation of Hazardous and non hazardous waste material as well as planned reduction in waste. Planned reduction of waste will include implementing policies that reduce packaging that generates packing materials, reusing materials befor they are classified as waste and implementing a system for managing and tracking waste costs. Non hazardous materials will be further separated into recycle and non recycle materials. In both types of waste an inventory will be kept that will include the disposal and destination of the waste material.

Non hazardous recycle material will be separated and packaged and stored in a designated area until shipped off site. When these materials are shipped off site a manifest will be generated, checked by the carrier and the receiver to verify all materials have been disposed of in accordance with the waste management plan. Non recycled materials will be separated and disposed of on site by incineration or land fill.

Hazardous wastes are those wastes which, due to their nature and quantity, are potentially hazardous to human health and/or the environment and which require special disposal techniques to eliminate or reduce the hazard.

The proponent will ensuring workers are trained in the management of hazardous waste including emergency response in the event of a discharge. Hazardous waste will not be mixed or diluted with any substance or divided into smaller in to smaller quantities. In addition hazardous wastes will be classified, labelled and stored in the hazardous waste containment properly.

Monitoring at the hazardous waste storage facilities will involve in-plant surveillance and inspection, together with thorough record-keeping that can account for all qualities and quantities of wastes being stored.

Hazardous waste should be stored in containers according to the following:

- In the original containers, where possible, or in containers manufactured for the purpose of storing hazardous waste. The containers must be sound, sealable and not damaged or leaking. The Transport Authority regulates container specifications.
- Clearly labelled according to the requirements of the Work Site Hazardous Materials
- Information System (WHMIS) of the *Safety Act* or the relevant Transport Authority, if transport is planned.
- Bulked into 16 gauge or equivalent metal or plastic 205 litre drums, as appropriate.
- The containers should be sealed or closed at all times, unless in use.

If waste is to be transported off-site the generator should:

- register as a generator of hazardous waste;
- ensure a waste manifest is properly completed and accompanies the shipment; and ensure the waste is transported by a registered hazardous waste carrier to a registered receiver.
- ensure the waste is transported by a registered hazardous waste carrier to a registered receiver and registering their hazardous waste management facility, if required.

A detailed Waste Management Plan is provided in Appendix 3.2-1.

3.2.6 Information Request EC-6

3.2.6.1 Rationale

The C&R Plan states that bridges will be removed on closure of the roads but the Plan does not reference how any disturbed streambeds will be re-established and whether appropriate bank stabilization will be carried out if required.

3.2.6.2 Request

EC requests the proponent provide additional detail on reclamation measures for disturbances caused to streams, streambanks and water flow paths affected by any road construction. In areas where surfaces need to be resloped, EC requests the proponent to plan for erosion control features (*e.g.*, diversion berms, contouring etc) that will prevent gullies, rills *etc*.

In addition, EC requests the proponent to provide additional details on how roadcuts and fill areas will be stabilized and how access will be controlled should there be a safety hazard or where access could impact fish or wildlife populations.

3.2.6.3 Response

All culverts will be removed under the direction of a qualified person such as an engineer unless designated to remain in place. Natural drainage will be re-established. These areas will be inspected every summer for signs of flooding or impeded drainage and problems will be rectified as required. All issues and treatments will be documented and the records kept. Annual monitoring will be carried out for the next five years.

All bridges will be removed unless designated to remain in place as required by regulators. Removal will be supervised by a qualified person. All bridge areas will be inspected by a qualified person before removal to plan for closure, to examine whether riprap or other treatments are required. This information will be recorded and made available during the dismantling operation. During this operation, erosion cloth or another sediment barrier material will be available to ensure sediment does not enter waterways. The waterways will be inspected downstream of the bridge areas following deconstruction of the bridges to check for visible sediment in the water. If bridges are removed during the summer, water quality will be monitored for turbidity. Any signs of sediment will trigger a site re-inspection and immediate amelioration. The waterways will be inspected for sediment until freeze over and again after thaw, and the next season. Any signs of sediment in the water will be traced back to the source and the area rectified immediately. All such occurrences and treatments will be recorded (dated, located, photographed, and described).

A fisheries specialist will be on-site during removal of bridges and culverts at fish-bearing crossings to ensure that the streambed will not be disturbed or to recommend temporary measures during bridge removal. Disturbance of the streambed is not predicted as crossings will be constructed outside the bankfull width of the streams. However, if some disturbance does occur, the fisheries specialist will ensure streambeds are rehabilitated to allow future use for fish. All visits and activities will be documented. The specialists will inspect such sites following bridge removal to ensure that the streambed is stable. Any issues will be rectified immediately under the direction of the specialist. The sites will be revisited the following spring, and fall, or until the streambed and banks are stabilized.

More information on the closure and reclamation proposals is contained in other sections of Vol. IVa of the DEIS, (*e.g.*, Appendix C-1, Sections 4.1.5 and 5.1.3; Appendix C-2, Sections 4.2.2 and 4.4.2, and Appendix C-4, Section 5). It is indicated that standard decommissioning, grading, restoring natural fluvial patterns to baseline conditions will be done during the winter months (when there is no flow) to limit the amount of sediment entrainment. If decommissioning of watercourse crossings is required during the open water period, best management practices will be followed to ensure that sediment loads and erosion are minimized during these activities.

Siltation caused by these activities will be short-term and efforts will be focused on erosion control rather than sediment containment as containment usually involves temporary structures

that eventually have to be removed or blended into the environment. Restoration methods will be designed on a case-by-case basis. Streambeds and banks will be sloped and armoured with clean riprap or coarse granular material as required. Where soil is re-spread and re-vegetated, mulching with a biodegradable binder or tackifier will be applied where appropriate to prevent rilling or gullying before root systems are established.

With respect to safety hazards to wildlife, Appendix G-6 of the DEIS, Section 5.4.1 states that quarries will be contoured and benched to prevent entrapment of wildlife. Also, large rocks will be placed at the high end of quarry walls to prevent animals from getting close to the quarry edge where they might fall in.

Access to these sites once the road infrastructure is removed will be difficult so the closure and reclamation methods will be conservative to minimize the probability of adverse environmental accidents related to the abandoned road and facilities.

3.3 Issue – Marine Water Quality

3.3.1 Information Request EC-7

3.3.1.1 Rationale

The proponent has provided maps with baseline sampling sites and a text description of the two different study areas, however it is difficult to determine which sites are within the zone of influence and if all areas affected by the projects activity have in fact been captured within these given study areas. A map would be helpful in identifying visually where the proponent has delineated the Local and Regional Study Areas and would also help determine whether the sample sites are in appropriate locations.

3.3.1.2 Request

Environment Canada requests that maps are provided of the Regional and Local Study Areas for the Marine Water Quality.

3.3.1.3 Response

Figure 3.3-1 on the next page illustrates both the local and regional marine study areas.

3.3.2 Information Request EC-8

3.3.2.1 Rationale

The proponent states that in 2001 five sampling stations were established for marine water quality and sediment quality. In 2002 sediment quality was again sampled at one of the previous stations. In 2007 the proponent sampled an additional 5 stations within the same area. EC understands that the total amount of baseline data that has been collected for the area includes 10 stations in total and one set of samples for each station, except a second sediment sample that was collected in 2002 at one station. In order to ensure that baseline data captures the variability

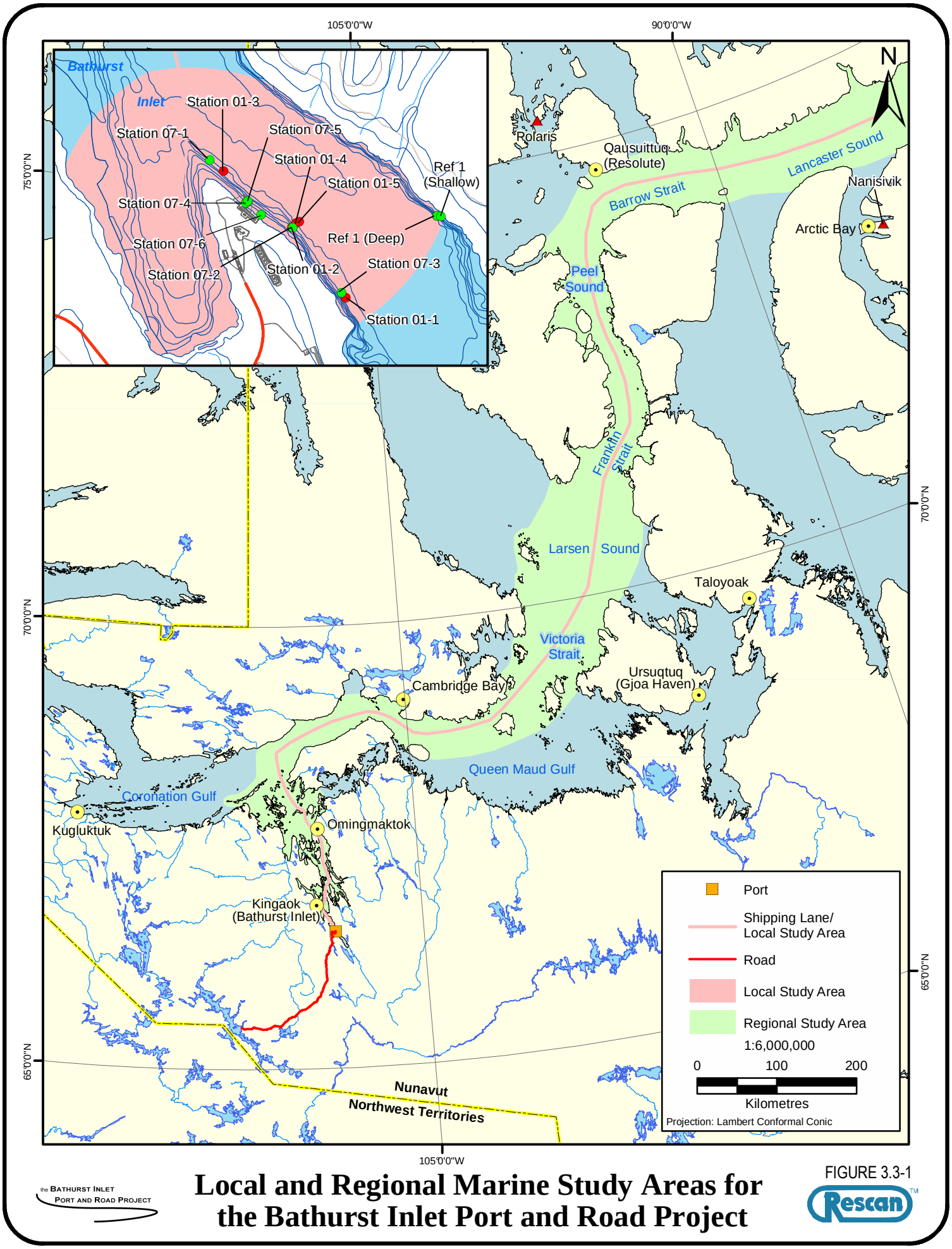

FIGURE 3.3-1

Local and Regional Marine Study Areas for the Bathurst Inlet Port and Road Project

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of the environment and to ensure that monitoring of effects will be detectable; further baseline data will need to be collected. It should also be determined that these sites are within the zone of influence of the project and that the reference sites are outside the zone of influence.

3.3.2.2 Request

EC requests that the proponent collect further marine water quality and sediment quality baseline data as part of a comprehensive Aquatic Effects Monitoring Program and discussions as to the reasoning for the sample sites chosen.

3.3.2.3 Response

In 2008, 32 water (four at each of the eight sites if depth allows) and 25 sediment samples will be collected. Transects running perpendicular to the shoreline, with sites of varying depths, will be established. Three transects will be on the east shore of the port peninsula (two of which bisect sampling stations from previous years), three transects will be on the west side of the peninsula (a treated domestic sewage outfall is proposed in this bay), and one transect will be on the east shore of Bathurst Inlet, opposite the port, which will serve as a reference site. The sample sites were chosen to characterize both deep and shallow, and near-field and far-field marine water and sediment quality.

3.4 Issue – Air Quality and Emissions

3.4.1 Information Request EC-9

3.4.1.1 Rationale

The Air Quality and Emissions Management Plan (AQEMP) will allow an organized approach to address air issues and annual reporting will allow tracking of emissions and efforts toward minimizing impacts. This approach is being applied to several northern developments including the Mackenzie Gas Project and the DeBeers Snap Lake Diamond.

The AQEMP should include strategies to comply with applicable CCME Canada-wide Standards that both the Government of Canada and Government of Nunavut are signatories. For example the Keeping Clean Areas Clean principal of the Canada-wide Standards for PM and Ozone and the Canada-wide Acid Rain Strategy require the use of best available technologies (BAT) and best management practices (BMPs) to minimize air emissions. The use of BAT and BMPs should be documented and discussed in the AQEMP.

Residual air pollutant emissions after the application of BAT and BMPs should not exceed relevant ambient air quality standards. The AQEMP should include results from the air monitoring program to demonstrate that these standards are being met.

An example template for an AQEMP is provided in Appendix A.

Appendix A from Environment Canada's Information Request Document

Example template of the Air Quality and Emissions Management Plan (AQEMP)

The following is an example of air quality and emissions plan that has been used in other the northern developments.

An air quality and emissions management plan should be designed in consultation with representatives of the appropriate governments, agencies and communities. It should include, but not be limited to:

- Clearly defined goals, objectives and methodologies for each of the component programs within the plan
- An emissions tracking and monitoring program including:
  - annual estimation of emissions from the facility, apportioned by major sources, using the same methodology as that used in the Environmental Assessment (EA). Emissions include:
    - nitrogen oxides (NO_x),
    - sulphur dioxide (SO_2),
    - particulate matter (PM) apportioned as total suspended particulate (TSP), PM_{10} and $PM_{2.5}$,
    - greenhouse gases (GHG) apportioned as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O)
  - annual summary of fuel use, apportioned by major source, and confirmation of use of ultra-low sulphur diesel fuel
  - a fugitive dust abatement program to minimize the generation of non-point source particulate (e.g. from roads, waste rock piles, quarries etc)
  - documentation of mitigation measures and pollution prevention strategies (e.g. best management/environmental plans, energy conservation strategies, best available control technology) used to ensure emissions are minimized
  - contingency or response plan to increasing trends or exceedances of emission estimates used in the EA
- An ambient air quality monitoring program including:
  - monitoring of pollutants of concern
  - monitoring of fugitive dust to determine the effects of dust deposition on the surrounding environment
  - monitoring of relevant meteorological parameters
  - documentation of quality assurance and quality control (QA/QC) procedures used to ensure valid data collection
  - contingency or response plans to increasing trends or exceedances of air quality criteria/dispersion modelling predictions
- An annual report summarizing and analyzing the emissions and ambient monitoring information, including:
  - comparison of annual emission estimates to previous years and the estimates used in the EA dispersion modelling

- comparisons of ambient air quality and deposition monitoring results to previous years and the predictions of the EA dispersion modelling
- analysis of emissions and ambient air quality trends and effectiveness of strategies employed to minimize emissions
- responses (either initiated and/or planned) to issues (e.g. equipment failure, data loss, increasing trends or exceedances of air quality criteria/dispersion modelling predictions)

➢ A commitment to participate in future regional and cumulative effects assessment and monitoring programs

3.4.1.2 Request

Environment Canada requests that the Proponents design and implement a comprehensive Air Quality and Emissions Management Plan (AQEMP) to:

- Ensure that project emissions of air pollutants and greenhouse gases from the entire range of sources are tracked;
- Meet any emission reporting that is legally required (i.e. NPRI);
- Demonstrate the application of BAT and BMPs;
- Document the proponent's continuous improvement efforts; and
- Ensure that contaminants of potential concern are monitored over the life of the project.

The AQEMP should be designed in consultation with EC and GN and include an annual report which is publicly available.

3.4.1.3 Response

The proponent will revise the air quality modelling study and assessment in response to a number of requests (see response to request GN-IR #2, for full details). The corresponding reports (Appendices B-2 and B-4 of the DEIS) will be updated accordingly.

In response to this request the modelling period will be extended to include the full year.

A summary of conditions during which air quality guidelines are typically exceeded will be included in the modelling report.

3.5 Issue – Waste Management

3.5.1 Information Request EC-10

3.5.1.1 Rationale

Environment Canada recognizes that timely disposal of camp waste - specifically food waste - is of critical importance to minimize safety risks associated with wildlife attraction. Timely disposal is usually achieved through burning. However, burning of waste products releases numerous contaminants to the air, many of them persistent, bioaccummulative and toxic (*e.g.*,

polycyclic aromatic hydrocarbons - PAH's - heavy metals, chlorinated organics – dioxins and furans).

The type of incineration technology and the management practices can greatly affect the amount of dioxins and furans released to the environment. Incinerators capable of meeting the Canada-wide Standards for Dioxins and Furans (controlled incineration) will release about 9.5 µg TEQ of dioxins and furan per tonnes of waste combusted (Chandler 2006, Lanfranco 2006). Poor incineration equipment (uncontrolled burning) can release much greater amount of dioxins and furans, 3500 µg TEQ per tonne of waste combusted (UNEP, 2005). Webster and Mackay (2007) used an environmental fate model to predict contaminant concentrations in air, soil, water, sediment, aquatic and terrestrial wildlife (including fish, birds and terrestrial herbivores and carnivores) resulting from incineration emissions at a typical remote work camp. The conclusions from the study are quoted below.

> *It is concluded that uncontrolled burning of waste could result in substantial accumulations of dioxins and furans in the local ecosystem, some of which will persist for some 8.5-years with exposure levels approaching those considered to be of toxicological concern. The use of controlled incineration will substantially reduce the expected contamination levels and correspondingly reduce the likely exposure and effects.*

To minimize the release of contaminants the Proponent should include the following as part of the incineration management plan:

Technology:
The proponent should ensure that the incineration device is capable of meeting the emission limits established under the *Canada-wide Standards (CWS) for Dioxins and Furans* and the *CWS for Mercury Emissions* (both the Government of Canada and the Government of the Nunavut are signatories to these Standards and are required to implement them according to their respective jurisdictional responsibility). The minimum requirement for incineration technology should be a dual-chamber controlled-air incinerator.

Waste Management:
The goal should be to minimize the amount of waste to be incinerated and only incinerate appropriate types of waste.

- The amount of waste should be reduced through purchasing policies that focus on reduced packaging and on-site diversion and segregation programs (i.e. the separation of non-food waste items suitable for storage and subsequent transport and disposal or recycling).
- Only food and food contaminated waste should be incinerated.
- Used absorbent materials, oily or greasy rags, and equipment servicing wastes (such as used engine oil, antifreeze, hydraulic oil, lead acid batteries, brake fluid and other lubricants) should be safely stored and transported in sealed containers (odour free to

prevent animal attraction) and safely transported to a facility that is authorized for the treatment and disposal of industrial hazardous wastes.

Operation:
Proper operation and maintenance of incineration equipment is essential to minimizing the release of contaminants

- Appropriate training should be provided to the personnel operating and maintaining the incinerator.
- Maintenance records should be kept and reported in an annual report
- The amount of waste incinerated is recorded and reported in an annual report.

3.5.1.2 Request

Environment Canada requests that Proponent develop an Incineration Management Plan in consultation with EC. The management plan should include annual reports to provide details on the following:

- Recycling/segregation waste program
- Incineration technology selected
- Waste audit -- amount and types of waste incinerated
- Operational and maintenance records
- Operator training
- Emission measurements
- Incineration ash disposal

3.5.1.3 Response

A Waste Management Plan is provided in Appendix 3.2-1.

3.5.2 Information Request EC-11

3.5.2.1 Rationale

Mobile camps will be used during road construction, housing 60 persons and moving every 60 days. Tertiary-treated sewage will be discharged to the tundra from a skid-mounted treatment plant. During construction at the port, a 150-person camp will utilize a similar treatment system, with release onto the tundra. During operations, port camp effluent will be discharged into the marine environment. The water licence application states this is to be overland, while page 4-48 of the Feasibility Study states this will be via submarine pipe, and utilize disinfection. A 20-person camp will be set up at Contwoyto Lake, and there are conflicting descriptions of effluent disposal for this site also (land vs subaqueous disposal to Contwoyto Lake).

Specifications for the treated sewage equate to tertiary treatment, however there may still be toxicity associated with the effluent due to ammonia levels. There are also concerns with

fluctuations in treated wastewater quality, as such systems may be subject to upset or take a while to achieve optimum performance, and nutrient additions to oligotrophic waters. For these reasons, EC discourages the direct discharge of treated wastewater to Contwoyto Lake. Similarly, wastewater discharged to the marine environment must also be non-toxic and comply with the *Fisheries Act* Section 36(3).

Disinfection of wastewater is generally done when there is a public health risk, rather than for reasons of environmental protection. It is not specified what disinfection method will be used, nor why it is necessary. Use of chlorination for disinfection is strongly discouraged.

3.5.2.2 Request

Please clarify:

1. what the receiving environment will be for treated sewage effluent, and how compliance with the *Fisheries Act* will be achieved.
2. Why and how wastewater will be disinfected.

3.5.2.3 Response

The treated sewage effluent from the port camp during the port operation will be transported overland to the ocean via an insulated line and discharge into the ocean via a submarine outfall line. The system will be designed applying the principal of no net loss of productive capacity of fish habitat. The discharge will be non-toxic. Effluent Quality will be as follows BOD < 10mg/L : TSS<10mg/L :Oil & Grease ≤ 5mg/100mL : Free chlorine ≤ 0.1 mg/L: E Coil ≤ 5cfu/100 mL. The solids/sludge will be dried and incinerated. The sewage treatment plants will use membrane bioreactor technology.

At the Contwoyto Lake camp the effluent will be discharged to the tundra this will be a small 20-person camp with an estimated water usage of 70 gallons per day per person. (1,400 gallons per day discharge). Solids will be incinerated. Waste water will be disinfected by UV radiation prior to discharge to the tundra.

3.6 Issue – Wildlife at Risk

3.6.1 Information Request 1

3.6.1.1 Rationale

The proponent has assessed the impacts of the proposed shipping route on birds (murres and eiders), but no assessment was provided in regards to specific impacts to birds that may be using the local marine area around the proposed port site. In order to evaluate the potential impacts to marine birds of the construction and operation of the proposed port, EC requires information on the use of the proposed area by birds. Birds such as sea ducks use marine areas for feeding, brood-rearing, and moulting, and are sensitive to disturbance at these times. Information on bird use of the area will help to determine potential impacts on birds and appropriate mitigation measures to minimize any impacts. The proponent did undertake an aerial waterfowl survey of

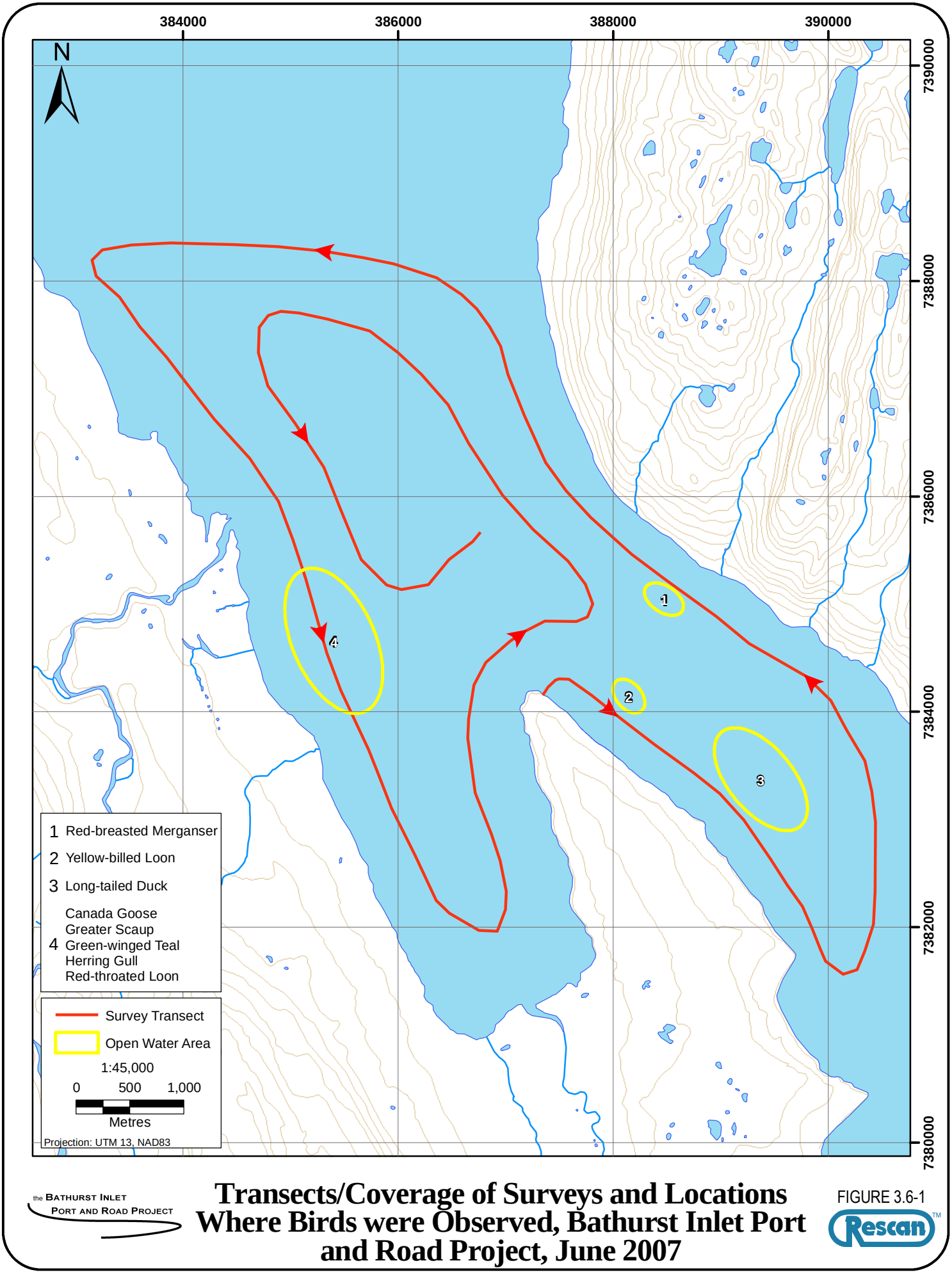
Bathurst Inlet on June 25, 2007, although it is not clear on the exact extent of the area covered during this survey.

3.6.1.2 Request

1. The proponent is asked to provide a map showing transects and/or coverage of the June 2007 surveys, locations where birds were observed, the area of the proposed port, and the shipping route within the southern part of Bathurst Inlet (i.e., in the immediate vicinity of the proposed port).
2. The proponent is asked to indicate whether any further wildlife information/data was collected on birds in the marine area around the proposed port. Information on numbers of birds using the area in late summer would especially be helpful, because this may indicate whether the area is being used by brood-rearing or moulting waterfowl. If information is available, the proponent is asked to provide details on the bird information collected. Useful information would include survey/observation methods, number of birds, species, location, whether birds were alone, in small groups or large flocks, if young birds were present, and if birds were moulting. Even if no formal baseline surveys were conducted, any observations of birds collected during other work in the area may be useful.

3.6.1.3 Response

1. A map showing the survey locations, where birds were observed, and the proposed port have already been created and are all included in the DEIS (Appendix D-10, *Songbird and Shorebird Baseline Study, 2007*, and Appendix E-4, *Polar Bear and Seabird Effects Assessment*).
2. All data collected on birds in the marine area during the 2007 surveys around the proposed Port were reported in Appendix D-10 of the DEIS, and incidental observations of birds at the Port site were reported in Appendix 6.4-1 of the *Wildlife Baseline Studies, 2001-2002* (Appendix D-7 of the DEIS).
3. A map showing the transects/coverage of the June, 2007, surveys and locations where birds were observed is provided herein (Figure 3.6-1).
4. Another bird survey of the area surrounding the proposed port will be conducted in late summer of 2008.



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Transects/Coverage of Surveys and Locations Where Birds were Observed, Bathurst Inlet Port and Road Project, June 2007

FIGURE 3.6-1

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4. FISHERIES AND OCEANS CANADA

4. Fisheries and Oceans Canada

4.1 Introduction

This chapter includes the issues, rationales, and information requests from Fisheries and Oceans Canada, and the Proponent's responses to them. To maintain consistency with other chapters, the DFO's rationales have been placed in front of the information requests they pertain to, in contrast from the layout provided by the DFO. Further, the request has been separated from the original paragraph supplied by DFO and inserted as its own sentence(s) for ease of reference.

4.2 Issue – Alternative Assessments

4.2.1 Rationale for Information Requests 1 – 5

The study of alternatives will demonstrate that the project design has considered all technically and economically feasible options to reduce potential environmental effects from the project. The information is necessary to assess the conclusions and predictions of alternatives means for the project. The assessment of alternatives is also a requirement of the NIRB's 10 minimum EIS requirements.

4.2.2 Information Request 1

4.2.2.1 Issue Identification - Alternatives assessment for water crossings along the all weather road

The proponent's *DEIS* includes a report entitled:" *Bathurst Inlet Port and Road Project Alternatives.*" The alternative assessment was based on the following factors: capital cost, operation and maintenance cost, technical feasibility, freight and re-supply efficiency, operating reliability, community support, socio-economic effects, and environmental effects. The proponent reports that three of the 17 alternatives to the Tibbitt-Contwoyto Winter Road were considered. The three that were considered include: Seasonal (Winter only) Overland Road-Tibbitt to Lockhart, Grays Bay Port and Road (GBPR), and BIPR. The proponent indicates that the technical and financial feasibility component of GBPR is still in the conceptual stage.

4.2.2.2 Request

DFO requests the proponent provide justification for considering an alternative that is not yet considered technically and financially feasible.

4.2.2.3 Response

The proposed BIPR road corridor was located with due consideration of several factors. The route is intended to maximize utility to a number of mineral deposits which could potentially be developed, to be the most easily constructible consistent with requiring the least disruption to the environment, and to be a reasonably direct route connecting the Tibbitt-Contwoyto Winter Road to the proposed seaport. Although the details of the GBPR are currently considered conceptual under these criteria, it has been studied as one of the potential alternatives, therefore, included

since all potential options are required to be presented in the Project Alternatives Effects Assessment.

4.2.3 Information Request 2

4.2.3.1 Issue Identification - Alternatives assessment for water crossings along the all weather road

The proponent's *DEIS* includes a report entitled:" *Bathurst Inlet Port and Road Project Alternatives.*" The alternative assessment was based on the following factors: capital cost, operation and maintenance cost, technical feasibility, freight and re-supply efficiency, operating reliability, community support, socio-economic effects, and environmental effects. The proponent reports that three of the 17 alternatives to the Tibbitt-Contwoyto Winter Road were considered. The three that were considered include: Seasonal (Winter only) Overland Road-Tibbitt to Lockhart, Grays Bay Port and Road (GBPR), and BIPR.

4.2.3.2 Request

DFO requests the proponent provide the assessment criteria for the project alternatives evaluation of the three recommended options especially with respect to impacts to the marine and freshwater environment. There is currently insufficient information to review the alternatives assessment.

4.2.3.3 Response

Geowest Environmental Consultants Ltd. was contracted by the Department of Transportation, Government of Northwest Territories in 1999 to conduct a route analysis to examine the feasibility of developing an all-season road between Yellowknife and Rae-Edzo in the south and Bathurst Inlet in the north. Included in this study was the identification of two northern (north of Contwoyto Lake) and two southern routes from Contwoyto Lake/Lupin Mine to Bathurst Inlet.

In 2007, EBA Engineering Consultants Ltd. submitted "An Overview of Strategic Transportation Options to Supplement the Tibbitt to Contwoyto Winter Road" to the Tibbitt to Contwoyto Winter Road Joint Venture. The EBA report recommended that the Joint Venture support one of the options to bring fuel and supplies south from an arctic deep sea port. GBPR and BIPR were the two northern alternatives considered by the study. The EBA report also noted that the BIPR alternative had been developed to the level of a full feasibility study whereas most of the GBPR project plan was still in the conceptual stage.

The proposed BIPR road corridor was located with due consideration of several factors. The route was intended to maximize utility to a number of mineral deposits that could potentially be developed, to be the most easily constructible consistent with requiring the least disruption to the environment, and to be a reasonably direct route connecting the Tibbitt-Contwoyto Winter Road to the proposed seaport. The environmental studies conducted to date show that no environmental concerns of a nature to preclude proposed development have been identified. The BIPR option crosses two relatively large rivers, the Mara and the Amagok. Given the constraints imposed by virtue of the road location, which itself is constrained by terrain, the only choice was to choose a port site on the west side of Bathurst Inlet. The selected site met the necessary

criteria. The terrain along the GBPR route, north of Contwoyto Lake, is considered much more challenging resulting in the technical feasibility of this option being judged as uncertain. Viewing a 1:250,000 scale map of the GBPR option indicates that three major river crossings will need to be assessed. These include the Burnside, Hood, and James rivers. Due to the size of these rivers, the crossing structures will likely be larger than those used for the two major crossings on the BIPR option (Mara River and Amagok Creek). Therefore, the possibility exists that there will be more HADDs on the GBPR route than the BIPR route due to the need for more pilings to construct the GBPR large crossings.

The marine mammal VECs identified in relation to the port at Grays Bay included ringed seal and beluga whale. Potential impacts to ringed seals from blasting or collisions with vessels could cause injury or death and were assessed to affect only a small number of individuals. Potential impacts to belugas were assessed as having low probability and magnitude since the local study area is not an important area for this marine mammal.

The Bathurst Inlet option port included similar marine mammal VECs (beluga and ringed seals). Project activities were assessed for beluga and ringed seals at the port and effects were assessed as having a low probability of occurrence and a negligible or low magnitude effect.

The density of marine mammals is higher in Grays Bay area than near the BIPR port; therefore there is the potential for higher risks for the Grays Bay option.

4.2.4 Information Request 3

4.2.4.1 Issue Identification - Alternatives assessment for water crossings along the all weather road

Water crossings of the Mara River and Amagok Creek along the all weather road will result in a harmful alteration, disruption or destruction (HADD) of fish habitat.

4.2.4.2 Request

DFO requests the proponent provide the following information:

a) an assessment of alternate water crossing designs to avoid the HADD of fish habitat at the Mara River and Amagok Creek bridges.

b) a description of the environmental impacts and the proposed mitigation measures for the preferred alternatives.

4.2.4.3 Response

The alternatives to a bridge for stream crossings are fords and arch culverts. Both Amagok Creek and Mara River have bankfull depths that are considered too deep for fords. The maximum span for arch culverts is 6 m and the bankfull widths of Amagok Creek and Mara River are 47 and 126 m respectively. These spans would require multiple spans and unacceptable disturbance of streambeds in these fish-bearing streams. Bridges are clearly more habitat-friendly than fords or arch culverts. Because of fabrication and transportation standards a maximum 40 m bridge span is selected for this project. Options considered were shorter spans

or longer spans. The shorter spans would require more piling and increase the footprint in the stream and add HADDs in the Mara river. The longer 60 m span would have a significant cost increase of approximately 100%. Increased costs include larger piling, larger beams, and increased transportation costs. In both the 40 m span and 60 m span options a centre pier is required, and in both cases the abutment would encroach the shoreline. The 40 m span has been chosen as this was the most economic and caused the least disturbance to the streambed.

We also considered the following types of bridges:

Suspension Bridges: These would require at least two towers erected above piers in the middle of the span plus large anchors or counterweights at both ends. In-stream construction would be greater than that required for the simple beam bridges proposed. Specialized design input would be required and such a structure would not be economically feasible for this type of resource haul road.

Cable-stayed Bridges: This type of bridge would require a mid-span concrete pier and a tower erected above the pier. Light anchors or footings would be required at both ends. There would be HADD involved and design efforts and costs would be much greater than the simple beam design proposed.

Arch Bridges: The arch bridge may not require mid-span piers but the abutments must be founded in strong, massive, competent bedrock. Preliminary analysis of the abutment conditions does not support this requirement.

Truss Bridges: The Bailey bridge is a popular example of this type of bridge and is a viable alternative. However, the skeletal steel superstructure is viewed as a distraction to drivers and limits the width of loads. If the steel trusses are elected below the elevation of the bridge deck to alleviate these disadvantages then clearance below the bridge is sacrificed and could be detrimental during high flows.

Amagok Creek can be crossed by a single span but the bridge abutment slopes and riprap armour will encroach into its bankfull width. Mara River crossing will require three spans, which means that two intermediate piers will be fully within its bankfull width and the abutment piers will encroach into its bankfull width. Construction within the bankfull width will cause some local disturbance of the streambed. Mitigation measures will include construction during periods of low flows, use of silt fences to prevent siltation of the streams, armouring the abutments and streambeds to prevent erosion, and compensation for any loss in fish habitat.

4.2.5 Information Request 4

4.2.5.1 Issue Identification - Alternatives assessment for wharf design at the port site

Construction of the wharf and dock at the port site will result in a harmful alteration, disruption or destruction (HADD) of fish habitat.

4.2.5.2 Request

DFO requests the proponent provide the following information:

a) an assessment of alternate wharf designs (including alternative locations) to avoid/minimize the HADD of fish habitat at the Bathurst Inlet port site;

b) a description of the environmental impacts and the proposed mitigation measures for the preferred alternatives (including recommendation for preferred timing of sheet pile installation).

4.2.5.3 Response

Alternate designs were considered as well as alternate locations. Alternative locations to the south and west were considered.

The location to the west would have disturbed a freshwater wetland, required more disturbance area, and increased the road length along the shoreline. These impacts would increase area of disturbance, as well as the number of HADDs proposed for the Project. The alternate location to the south required that the wharf location be farther from the shoreline than the current proposed design. This would increase the area of marine habitat that would be disturbed or destroyed. In addition, because this location was in a bay, ships would not be able to turn when approaching the wharf. In this case a pilot tug would be required, incurring additional operating costs and increasing the risk that large ships may become grounded, damaging sensitive shoreline habitat. In addition, the south location would require the access road to either have a large turnaround area at the end of the rock spit or circle at the end and exit in the same location proposed. Thus, the area of affected habitat would be larger for this alternative than for the current proposed location.

At the current proposed location, three wharf foundation types were considered; namely, pre-built concrete cells floated from the south and placed on the seabed, piers drilled into the competent foundation, and steel sheet pile cells (SSPCs). The first two foundation types are not suitable for this location for the following reasons:

- Pre-Built Concrete Cells: The placement of the cells on top of the soft clay would produce unacceptable large settlement due to consolidation of the clay. Furthermore, the adhesion between the cell base and the clay would not be sufficient to resist the lateral loads produced by ice floe forces.

Reinforced Concrete Drilled Piers: Large diameter piers drilled about 8 m into the bedrock would be required to resist the ice forces. The drilling of these piers and the magnitude of the reinforced concrete would make this option very costly. The costly design is governed by the fact that the 20 m clay does not provide any resistance to the lateral ice forces.

The use of steel sheet pile cells for the wharf is standard in the Arctic because of the ease of installation, the large diameter that can resist large lateral forces, and the deformability of the cell walls that can tolerate impacts.

SSPCs have been used in the Canadian Arctic for at least 30 years and they have been successful in resisting the lateral forces from large ice floes. The significant advantage of using SSPCs in

the Arctic is that the installation of the sheet pile can be done from ice. Some examples of SSPCs that were designed to resist ice forces are:

- Asbestos Hill Wharf, Deception Bay, Northern Quebec;
- Polaris Mine, Little Cornwallis Island, NT;
- Nanisivik Mine, Strathcona Sound, NT; and
- Golden Eagle Canada Ltd., Refinery Wharf, St. Lawrence River, Quebec.

In the above examples, the SSPCs were constructed with diameters between 20 m and 25 m and a length of up to 30 m.

While there are no specific timing windows for construction in Nunavut marine waters, two times during the year could be considered for blasting and pile driving at the wharf site. These timings are based on the life histories of the fish species present, as well as on practical considerations surrounding construction. The first window occurs in late summer between August and September. During this time of year, it is expected that both fourhorn sculpin and Bering wolffish larvae will have hatched from the spawning grounds and will be motile. However, Arctic char may be migrating through Bathurst Inlet at that time and may be affected by blasting or pile-driving activities. However, based on the *Marine Environment Baseline Studies 2001-2002* (Appendix E-7 of the DEIS), only one Arctic char was captured out of 177 fish during the survey conducted in August, suggesting low abundance at that time of the year. The advantage of this timing is that the water will not be frozen; therefore, silt curtains could be used to curtail the spread of fine sediments to surrounding areas and fish could be salvaged from the construction areas and moved elsewhere. Another option for a construction timing window is the early winter, between November and January. During these months, none of the VEC species will be spawning, incubating, or migrating through the Project area. However, if Bathurst Inlet is frozen over at this time, it will be impossible to use silt curtains to contain sediment and to salvage fish from the construction area.

The environmental impacts of the proposed wharf and jetty are assessed in Section 4.2 of Appendix E-3 of the DEIS (*Marine Fish and Fish Habitat Effects Assessment*). Mitigation measures that will be implemented during construction are further described in Section 5.2 of the same report, and compensation for habitat loss is proposed in Section 5.3.

4.2.6 Information Request 5

4.2.6.1 Issue Identification - Alternatives assessment for fish habitat compensation structures

4.2.6.2 Request

DFO requests the proponent indicate whether an alternatives assessment for the physical location of the freshwater and marine compensation structures was conducted or is planned, for the compensation structures proposed for Bathurst Inlet and Contwoyto Lake?

4.2.6.3 Response

As the compensation plan proposed in the DEIS is conceptual, primary compensation structures have not been selected and therefore no alternatives have been assessed. All structures listed in the DEIS are options that may be used for compensation. Additional data collected from field work scheduled for the summer of 2008 will contribute to selecting the best technique for habitat compensation as a result of the Project.

An alternatives assessment for the physical location is planned during the summer field work (2008) for the compensation structures proposed. The planned baseline survey will identify fish and fish habitat in possible areas of compensation, including the Mara River, Amagok Creek, the shoreline of Contwoyto Lake, and Bathurst Inlet.

4.3 Issue – Marine Water Quality and Sediment Quality

4.3.1 Rationale for Information Request 6

An adequate baseline facilitates a clearer understanding of the impacts associated with the development and reduces uncertainty in predictions. Furthermore, an adequate baseline is necessary to verify predictions made in the environmental assessment and to identify unforeseen problems, in combination with an appropriately designed monitoring program.

4.3.2 Information Request 6

4.3.2.1 Issue Identification - Sediment quality monitoring

In Section 6 of Appendix E-1 the proponent indicates that sediment quality monitoring will be conducted once every two years.

4.3.2.2 Request

DFO requests that the proponent provide justification for the selection of this sampling regime. DFO also requests the proponent provide the rationale for the selection of the monitoring sampling locations. In addition, DFO requests a rationale for why baseline sampling was not conducted at all of the proposed monitoring sites.

4.3.2.3 Response

The monitoring regime for sediment quality is proposed for once every two years, since sediment quality is not expected to be significantly affected. This is an adaptable sampling regime and can be altered if the need arises (*i.e.*, accidental spills).

The sampling design (location of sites) was chosen to characterize water and sediment quality near the port on the eastern side of the peninsula and at sites of increasing distance from the port (including a reference site directly across the bay). Sampling design includes near-field and far-field sites in relation to the wharf location, as well as shallow and deep sites. The differences between baseline and monitoring site locations are a result of the feasibility study conducted in 2002 and new information regarding the Project design, which affected the wharf location and the position of a sewage outfall.

4.4 Issue – Marine Aquatic Resources, Marine Fish and Habitat, and Marine Mammals

4.4.1 Rationale for Information Requests 7 – 9

An adequate baseline facilitates a clearer understanding of the impacts associated with the development and reduces uncertainty in predictions. Furthermore, an adequate baseline is necessary to verify predictions made in the environmental assessment and to identify unforeseen problems, in combination with an appropriately designed monitoring program.

4.4.2 Information Request 7

4.4.2.1 Issue Identification - Marine aquatic resources baseline data collection

The proponent states that marine aquatic resources baseline data were collected during the ice-free seasons of 2001, 2002 and 2007. The 2007 data were not presented in the DEIS, however the results were discussed. The proponent indicated that 5 sampling stations were established in 2001; in 2007 six stations were sampled in the same study areas (but not at the exact same location) as those sampled in 2001. A map was provided showing the location of all the sampling sites (pg 2-2, Appendix E-2 of the DEIS).

4.4.2.2 Request

DFO requests the proponent provide the rationale for the selection of the 2001 and the 2007 sampling site locations. In addition, DFO requests the proponent provide the rationale for why the same sites were not sampled both in 2001 and in 2007.

4.4.2.3 Response

In 2001, a detailed project description was not yet available; therefore, only preliminary baseline work could be completed. After the 2002 feasibility study and as more project details became available, this information was taken into consideration when choosing the 2007 site locations. More aquatic resource data will be collected from the 2007 sites in the summer of 2008.

4.4.3 Information Request 8

4.4.3.1 Issue Identification - Marine Aquatic Resources monitoring program

Section 6 of Appendix E-2 includes a map of marine monitoring sampling locations.

4.4.3.2 Request

DFO requests the proponent provide the rationale for the selection of the monitoring sampling locations. In addition, DFO requests a rationale for why baseline sampling was not conducted at all of the monitoring sites.

4.4.3.3 Response

The sampling design (location of sites) for monitoring was chosen to characterize the marine habitat in relation to Project activities (*i.e.*, near and far from wharf and sewage outfall, deep and shallow sites near wharf, and reference site).

In 2001, a detailed project description was not available; therefore, only preliminary baseline work could be completed. After the 2002 feasibility study and as more project details became available, this information was taken into consideration when choosing the 2007 site locations. The 2008 aquatic resource sampling program will continue sampling from the 2007 sites and sample the proposed monitoring sites.

4.4.4 Information Request 9

4.4.4.1 Issue Identification - Marine Fish and Habitat baseline studies

4.4.4.2 Request

Section 6 in Appendix E-3 refers to the need for additional monitoring/baseline data collection prior to construction of the port facilities. DFO requests clarification regarding:

a) baseline and compensation monitoring (timing and methods) at the port site and proposed compensation sites;
b) methods that will be used to determine relative habitat units for the HADD and proposed compensation in Bathurst Inlet;
c) proposed methods/further studies to increase confidence of assessment of impacts on VECs at port site.

4.4.4.3 Response

Additional data on fish and fish habitat at the port site and future locations for compensation structures will be conducted in August, 2008. A habitat assessment was conducted in August, 2007, as well, and will be presented in the FEIS. Baseline conditions at the port site will be from these surveys and will document water depth, substrate types, and fish presence underneath the footprint of the wharf and jetty. A detailed map of fish habitat of the wharf and jetty will be created so that alterations caused by construction can be quantified. Following construction, another detailed habitat map of the existing conditions will be created so that the exact area of the habitat alteration can be calculated.

As a general approach, fish habitat permanently lost during the construction of the Bathurst Port will be replaced with new habitat on a ratio of two-to-one for new to lost habitat based on an estimation of the number of habitat units lost. Habitat units were originally developed by the US Fish and Wildlife Service in response to initiatives by the US government for sustainable management of water resources, and are indices of both habitat quantity and quality. The first step in calculating the number of habitat units lost is to apply a habitat suitability index (HSI) to each section of lost habitat. The HSI is then multiplied by the area of the habitat to be compensated for to achieve the number of habitat units. Thus, fish habitat lost will be replaced with new habitat of equal or greater ecological importance for fish. HSI may only be available

for a few species inhabiting the inlet. Therefore, it is possible that an HSI model may have to be created for a specific species.

Baseline studies for the compensation works will be completed in August 2008. These studies will include the above-mentioned habitat surveys, as well as fish sampling to confirm the species present at the port site. In particular, continued sampling at the port site will assist in confirming the absence of Bering wolffish in construction zones. The same techniques used for the 2001 fish surveys will be employed. These included seines, gillnets, longlines, and minnow traps.

4.4.5 Rationale for Information Requests 10 – 18

The negative impacts from the construction and operation of the wharf jetty and compensation structures as well as from marine shipping have not been fully assessed and reported. The information requested is necessary to complete the technical assessment of impacts to marine aquatic resources, to marine fish and habitat, and to marine mammals.

4.4.6 Information Request 10

4.4.6.1 Issue Identification - Marine Aquatic Resources-VECs

The VEC-Marine Aquatic Resources includes phytoplankton, zooplankton, and benthic invertebrates. The proponent has identified that these types of marine organisms were selected and grouped into a VEC as they are essential components of the marine food web. Changes to these communities could have effects on higher trophic level organisms. It was stated that these lower trophic level organisms could be used to monitor for adverse effects to the marine environment. The proponent, however, reports that assemblages of primary and secondary producers are highly variable from year to year and therefore may not be appropriate to monitor for potential effects on marine fish and marine mammals.

4.4.6.2 Request

DFO requests the proponent identify and provide the thresholds for measuring impacts.

4.4.6.3 Response

Community variability emphasis should be placed on primary producers. Phytoplankton communities are highly variable because of their relatively quick response to seasonal changes. These changes result in a high variation in species composition, density, and biomass relative to the benthic invertebrate community.

As outlined in the metal mining guidance document for aquatic environment effects monitoring (Environment Canada, 2001), a commonly accepted criterion is an effect size of +/-2 standard deviations from the mean, based on the variability observed in the reference community. Once the 2008 data are available, a power analysis will be conducted to assess if the proposed monitoring program has the power required to detect an effect.

4.4.7 Information Request 11

4.4.7.1 Issue Identification - Marine Aquatic Resources

The proponent reports that potential negative impacts to marine aquatic resources can occur from the release of deleterious substances, sediment, and from marine shipping.

4.4.7.2 Request

DFO requests the proponent identify the magnitude of these impacts and a description of how they are measured. DFO also requests clarification as to whether there are other suitable indicators to measure the negative impacts to fish and marine mammals.

4.4.7.3 Response

In the *Marine Aquatic Resources Effects Assessment* (Appendix E-2 of the DEIS) the magnitude of effects from Project activities are assessed in Table 4.2-1. Within this table the magnitude of effects from project activities range from negligible to moderate. The effects are considered in terms of both spatial and temporal gradients. All activities that had a magnitude of low or moderate also had an occurrence frequency of a 'one-time' event. Since the resilience to these activities is considered high, the resulting significance of all Project activities was judged as low or negligible. The specifics of the Effects Assessment methodology are outlined in Appendix A-5 of the DEIS (Table 6.4-1).

Other indicators of potential negative impacts to fish include fish habitat variables such as changes in substrate type and water and sediment quality as outlined in the *Marine Fish and Fish Habitat Effects Assessment* (Appendix E-3 of the DEIS). The *Marine Mammal Effects Assessment* (Appendix E-5 of the DEIS) indicates that marine mammal movements and activities relative to shipping vessels will be closely monitored to ensure ships maintain the required 500 m distance. The magnitude of the effects on marine mammals are given in Table 4.1-1 of Appendix E-5. The potential impacts were:

- disturbance by noise from pile driving at the port site during construction;
- disturbance by small fuel spills during transfers at the port site during construction and operations;
- aircraft disturbance at the port site during construction and operations;
- injury or mortality caused by collisions with vessels on shipping route;
- disturbance, displacement, on shipping route; and
- disturbance, injury, or mortality from a major oil spill on the shipping route.

The magnitude of the impacts was assessed as negligible or low for each impact after taking mitigation measures into account. The terms 'negligible' and 'low' are defined in Table 6.4-1 of Appendix A-5 of the DEIS. The assessment was made using knowledge of the species, knowledge of the literature on impacts on marine mammals, and professional judgment. Visual observations from the project vessels will be made both to mitigate effects and to assess the degree of disturbance to marine mammals, if any. In our opinion, the use of threshold values or

the measurement of other indicators that are used to assess disturbance of marine mammals (*e.g.*, breathing rates, dive times, detailed distribution as determined by aerial surveys) are not warranted, given the low magnitudes, short durations, reversibility, and low probability of occurrence of the predicted effects.

4.4.8 Information Request 12

4.4.8.1 Issue Identification - Marine Fish and Habitat-VECs

The proponent identified fourhorn sculpin, Arctic char, Bering wolfish, and fish habitat as VECs. Sources of potential impacts on these species were discussed and presented in Table 4.2-4 and in Table 4.2-5 the potential effects and the significance determination are presented.

4.4.8.2 Request

DFO requests further discussion on the thresholds used for assessing impacts. DFO also requests the proponent provide clarification as to whether the impacts are quantifiable or if the analysis is qualitative.

4.4.8.3 Response

The predicted impacts on fish and fish habitat will be assessed both qualitatively and quantitatively. Impacts on fish habitat will be assessed based on water quality, physical changes in habitat type, depth, and substrate in the construction zone as well as surface area affected. Fish habitat changes can be measured in terms of area affected, area compensated, and the extent of the physical habitat alteration. The quality of habitat that is altered will be assessed using habitat suitability indices for the species inhabiting the area. Habitat created or altered through the construction of the Port site is predicted to be similar to habitat elsewhere in Bathurst Inlet in terms of substrate type, water quality, and depth. Threshold values for determining the similarity between altered habitat and existing habitat can be measured, for example, as % substrate type. A certain percent increase of silt could be used as a threshold. The similarity of the altered habitat to the baseline habitat structure will be described and assessed quantitatively and based on professional judgment.

Impacts on fish communities will be assessed using fish presence/absence and catch-per-unit-effort. Because the port site is on an exposed shoreline, fish are expected to move away from the area of impact before they are physically affected. Fish within the construction zone will be salvaged before beginning construction and moved to another location.

Compensation projects will be assessed based on the similarity of the habitat created to the existing habitat in Bathurst Inlet. Long-term monitoring of the compensation projects will ensure that the compensation works continue to provide the type and quality of habitat that was intended.

4.4.9 Information Request 13

4.4.9.1 Issue Identification - Marine Fish and Habitat-Dredging

Section 4.2 p.4-4 of the feasibility study (Appendix A-3) states "The water depth directly adjacent to the wharf is sufficient for the vessels proposed to use the facilities and under these conditions it will not be necessary to undertake any marine dredging during the 20 year project life." However, the proponent has used a 30 year project life as a basis for capital and operating cost estimates.

4.4.9.2 Request

DFO request the proponent please confirm whether dredging is likely to be required during the 30 year project life.

4.4.9.3 Response

Dredging is not anticipated for the wharf however, for the installation of the wet well at the port site dredging may be required. This will be fully described in the final EIS.

4.4.10 Information Request 14

4.4.10.1 Issue Identification - Marine Fish and Habitat - Water Intake and outlet footprint and design

4.4.10.2 Request

DFO requests detailed design drawings for any water intake and/or sewage outlet structures that will be constructed in Bathurst Inlet and/or the unnamed creek (referred to as a potential water source during construction of the port facilities).

DFO requests detailed design drawings for any water intake and/or sewage outlet structures that will be constructed in Bathurst Inlet and/or the unnamed creek (referred to as a potential water source during construction of the port facilities). DFO also requests information regarding whether the unnamed creek is fish bearing and if so, potential impacts of proposed water use on fish and fish habitat.

4.4.10.3 Response

According to Appendix C-6 of the DEIS (*Freshwater Environment Baseline Studies, 2001*), and Table 4.6-1 in Appendix C-4, No Name Creek, at km 2.2 of the road, is fish-bearing navigable stream. Only one fish (Arctic cisco) was captured in the stream. This fish was likely a marine resident due to the high number of Arctic ciscos captured during the marine surveys. No inputs on fish and fish habitat are expected from water use due to the low volume needed per day. Approximately 155 m^3/day of water will be used during construction. According to the INAC IR 7.1 based on flow estimates, the lowest monthly flow in Un-named Creek is expected in October. During this month, the maximum estimated water demand of 155 m^3/day (0.0018 m^3/s) represents 1.1% of the available flow. This would be the maximum withdrawal during the open water season, and would not be expected to cause any impact to fish and fish habitat.

Design drawings of any water intake and/or sewage outlet structures will be provided in the FEIS. Design of the water intake will ensure that intake velocities are low and screens sized to prevent fish from being sucked into the pump.

4.4.11 Information Request 15

4.4.11.1 Issue Identification - Marine Fish and Habitat - Mitigation methods

Section 5.2.2 of Appendix E-3 refers to fish salvage as a mitigation measure.

4.4.11.2 Request

DFO requests details regarding proposed methods for fish salvage during wharf and jetty construction (*e.g.*, salvage methods and timing to reduce fish mortality).

4.4.11.3 Response

Fish will be removed from the area that will be altered/affected during the construction of the Project infrastructure, specifically the wharf and jetty. Fish salvage will occur prior to wharf and jetty construction and include the isolation of the work area, the removal of fish from enclosed areas, and the immediate release of those fish. The fish salvage protocol described below may be modified as needed to reduce risk to fish.

Background

Baseline fish community results determined that the majority of fish in the area are near-shore, shallow-water species. The following fish species were captured in the study area during the 2001 fisheries survey: fourhorn sculpin (*Triglopsis quadricornis*), Arctic cisco (*Coregonus autumnalis*), starry flounder (*Platichthys stellatus*), saffron cod (*Eleginus gracilis*), Arctic flounder (*Liopsetta glacialis*), Pacific herring (*Clupea pallasi*), broad whitefish (*Coregonus nasus*), rainbow smelt (*Osmerus mordax dentex*), Arctic char (*Salvelinus alpinus*), ogac (*Gadus ogac*), and lake trout (*Salvelinus namaycush*).

Fish Salvage Program

Fish salvage will be undertaken within the boundaries of the enclosed area to prevent unnecessary mortality of resident fish from construction-related activities. The fish-out will be based on Fisheries and Oceans Canada fish-out protocol developed for lakes to be lost due to mining development; this protocol will be modified to fit the environment and objectives of the Project.

The timing window for protecting fish and fish habitat during water construction activities is during spawning and incubation periods when spawning fish, eggs, and fry are vulnerable to disturbance or sediment. To date, Fisheries and Oceans Canada has not developed timing windows for marine fish species inhabiting Nunavut waters (Amy Liu, DFO Iqaluit, *personal communication*). Therefore, based on the fish populations in the study area, their life histories, and timing of their most sensitive life stages, fish salvage will be restricted to summer months, specifically July and August.

Isolation of the Work Area

Silt curtains will be installed around the construction site to prevent fish and other aquatic wildlife moving into the work area. Placement of the curtains will begin on the northwest side of the construction site, and they will be anchored to shore. A boat will be used for the placement/release of the silt curtain around the construction site. At set intervals around the silt curtain, additional support will be added to improve security and minimize failure during salvage operations.

Once the silt curtain is in place, small sections of water within this enclosed area may be isolated for easier and more efficient removal of fish. Block nets will be used for these sections.

The size, length, type, and depth of both silt curtains and block nets will vary based on site conditions and water depth.

The main silt curtain will remain in place after fish salvage is complete. During construction related activities, the silt curtain will aid in the containment of sediment and minimize sediment migration into the nearby marine environment.

Fish Capture

A depletion estimate will be used to evaluate the effectiveness of the fish salvage operations. Initially, a catch-per-unit-effort (CPUE) removal phase will be used to remove fish from the enclosed area. This phase will consist of standardized fishing and will provide biologists with an abundance estimate of fish populations within the enclosed area. Once the CPUE phase is complete, all fishing will cease for a 48-hour period. Following this, a final (or total) removal phase will begin. In this phase, all remaining fish in the enclosed area will be captured.

Capture methods to remove fish from the enclosed area include: beach seine, minnow traps, and sinking and floating gillnets. Seines will be the primary gear used during the CPUE phase as they were the most efficient gear for sampling fish during the 2001 fish community survey. During the final removal phase of the fish-out operations, minnow traps and gillnets will also be deployed. Timing of installation and retrieval of gear will be recorded for each gear type and location. Average depths at which gear will be used will be estimated.

Seining

A beach seine and/or a purse seine will be the primary gear used to capture fish of all sizes that live in shallow water near the surf line. One end of the seine is held on the shoreline, and the other end is pulled by a boat in a horseshoe shape so that it envelopes a portion of the shoreline. The two ends are then quickly drawn onto the beach, keeping the lead line on the sea bottom and forcing fish into the bunt of the seine. Fish will be picked out of the bunt with dipnets.

Minnow Traps

Minnow traps are designed to catch juvenile and small forage fish that live in shallow water. Traps will be baited and set in a line along the shore in shallow water. A plastic buoy will be attached to each trap to mark its location. Traps will be deployed along the shoreline of the enclosed area for the duration of the fish salvage operation and checked daily.

Gillnets

Both sinking and floating gillnets of various mesh size will be used to catch fish of a wide range of body sizes that move along the sea bottom and near the water surface, respectively. Nets will be set throughout the enclosed area for a maximum of one hour to minimize fish mortalities. Gillnets will be used if seining proves to be unsuccessful.

Angling

Angling will be used to catch larger fish that evade the above-mentioned gear during the removal phase of the fish-out operation. Barbless hooks will be used to minimize injury and mortality to the fish.

Fish Removal/Release

Once collection gear is pulled and fish are removed, they will be immediately transferred into water-filled plastic fish buckets to keep them alive until they can be processed and released live into open water on the opposite side of the main silt curtain (*i.e.,* outside construction zone). Fish will be counted and identified to species.

Once identified to species, a subset of fish will be measured for fork length and weight, and external health examined. Once measured and examined, fish will be released live into the open water on the opposite side of the silt curtain. Fish that appear to be stressed will be placed into a recovery box in shallow water and allowed to recover before being released.

4.4.12 Information Request 16

4.4.12.1 Issue Identification - Marine Mammals

The magnitude of impacts to marine mammals were identified and presented in Table 4.1-1 of Appendix E-5.

4.4.12.2 Request

DFO requests the proponent provide clarification on how magnitude was determined and the use of any threshold values.

4.4.12.3 Response

The magnitude of the effects on marine mammals are given in Table 4.1-1 of Appendix E-5 of the DEIS. The potential impacts were:

- disturbance by noise from pile driving at the port site during construction;
- disturbance by small fuel spills during transfers at the port site during construction and operations;
- aircraft disturbance at the port site during construction and operations;
- injury or mortality caused by collisions with vessels on shipping route;
- disturbance, displacement, on shipping route; and

- disturbance, injury, or mortality from a major oil spill on the shipping route.

The magnitude of the impacts was assessed as negligible or low for each impact after taking mitigation measures into account. The terms 'negligible' and 'low' are defined in Table 6.4-1 of Appendix A-5 of the DEIS. The assessment was made using knowledge of the species, review of the literature on impacts on marine mammals, and professional judgment. Visual observations from the project vessels will be made both to mitigate effects and to assess the degree of disturbance to marine mammals, if any. In our opinion, the use of threshold values or the measurement of other indicators that are used to assess disturbance of marine mammals (*e.g.*, breathing rates, dive times, detailed distribution as determined by aerial surveys) are not warranted, given the low magnitudes, short durations, reversibility, and low probability of occurrence of the predicted potential effects.

4.4.13 Information Request 17

4.4.13.1 Issue Identification - Marine Processes

Appendix E-10 discusses marine physical processes. The proposed wharf, jetty boulder field, rock spurs, and fish shelters may directly influence coastal processes in the area and potentially impact marine fish and marine habitat. In addition, environmental effects related to shipping and mobilization activities along the dock, such as propeller wash and ship wake, may also have impacts on the surrounding marine environment.

4.4.13.2 Request

DFO recognizes that the proponent has planned a study for 2008 to assess the coastal process occurring around the site. However, in order for DFO to complete our technical review the assessment of the coastal processes occurring within the immediate area of the dock, jetty and the proposed compensation structures will be required.

4.4.13.3 Response

Pertinent coastal processes are erosion, accretion, and sediment transport through the planned dock area. The dock structures will alter the natural shoreline and cause changes in certain aspects of the hydrodynamic regime, specifically local currents and waves. The relative importance of these effects is dependent upon the shape and nature of the seabed and the beach and the physical characteristics of the port area.

Port area description

The port is to consist of a rock-filled wharf and a barge loading dock. Rock-filled steel sheet pile cells were selected because foundation conditions (20 m clay) preclude other construction methods. Steel sheet pile cell wharves have been successfully employed at Nanisivik in Strathcona Sound (where they will likely be re-used for the planned naval base) and at the Polaris Mine on Little Cornwallis Island.

Sheet pile will be driven through the 20 m thickness of soft sediments to the underlying sandstone. The wharf face is to be approximately 150 m from shore at a water depth of approximately 13.5 m. The length of the wharf will be approximately 120 m.

A barge loading ramp will be provided approximately 250 m south of the wharf. The sloping ramp will extend from the beach to a depth of approximately 3 m.

Seabed

The seabed slope is approximately 8% from the shoreline to 10 m deep. The slope then increases to approximately 30% between the 10 and 40 m isobaths.

Sediment Transport

Particulate material can be transported from a source area down current. Finer particles settle more slowly (*e.g.*, Stokes Law) so they are carried farther before settling to the seabed. Thus sorting occurs at river mouths where the coarsest material accumulates closest to the source and the finest material is transported farther offshore. Currents can prevent settling of fine particles and re-suspension may occur after the initial settling of particles due to the larger waves and currents associated with strong winds.

There are two primary agencies for sediment transport in the sea:

- direct transport by currents; and
- longshore transport due to scour and the residual currents (or Stokes drift) of breaking or finite amplitude wind waves.

The currents in the port area are most probably primarily wind-driven with a smaller estuarine component. Northwest winds occur most frequently and the strongest winds originate from this direction. Surface water should move southeast in the presence of northwestern winds (there may be a general southeast transport in deep water with return northwest flows over the shallows). The largest waves will originate from the northwest and longshore transport will be to the south. The overall expectation is for southwest net sediment transport through the proposed wharf area.

Currents will be measured in the area during the summer 2008 field program.

A spit protruding to the south is present on the western shore of the peninsula, further confirming the concept of net southerly sediment transport.

At present, fine river-derived sediment is transported along the slope shoreward of the 10 m isobath. Suspended sediment concentration will be highest in the near-bottom (log) boundary layer. It is probable that suspended sediment transported to the steep slope at depths greater than about 10 m is lost to the near-shore region (the 30% slope is steep enough to promote gravity driven downslope transport through slumping and turbidity currents).

The proposed wharf will be an effective barrier to longshore sediment transport. Suspended sediment-bearing flows will encounter the up-current/upwind face. The flows will be diverted offshore and low velocity areas (stagnation points) may experience enhanced sedimentation. After diversion offshore, flow speed will decrease and sedimentation will occur in deeper water over the steep (30%) slope. As mentioned earlier, it is probable that sediment deposited on the steep slope will be transported downslope and lost to the shallow environment. A region down

current of the wharf could be deprived of its natural source of sediment supply while still exposed to wave scour, causing a coarsening of the bottom substrate.

In 2008, an effort will be made to quantify the interruption to natural longshore transport caused by the new wharf. Sediment samples in the near-shore (8%) slope region will be collected and analyzed for particle size distribution.

The effects of the proposed compensation structures will be negligible compared to the wharf itself.

Estuarine and wind-driven circulation

CTD (conductivity-temperature-depth) casts at the port site show the surface layer is a few metres thick with a salinity of about 7 psu. The pycnocline/halocline extends to about 20 m deep, suggesting that the seaward estuarine flow would be present at depths less than 20 m. In 2008, current data will be collected to better describe the estuarine and wind-driven flows in the area.

Ice effects

Ice approximately 2 m thick and landfast will tend to include sediment as it grows and erode fine sediment from the shoreline to a depth of 2 m below low tide and up to high tide. The intertidal is therefore expected to consist of rather coarser sediments than the subtidal, at least before river freshet carries more sediment to the area. Sediment particle size distribution is likely to vary through the open water season as sediment from streams in close proximity 'nourish' the local beaches.

Storm surges

During prolonged episodes of strong northwest winds it is probable that a sea surface slope is established upward to the south. Rises of sea surface elevation above astronomical high tide will therefore be larger in the southern reaches of Bathurst Inlet. The storm surges are accompanied by larger than average waves.

Some evidence of the effects of wave action during storm surges is available from the photographic record. During a surge, water levels are higher on the beach and waves break farther up the beach. The plunge zone of the waves will experience relatively greater erosion and have coarser sediment. Finer sediment will settle just offshore of the breakers during each event. Thus the observed banding structure is suggestive of the storm surges of the past. The features are likely preserved because they are above normal astronomical high tide.

The photos show that storm surges reached about 1 m above high tide, corresponding to the vegetation line. The vegetation may be salt intolerant, another indication of the highest sea level of the past few seasons.

The 2008 field work will measure time series of water levels at the port site. Correlation of these water levels with the wind data will permit an estimate of the largest likely storm surge during, for example, the 100-year return period wind storm.

Wake Study

A study on vessel wake characteristics and potential coastal impacts will be conducted in 2008. The objective will be to characterize the vessel wakes at various speeds along the coastline with a particular focus on the implications to coastal erosion.

4.4.14 Information Request 18

4.4.14.1 Issue Identification - Coastal processes around the boulder field, rock spurs, and fish shelters

Fish habitat compensation being proposed includes a boulder field, rock spurs, and fish shelters in the immediate vicinity of the wharf and jetty.

4.4.14.2 Request

DFO requests the proponent provide an assessment of how coastal processes, including but not limited to sedimentation, may negatively impact the proposed fish habitat compensation structures.

4.4.14.3 Response

The fish habitat compensation plan (the 'Plan') detailed in the DEIS for the Bathurst Inlet Port and Road Project lists various methods that could be used to meet the requirements of DFO's "no net loss" policy for the management of fish habitat. The Plan, and therefore all methods listed within, was conceptual when the DEIS was written. A detailed plan will be prepared in conjunction with DFO, other federal and territorial agencies and local Inuit associations to meet the policy requirements.

Additional surveys of the marine environment will be conducted in the spring and summer of 2008 to adequately assess which compensation methods are best for the Project (with respect to coastal processes, fish species, and affected habitat). Surveys will focus on collecting site-specific data from the Project area to augment existing available information. These data will provide the necessary information to assess the potential effects of the Project on marine fish and fish habitat and assist in selecting habitat compensation structures that best suit the compensation plan and the environment. They will also provide additional background information for future monitoring results comparison.

Work planned for 2008 includes measuring and monitoring current and tides in the study area, the assessment of the marine fish community and fish habitat (methods follow below). After the completion of the 2008 field season, further information will be provided with respect to proposed compensation structures and the best location for effective use of structures.

Based on a preliminary assessment, compensation structures will not be placed to the northwest or southeast of the port site due to the possibility that sedimentation will occur there once the port is constructed. The focus of the assessments will therefore be further to the southeast along the coast of the port site and will cover a distance of approximately 2 km.

Current meter, Tides and Water Quality

A 600 kHz ADCP (acoustic Doppler current profiler) made by Teledyne will be used to measure currents through the water column near the proposed dock. Instrument deployment will be approximately two months (early July to early September). The ADCP will measure currents; a small transducer with internal data logging capabilities will be attached to the ADCP cage to measure and record changes in water level due to tides.

Vertical profiles of conductivity, temperature, and depth will be measured using a CTD probe coinciding with the deployment and retrieval of the current meter.

Additional habitat assessments will be conducted to classify fish habitat types along the shoreline near the proposed port site for potential compensation sites away from the Project area.

The fish habitat survey will consist of taking aerial photographs from a helicopter at low altitude, perform a ground and boat survey to record the substrate and habitat types present, and take underwater still photographs of representative habitat types.

Shoreline surveys will provide a qualitative visual assessment of the presence and relative abundance of fauna, vegetation, and predominant substrate type. Shoreline surveys will delineate habitat units based on the substrate composition from shore. Habitat types will be classified as bedrock, boulder, cobble, gravel, sand, silt/mud/clay, shell hash, and organic debris. Vegetation will be recorded wherever present, and photographs will illustrate various habitat types.

Additional fish community surveys will be conducted at various locations in the Project area to identify fish species present and associated habitat/substrate type. Sampling sites will focus on the proposed port site as well as potential habitat compensation sites outside the construction zone. Sampling gear will include minnow traps, gillnets, seines, longline, and angling. The combination of this gear type will allow for a detailed assessment of various fish species and size classes.

4.5 Issue – Freshwater Aquatic Ecosystem and Fish Habitat

4.5.1 Rationale for Information Request 19

Water velocities and depths within the crossing structure during times of fish migration are required to ensure unimpeded fish access to spawning, nursery and feeding habitats. Improperly designed watercourse crossings can increase the impact to fisheries resources by preventing migration of fish to critical areas of their habitat. A 3-day delay during a 1 in 10 year storm event is a threshold used for establishing design criteria for fish bearing watercourse crossings. This information is used to describe the intensity and duration of the effect of water crossings on fish populations.

4.5.2 Information Request 19

4.5.2.1 Issue Identification – Hydraulics within crossing structures in fish bearing waters

The *Draft EIS* does not include information regarding hydraulics through the water crossing structures (including bridges or culverts on installed in fish bearing waters) and potential for impacts to fish passage due to physical obstructions and/or velocity barriers during migration periods.

4.5.2.2 Request

DFO requests the proponent provide the following additional information on the proposed crossing design's ability to meet fish passage needs:
a) estimates of water velocity and depth for low, medium, and high flow events for all crossing structures installed in fish bearing waters,
b) information to show that the average velocity, through these crossing structures, during the time of fish migration does not exceed the swimming abilities of the target fish species for the 1:10 year, three day delay discharge (Q3d), average velocity information through the crossing structures of fish bearing waters for 1:2, 1:5, 1:10 and 1:100 year storm events.

4.5.2.3 Response

Stream velocities, depth, widths and discharge values at crossings were compiled from Appendix C-6 of the DEIS and presented in Table 7.9-1 in response to INAC Information Request 8.1. All bridges and culverts will be designed and installed outside the bankfull widths; therefore, the velocity through these structures will not be affected.

4.5.3 Rationale for Information Requests 20 – 24

The proponent's construction plans and conceptual drawings and details will be used to verify the impacts predictions to fish and fish habitat. This information is required for DFO's technical review of the environmental assessment.

4.5.4 Information Request 20

4.5.4.1 Issue Identification - Clarification of criteria to determine width of crossing structures in fish bearing waters

Appendix C-2 p.4-8 states that "The 70 wetted stream crossings built with culverts or bridges that would be designed and be outside of the bankfull width of each stream to avoid any destruction of habitat." In addition, "to minimize disturbance to the bank and allow the bridge abutments to be reinforced with riprap without the need for instream work, bridge length will be a minimum of 5m greater than the bankfull width" and "culvert width will be at least 1m greater than the bankful width of the stream, thereby avoiding disturbance of the bank" (Appendix C-4 p.4-21).

According to the average bankfull width data provided in Table 4.6-1 in Appendix C-4 and statements in the feasibility study that bridges spans would range from 10-40m and arch culverts

would span 1-3m (Appendix A-3, p. 5-22) a number of crossings would have structures located within the bankfull width.

4.5.4.2 Request

DFO requests clarification regarding:

a) the design criteria to determine watercourse crossing widths;

b) which watercourse crossings on fish bearing watercourses will meet the above mitigation;

c) whether site specific fish habitat data and impact assessment (including but not limited to potential impacts to fish passage/ loss of physical habitat due to infilling and downstream erosion due to constriction of the channel at watercourse crossings) will be provided at locations where crossings cannot be constructed entirely outside of the bankfull width (including riprap).

Further, Appendix C-2 p. 5-2 states that the recommended mitigation measures include installation of riprap at all crossings. DFO requests clarification regarding:

a) the identification of fish bearing watercourses (in addition to Mara River and Amagok Creek) in which instream work (including isolation/dewatering during construction) will be required for installation of riprap and crossing structures;

b) extent of riprap required at watercourse crossings on fish bearing watercourses;

c) impact of disturbance of bed and banks at crossing sites and mitigation related to design and placement of riprap.

4.5.4.3 Response

It is acknowledged that there are discrepancies between the stated criteria and the proposed crossing type. The bankfull width is the average bankfull width and not necessarily the bankfull width at the point of crossing. Appendix C-4 of the DEIS, Section 4.6.3.1 states, "a final survey of the road alignment will be undertaken to confirm fish absence at crossings classified as non-fish-bearing, and to identify the exact crossing location where culverts and bridges should be installed to minimize both disturbance and cost." The governing objective will be to avoid disturbing the bankfull width of the stream as much as possible. Arch culverts are viable for spans up to 6 m. Accounting for the 1 m margin would allow us to use arch culverts where bankfull width is 5 m or less. This could mean upgrading eight of the identified culvert crossings to modular bridges (Table 4.6-1, Appendix C-4 of the DEIS). It also appears that seven more streams could need pilings within the bankfull width if the 40 m maximum bridge span cannot be exceeded. However, a final field survey of the alignment will be undertaken and the road will be moved to the narrowest location if possible to avoid using multispan bridges. If one 40 m bridge span can not be used at these crossings, fish habitat compensation will be undertaken to comply with the No Net Loss policy of fish habitat for these pilings.

Fish-bearing streams were identified in the 2007 field work by Rescan. Isolation/dewatering will be by berms or sheet piping and sumps, which is not anticipated in stream work. Individual crossings will be completed during detailed engineering. Field work during the summer of 2008 will be required to complete this information.

There are no plans for any infilling and no constriction should occur because the crossings will be build outside the bankfull widths.

As per the initial design, no instream work will occur in any of the crossing except for the Amagok and Mara rivers.

4.5.5 Information Request 21

4.5.5.1 Issue Identification - Effects assessment for Arctic Grayling

4.5.5.2 Request

DFO requests clarification why obstruction of fish passage was not considered as a potential impact to Arctic grayling in Appendix C-4 Table 4.3-1.

4.5.5.3 Response

Obstruction of fish passage was not considered to potentially affect Arctic grayling migration because of the type of structures to be installed at stream crossings and the lack of materials to block passage. All crossing structures across fish-bearing stream will be either bridges or open-bottomed culverts. The crossing structures will all be installed and designed to be outside the bankfull width of the streams. The Project area is absent of any large woody debris (LWD) that could block the flow of water through these types of stream crossings. Therefore, only stream and bank sediment could block water flow in this area; however, presence of sand and silt is low and high velocity water flows would flush these materials through the crossing structures without LWD forming a backing structure on which to mass.

4.5.6 Information Request 22

4.5.6.1 Issue Identification - Impacts of flood events greater than 1:25 on fish and fish habitat adjacent to crossing sites

The project description (Appendix A-2 , p. 23) states that "It is expected that the project will be in use for many generations into the future, nevertheless the project proponents acknowledge that non-renewable resources are finite and that some day the road and associated facilities may no longer be required."

4.5.6.2 Request

DFO requests further clarification regarding the impacts of flood events on fish and fish habitat at and downstream of watercourse crossings on fish-bearing watercourses, assuming a 1:25 year design criteria, particularly in the event the project lifespan is extended or flood events are higher then 1:25.

4.5.6.3 Response

Streams in the Bathurst Inlet Road and Port Project area are characterized by wide, shallow channels because of continuous permafrost that limits their depths. When these streams flood, water spills over the banks with little scouring or sediment loading within the stream.

Due to the design of the road and crossing structures across fish-bearing streams (*i.e.*, raised road with larger rock at base and bridges), water during extreme flood events (higher than 1:25) may be redirected along the road and channelled through the larger rock base of the road. Therefore, flood events of greater than 1:25 years are not expected to have significant impacts to fish an fish habitat at stream crossings. An initial flush of sediment may occur as water flows though the road.

4.5.7 Information Request 23

4.5.7.1 Issue Identification - Designation of watercourses as non-fish bearing at proposed ford crossing sites

The DEIS states that "a final survey of the road alignment will be undertaken to confirm fish absence at crossings classified as non-fish bearing, and to identify the exact crossing location where culverts and bridges should be installed to minimize both disturbance and cost."

4.5.7.2 Request

DFO requests further detail regarding the sampling methods and criteria that will be used in confirm absence of fish habitat at the crossing sites (including timing).

4.5.7.3 Response

Stream crossings listed as being non-fish-bearing were assessed using single pass electrofishing procedures in two consecutive years (Rescan, 2002, 2003) to verify fish presence. Both studies were performed at the end of the Nunavut summer in the month of August (20 to 23 and 2 to 7, respectively). August is the period with the highest density and diversity of fish presence in streams in Nunavut. The final survey to confirm fish absence at stream crossing and identify exact crossing location will occur in August. Electrofishing will be used as the method of sampling as it is the most effective method in that region. Streams will be classified as non-fish bearing if after two field seasons of sampling no fish were captured.

4.5.8 Information Request 24

4.5.8.1 Issue Identification - Impacts to shoreline of Contwoyto Lake

4.5.8.2 Request

Potential for impacts to fish and fish habitat related to shoreline degradation at the terminal end of the road are mentioned in the DEIS. DFO requests clarification regarding potential impacts to the shoreline of Contwoyto Lake, including any proposed shoreline works (*e.g.*, removal of riparian vegetation, installation of a water intake/diffuser structure)?

4.5.8.3 Response

There will be no removal of riparian vegetation along the shoreline of Contwoyto Lake. The installation of a water intake will not cause any effects to the shoreline. No impacts to fish and fish habitat are expected along the shoreline of Contwoyto Lake because the ice road to be continued from the terminal end is not expected to affect shoreline sediments or vegetation. An approach to the lake will be built with snow and ice from the end of the road to minimize impacts to the shoreline.

4.6 Issue – Environmental Management and Monitoring Plans

4.6.1 Rationale for Information Request 25

Monitoring and follow up is a requirement of the NIRB's 10 minimum EIS requirement. The draft monitoring plan will be required to verify the extent to which the plan's purpose (i.e. demonstrating No Net Loss) can be achieved. This information is necessary for completion of the technical review of the environmental assessment.

4.6.2 Information Request 25

4.6.2.1 Issue Identification

The *Fish Habitat No Net Loss Plan* identifies that fish habitat compensation monitoring will be undertaken, yet the plan provides only minimal detail on the proposed monitoring and follow up programs.

4.6.2.2 Request

DFO requests the proponent provide a more detailed preliminary Fish Habitat Compensation (No Net Loss) Monitoring plan. Details should include the methodology and reporting format for monitoring surveys and a monitoring schedule with justification for the proposed schedule, frequency and duration. The monitoring program must assess the accuracy of the impact predictions and effectiveness of proposed mitigation and compensation measures.

4.6.2.3 Response

As a general approach, fish habitat permanently lost during the construction of the all-weather road and the port will be replaced with new habitat on a ratio of two-to-one for new to lost habitat based on an estimation of the number of habitat units lost. Habitat units were originally developed by the U.S. Fish and Wildlife Service in response to initiatives by the U.S. government for sustainable management of water resources, and are indices of habitat quantity and quality. The first step in calculating the number of habitat units lost is to apply a habitat suitability index (HSI) to each section of lost habitat. The HSI is then multiplied by the area of the habitat to be compensated for to achieve the number of habitat units. Thus, fish habitat lost will be replaced with new habitat of equal or greater ecological importance for fish.

A pre-construction survey that will document water depth, substrate types, habitat features, cover, and fish presence at stream crossing sites will be prepared. A detailed map of fish habitat will be created so that alterations caused by construction can be quantified. This will be completed in the summer prior to the start of construction.

To address the accuracy of the HADD predictions, another detailed habitat map of the conditions existing after construction is complete will be created so that the exact area of the habitat alteration can be calculated. Surveys of affected habitat will occur in the year following the completion of construction so that impacts can be accurately assessed.

Compensation project monitoring will occur once every year for five years, beginning two years after the completion of construction. The delay between the completion of construction and the start of compensation monitoring is to allow constructed habitat to settle and to give fish species an opportunity to colonize the structures. Monitoring will consist of a combination of fish sampling and fish habitat surveys. Physical attributes such as water depth, substrate type, cover type and cover abundance will be recorded at each compensation site. Fish sampling will be conducted using a combination of seines, minnow traps, electrofishing, and visual observations. Visual observations of fish may be made from the surface, assisted by underwater cameras or via snorkel or scuba surveys around compensation structures. In the five years of post-construction monitoring, biologists will look for the compensation structures to provide consistently high quality habitat and to support stable populations of fish. If after five years of monitoring, these attributes are not met, then additional compensation projects may be proposed. A proposed schedule for compensation monitoring is presented in Section 6.1.1.1 of Appendix C-4 of the DEIS (*Freshwater Fish and Fish Habitat Effects Assessment*).

5. GOVERNMENT OF NUNAVUT

5. Government of Nunavut

5.1 Introduction

This chapter contains the issues, rationales, and information requests from the Government of Nunavut, and the Proponent's responses to them. To maintain consistency with other chapters, the text under the heading 'Issue' in the Government of Nunavut's document has been placed under the heading 'Concern' in this volume.

5.2 Issue – Water Quality

5.2.1 Information Request #1

5.2.1.1 Issue Identification - Hold times for water samples

5.2.1.2 Concern

Hold times for water samples collected during the 2001 and 2007 baseline monitoring are not mentioned. Delays in analyses may result in alterations in concentrations of nutrients and other parameters (e.g., alkalinity, conductivity, pH, turbidity, total dissolved solids, total suspended solids), therefore affecting the accuracy of baseline and predicted water quality characteristics.

5.2.1.3 Rationale

This information is required for QA/QC assessment.

5.2.1.4 Request

It is recommended that Bathurst Inlet Port and Road Joint Venture Ltd. provide the hold times (period between water collection and analyses) for water samples collected in 2001 and 2007.

5.2.1.5 Response

In 2001, water samples were collected on August 14 and 15. These samples were received by ALS in Vancouver on August 21, 2001.

Water samples that were collected on August 4, 2007, (10 samples including QA/QC), were received at the lab on August 10, 2007. Water samples collected on August 6 and 7, 2007, (11 samples including QA/QC), were received at the lab on August 14, 2007.

5.3 Issue – Air Quality

5.3.1 Information Request #2

5.3.1.1 Issue Identification - Air Quality Effects Assessment

5.3.1.2 Concern

The Proponent has indicated in Section 13.1 and in Appendix III that "the delivery of fuel to existing mines via the port and road will reduce emissions by replacing part of the current overland trucking route with ocean transport, which produces fewer emissions".

5.3.1.3 Rationale

In order for NIRB to assess the comprehensiveness of the environmental effect assessment, this information is required.

5.3.1.4 Request

To support this evidence provide specific details of the GHG emission inventory including; i) the spatial and temporal boundaries of the inventory for both the proposed port and road option and the current overland route; ii) the absolute amounts of GHGs emitted per annum for both options; and iii) the GHG emission intensity (CO_{2eq} / tonne delivered) for both options.

5.3.1.5 Response

The proponent will revise the air quality modelling study and assessment in response to a number of requests and the corresponding reports (Appendices B-2 and B-4 of the DEIS) will be updated accordingly. A number of model scenarios will be implemented to address issues raised in the information requests. These will include the following modifications to the model scenarios that are part of the DEIS (Appendix B-4):

Model set up

- Model period will cover all seasons.
- Receptor spacing will follow recommendations in the Air Quality Modelling Guidelines for B.C. published by the B.C. Ministry of Environment.
- Meteorological data representative of meteorological conditions farther inland for all road scenarios will be used. Preferably this data would come from an inland meteorological station. If such data is not available, measurements from the Bathurst Port meteorological station will be adjusted by comparing means given for Lupin station in the environmental settings section.
- Model output will include estimates of acid deposition and the report will include detailed emission inventories for SO_2.

Model Scenarios

- **Road - Operation:** Emission sources as in original DEIS.
- **Road - Cumulative Effects:** To reflect potential cumulative effects due to an increase in the number of users for the Project road the number of trucks modelled will be increased. Based on estimated hauling requirements for the reasonably foreseeable future, mining projects in the region could require approximately 21,000 truck loads each year.
- **Port Site - Construction:** Emission sources as in original DEIS.

- **Port Site - Operation:** Emissions expected during the ice-free period will be modelled, including ship transport, manoeuvering, hotelling/cargo unloading, barge and tug operation, and all onshore port operations expected during the ice-free period.
- **Port Site - Cumulative Effects:** To reflect potential cumulative effects due to an increase in the number of users for the BIPR road the number of trucks modelled will be increased (see Road – Cumulative Effects scenario). Increased emissions caused by the corresponding increase in port activities and ship traffic will be included in this scenario.

Emission inventories

- The revised air quality study will include emission inventories for all modelling scenarios and a comparison of these inventories to that of the current overland route.
- For all emission inventories the revised report will include the spatial and temporal boundaries of the emission inventories as well as the absolute amounts of GHGs emitted per annum and the GHG emission intensity (CO_{2eq}/tonne delivered).

Other

- A summary of dispersion meteorology showing the seasonal variations in atmospheric stability/turbulence and mixing heights in all seasons will also be included in the modelling report.
- A summary of conditions during which air quality guidelines are typically exceeded will be included in the modelling report.

5.3.2 Information Request #3

5.3.2.1 Issue Identification - Air Quality Mitigation and Management

5.3.2.2 Concern

The Proponent has not discussed and evaluated the effectiveness of the proposed mitigation measures and assessed the likelihood of mitigation failure and the potential severity of the consequences.

5.3.2.3 Rationale

In order for NIRB to assess the comprehensiveness of the environmental effect assessment, this information is required.

5.3.2.4 Request

To support this evidence, provide specific information on similar mitigation methods used with similar projects and the degree of success achieved. All uncertainties related to the mitigation measure should be clearly described and, if possible, quantified. Discuss in detail how the four general design features and practices that will minimize CO_2 emissions will be executed.

5.3.2.5 Response

The proponent will revise the Air Quality and Emissions Management Plan in response to information request EC-9, taking into account the revised modelling results (see GN IR #2). The revisions will address operating procedures for monitoring, evaluation of results, implication of results and integration of monitoring results with other aspects of the project.

5.3.3 Information Request #4

5.3.3.1 Issue Identification - Monitoring Program

5.3.3.2 Concern

The Proponent states that some form of weather and climate data gathering will continue throughout the life of the Project, but does not satisfy all requirements of the NIRB Guidelines with respect to the monitoring program

5.3.3.3 Rationale

In order for NIRB to assess the comprehensiveness of the environmental effect assessment, this information is required.

5.3.3.4 Request

To support this evidence, provide specific information as required in the NIRB Guidelines (Section 4.0):

a) integration of monitoring results with other aspects of the Project including adjustments to operating procedures and refinement of Mitigation measures;

b) procedures to assess the effectiveness of monitoring programs, Mitigation measures, and recovery programs for areas disturbed by the Project;

c) methodology of evaluation of monitoring results, including thresholds levels to trigger management responses;

d) details regarding management responses; and

e) the relationship between monitoring and Environmental Management Plans (Section 4.8 of NIRB Guidelines).

5.3.3.5 Response

The proponent will revise the Air Quality and Emissions Management Plan in response to EC-9, taking into account the revised modelling results (see GN IR #2). The revisions will address the effectiveness and uncertainty of mitigation methods and give detailed execution procedures.

5.3.4 Information Request #5

5.3.4.1 Issue Identification - Air Quality Effects Assessment

5.3.4.2 Concern

The Proponent has indicated that ships up to 50,000 tonnes, barges and tugs will deliver cargo to the port during the 100 to 110 day ice-free season in July to October. The proponent has also indicated that the dispersion model scenarios were set up to represent worst-case scenarios that could occur at any point during operation or construction. The proponent states that the CALPUFF model was run only for the road operating season (January to April) because maximum air contaminant concentrations will occur during this period. Emission estimates provided by the proponent related to shipping that were not included in dispersion modelling indicate potential SO_2 emission rates ranging from 0.6 to 18 g/s per ship, while the SO_2 emission rates for the assessment scenarios applied in dispersion modelling represent SO_2 emissions of 0.031 to 0.084 g/s.

5.3.4.3 Rationale

In order for NIRB to assess the comprehensiveness of the air effects assessment, additional information is required.

5.3.4.4 Request

Request: To support this evidence provide specific details of the effects of the operation of the port facility during the ice-free period including: Update effects assessment

a) Expected emissions during the ice-free period including ship transport, manoeuvring, hotelling/cargo unloading, barge and tug operation, and all onshore port operations expected during the ice-free period.

b) Quantitative dispersion modelling to assess air quality effects of the port operations during the ice-free period including operations from ship during transport, manoeuvring, hotelling/cargo unloading, barge and tug operation and onshore port operations.

5.3.4.5 Response

The proponent will revise the air quality modelling study and assessment in response to a number of requests (see response to request GN IR #2, for full details). The corresponding reports (Appendices B-2 and B-4 of the DEIS) will be updated accordingly.

In response to this request the modelling period will be extended to the full year and emissions expected during the ice-free period will be included in the model, including ship transport, manoeuvering, hotelling/cargo unloading, barge and tug operation, and all on-shore port operations expected during the ice-free period.

The revised air quality study will also include updated emission inventories for all modelling scenarios and a comparison of these inventories to that of the current overland route.

5.3.5 Information Request #6

5.3.5.1 Issue Identification - Effects Assessment

5.3.5.2 Concern

The Proponent has indicated in Volume III, B-4, that the grid resolution applied in the CALPUFF modeling domain was 1.0 km by 1.0 km. Best modelling practices, such as those found in the British Columbia Ministry of Environment Guidelines for Air Dispersion Modelling in British Columbia or that of the Alberta Environment Air Quality Dispersion Model Guideline recommend minimum receptor/grid spacing in order to delineate areas of highest predicted concentration. Both of these guidelines recommend receptor spacing to a minimum of 50 m as part of a regular system of receptors as well as a minimum of 20 m along project boundaries and areas of maximum predicted concentration.

5.3.5.3 Rationale

In order for NIRB to assess the comprehensiveness of the air effects assessment, additional information is required.

5.3.5.4 Request

To support this evidence, provide specific detail as to the receptor grid applied in the dispersion modelling and as to whether or not it is consistent with the best practices outlined in the British Columbia or that of the Alberta Environment Air Quality Dispersion Model Guidelines. If dispersion modelling was not completed consistent with the above requirement, please provide specific detail as to the change in predicted concentration if these best practices are followed.

5.3.5.5 Response

The proponent will revise the air quality modelling study and assessment in response to a number of requests (see response to request GN IR #2, for full details). The corresponding reports (Appendices B-2 and B-4 of the DEIS) will be updated accordingly.

The original modeling set up used a receptor grid of 1 x 1 km, identical to the computational grid. The 1 x 1 km spacing is the recommendation for receptors far away from the source. In response to this request receptor spacing will be decreased closer to the sources. The spacing will be 20 m at the port boundary, 50 m within 500 m of the source, 250 m within 2 km of the source, 500 m with 5 km and 1 km everywhere else. This is the spacing recommended in the British Columbia Air Quality Dispersion Model Guidelines.

5.3.6 Information Request #7

5.3.6.1 Issue Identification - Effects Assessment

5.3.6.2 Concern

The Proponent has indicated that the CALPUFF model was run only for the meteorological period of January to April of 2002 and 2003. The proponent has also indicated that construction activities and, shipping and port operation will occur outside of this January to April time period. The proponent has only completed dispersion modeling representative of meteorological conditions during mainly 24-hour darkness, stable atmospheric, winter conditions. These meteorological conditions are not representative of spring, summer and fall periods when increased mixing heights and atmospheric turbulence may cause elevated plumes to mix towards the ground more readily causing higher concentrations from certain types of emission sources.

5.3.6.3 Rationale

In order for NIRB to assess the comprehensiveness of the air effects assessment, additional information is required.

5.3.6.4 Request

To support this evidence provide specific details of the following:

a) Summary of dispersion meteorology showing the seasonal variations in atmospheric stability/turbulent and mixing heights in all seasons.

b) Quantitative dispersion modelling results that incorporate the full range of meteorology representative of the full year of meteorology (winter, spring, summer and fall) that coincide with project activities.

5.3.6.5 Response

The proponent will revise the air quality modelling study and assessment in response to a number of requests (see response to request GN IR #2, for full details). The corresponding reports (Appendices B-2 and B-4 of the DEIS) will be updated accordingly.

In response to this request the modelling period will be extended to include the full year.

A summary of dispersion meteorology showing the seasonal variations in atmospheric stability/turbulence and mixing heights in all seasons will also be included in the modelling report.

5.3.7 Information Request #8

5.3.7.1 Issue Identification - Effects Assessment

5.3.7.2 Concern

The Proponent has indicated that the CALPUFF model was run using measured meteorological data such as wind direction and wind speed collected at an onsite meteorological weather station located near the port facility. The proponent has indicated that the average wind speed measured at the port site meteorological station was 5.7 m/s and the average percentage of calm conditions was 3.4% of the time. The proponent has also presented a summary of wind speed and direction at the Lupin and George Lake meteorological stations located much further inland. These two stations indicate average wind speeds of 4.7 and 4.8 m/s and average calms of 9.2% and 13.3% of the time respectively. Wind speeds at the inland station were observed to be 16 to 18% less than that measured at the port site meteorological station. The proponent has applied meteorological data collected at the port site for the dispersion modelling of both project activities that occur at the port site and those that occur inland along the road.

5.3.7.3 Rationale

In order for NIRB to assess the comprehensiveness of the air effects assessment, additional information is required.

5.3.7.4 Request

Provide a description of the expected change in predicted maximum and average concentrations relative to the concentrations predicted for the Road Operation assessment scenario given that meteorological data collected at the port site overestimates the wind speeds and underestimates the periods of calm winds. Comment on its significance relative to the National Ambient Air Quality Objectives.

5.3.7.5 Response

The proponent will revise the air quality modelling study and assessment in response to a number of requests (see response to request GN IR #2, for full details). The corresponding reports (Appendices B-2 and B-4of the DEIS) will be updated accordingly.

Using a lower wind speeds in the model scenario will lead to higher concentrations. However, other assumptions made in the model set-up, in particular the emission source strengths are sufficiently conservative to compensate for this relatively minor effect.

Nonetheless, in response to this request the revised air quality modelling study will use data representative meteorological conditions further inland for all scenarios that describe emissions along the road. Preferably this data would come from a meteorological station located inland. If such data is not available, measurements from the Bathurst Port meteorological station will be adjusted by comparing means given for the Lupin station in the environmental settings section.

5.3.8 Information Request #9

5.3.8.1 Issue Identification - Effects Assessment

5.3.8.2 Concern

The Proponent has indicated that dispersion modelling has predicted that maximum 1-hour, 24-hour average NO_2 concentrations are predicted to exceed the National Ambient Air Quality Objectives during port construction. The Proponent has also indicated that dispersion modelling has predicted that maximum annual average NO_2 concentrations are predicted to exceed the National Ambient Air Quality Objectives during port construction and Port operation, but that "even though runtime average values exceeds the guideline, the annual average value will likely meet it." The Proponent has indicated a low significance associated with the predicted changes in NO_2 concentrations.

The proponent has also indicated that maximum predicted 24-hour TSP concentrations are predicted to exceed the Nunavut Ambient Air Quality Guideline during Road Operation. The Proponent has indicated a moderate significance associated with the predicted changes in TSP concentrations

5.3.8.3 Rationale

In order for NIRB to assess the comprehensiveness of the air effects assessment, additional information is required.

5.3.8.4 Request

To support this evidence provide specific details of the following:

a) Provide additional detail such as the frequency and meteorology typical of predicted exceedance of the 1-hour and 24-hour National Ambient Air Quality Objectives or Nunavut Ambient Air Quality Guideline for NO_2 and TSP in hours or days per year during Port Construction.

b) As the simplified assessment method indicated potential for annual average NO2 concentration greater than the National Ambient Air Quality Objectives, provide revised predicted annual average NO_2 concentrations that more realistically account for the changes in project emissions and meteorology over the calendar year.

5.3.8.5 Response

The proponent will revise the air quality modelling study and assessment in response to a number of requests (see response to request GN IR #2, for full details). The corresponding reports (Appendices B-2 and B-4 of the DEIS) will be updated accordingly.

In response to this request the modelling period will be extended to include the full year.

A summary of conditions during which air quality guidelines are typically exceeded will be included in the modelling report.

5.3.9 Information Request #10

5.3.9.1 Issue Identification - Effects Assessment

5.3.9.2 Concern

The Proponent has indicated that acid deposition is another potential air quality effect to consider for the Project. The proponent also indicated that use of ultra low sulphur diesel fuel will result in negligible SO_2 emissions and that acid deposition derived from sulphate formation is therefore limited. It is also stated that the formation and kinetics of nitric acid deposition are not well understood and due to uncertainty are not included in the air quality model study.

5.3.9.3 Rationale

In order for NIRB to assess the comprehensiveness of the air effects assessment, additional information is required.

5.3.9.4 Request

To support this evidence provide specific details of the following:

a) Compare the annual SO_2 emissions from all shipping related activity which was excluded from dispersion modelling to that of the emission source included in the dispersion modelling and effects assessment.

b) Given the emission estimates in part a) of this question, please confirm that SO_2 emissions from this project are negligible.

c) Given that the majority of SO_2 emissions from shipping occur in summer when precipitation is greatest, please provide specific detail or references to confirm that sulphate formation would be limited.

d) Given that estimates of nitric acid deposition are routinely performed as part of most air quality model studies for similar projects and that the CALPUFF model has a simplified routine to assess atmospheric chemistry and deposition of NO_x emissions, please provide specific detail or references to support the conclusion that model uncertainty prevents the proponent from quantitative estimates of acid deposition.

5.3.9.5 Response

The proponent will revise the air quality modelling study and assessment in response to a number of requests (see response to request GN IR #2, for full details). The corresponding reports (Appendices B-2 and B-4 of the DEIS) will be updated accordingly.

In response to this request the modeling period will be extended to the full year and emissions expected during the ice-free period will be modelled, including ship transport, manoeuvering, hotelling/cargo unloading, barge and tug operation, and all onshore port operations expected during the ice-free period.

The model output will include estimates of acid deposition and the modelling report will include an emission inventories for SO_2.

5.3.10 Information Request #11

5.3.10.1 Issue Identification - Monitoring Program

5.3.10.2 Concern

Dispersion modelling predicts exceedances of the National Ambient Air Quality Objectives and Nunavut Ambient Air Quality Guidelines for both TSP and NO_2. However, the Proponent does not propose any ambient air quality monitoring during construction and operation of the Port and Road.

5.3.10.3 Rationale

In order for NIRB to assess the comprehensiveness of the monitoring program, this information is required.

5.3.10.4 Request

To support this evidence, provide the following:

a) Please provide additional detail as to why some form of ambient air quality monitoring for TSP and NO_2, both of which dispersion modelling simulations predicted exceedances of the National Ambient Air Quality Objectives and Nunavut Ambient Air Quality, is not proposed.

5.3.10.5 Response

The proponent will revise the Air Quality and Emissions Management Plan in response to information request Environment Canada-9, taking into account the revised modelling results (see GN IR #2). The revised plan will be developed through consultations with Environment Canada and will address the need for air quality monitoring, including TSP and NO_2.

5.4 Issue – Noise Management

5.4.1 Information Request #12

5.4.1.1 Issue Identification - Environmental Setting

5.4.1.2 Concern

The Proponent presents background sound level data that are not relevant to the Local Study Area. For determining the background sound level in the areas of concern, an assumption of Leq (24 hours) was made based on collected data at different sites. Background noise should be measured at site and quantified in various terms, not assumed.

Any noise impact assessment should consist of fundamental information that can help determine the accuracy of the results and help provide realistic conclusions and valid recommendations. These necessary noise assessment fundamentals are not included in this study under review and should include an applicable noise level criteria for planning along with recently measured background sound level data and acoustic modeling of future noise levels at representative receptor locations in the vicinity of the project.

5.4.1.3 Rationale

In order for NIRB to assess the comprehensiveness of the consultation efforts, this information is required.

5.4.1.4 Request

Provide background sound level measurements representative of Bathurst Inlet, the road, and the shipping route. These measurements should be capable of describing the existing conditions of the acoustic environment before the start up of construction, and before the beginning of operations of port and road.

5.4.1.5 Response

Noise measurements will be undertaken along the shipping route, at the port and at two sites representative of conditions along the road. A first set of measurements will be conducted in June when there is still snow on the ground along the road and conditions will be more representative of the winter season. In July a second set of measurements will be conducted to

capture summer conditions. At each site, measurements will be taken every minute for four consecutive days to characterize noise levels in terms of L_{eq} as well as L_{10}, L_{90}, L_{night} and L_{day}.

These baseline noise measurements will be described as part of the environmental setting section.

5.4.2 Information Request #13

5.4.2.1 Issue Identification - Methodology

5.4.2.2 Concern

The Proponent has used guidelines that are suitable for oil and gas utilities in Alberta but are not suitable for the assessment of traffic noise and complex port projects. A specific acoustic model for this project has not been completed.

5.4.2.3 Rationale

In order for NIRB to assess the comprehensiveness of the consultation efforts, this information is required.

5.4.2.4 Request

Provide construction noise models for the road and the port to quantify the noise impact on the environment due to construction. Also, provide operations noise models for the road and the port to predict the increase of noise level in the environment. Should there be any excess above a noise criteria limit, then mitigation measures are to be specified in the models.

5.4.2.5 Response

The Computer Aided Noise Abatement (Cadna/A) noise model will be used to estimate noise levels during construction and operation of the Project. Separate scenarios will be run for the port (including the airstrip) and inland road.

Cadna/A is one of the most advanced and widely recognized programs currently available for outdoor noise prediction and assessment. The features of Cadna/A include:

- Ability to simulate noise effects at industrial facilities, roads, railways, airports, stationary sources, and heating, ventilation and air conditioning (HVAC) equipment.
- Prediction and assessment of noise levels in the vicinity of industrial facilities, roads and railways, airports, and any other noisy equipment.
- Calculation according to national or user-defined guidelines, including reflection, absorption, meteorological and terrain effects.

Cadna/A model calculations are performed in octave bands since outdoor sound propagation is frequency dependent. Each point, line, area, and road noise source is assigned an octave spectrum using field measurements or data based on reputable sources that specialize in sound monitoring and analysis. However, the modelling results are presented in A-weighted decibels

to allow comparison with evaluation criteria. All calculations will be performed for assumed receiver heights of 1.5 m relative to the ground and sound contours will be calculated using 10 m by 10 m grids.

The noise effects assessment will be revised using these model results, including the assessment of potential mitigation measures.

5.4.3 Information Request #14

5.4.3.1 Issue Identification - Effects Assessment

5.4.3.2 Concern

The Proponent uses impact rating values that are not contained in Guideline 38-Noise and does not reflect the response of humans to noise and vibration.

5.4.3.3 Rationale

In order for NIRB to assess the comprehensiveness of the consultation efforts, this information is required

5.4.3.4 Request

To establish the magnitude of noise excess above the pre-existing ambient sound level and the rating in terms of human response to noise increase in the environment, provide an acceptable provincial or federal noise rating criteria. It is suggested here that the magnitude of noise problem be established based on accepted human response to noise increase in the environment. The rating criteria should be based on a generally-accepted rating and magnitude of noise problem, similar to the Ontario Ministry of the Environment well-established methods to determine the representative magnitude and the rating.

5.4.3.5 Response

Assessment ratings in Appendix B-3 of the DEIS, *Noise Effects Assessment,* were developed with regards to the environment outside the Project fence-line. Because people do not live within hearing distance of the Project a standard based on the effect of noise on humans like the Ontario MOE Guideline LU-131 "Noise Assessment Criteria in Land Use Planning" was not selected. Camp facilities within the Project fence-line might be evaluated using this standard. Therefore, we will still use the original assessment rating criteria based on the Alberta EUB "Directive 038 – Noise Control" for noise outside the Project fence-line (the effect originally entitled "Change in hourly and daily noise levels"), but will add an effect "Change in camp facility noise levels" that will be based on the Ontario guideline. Evaluation of the rating criteria will be based on Cadna/A modelling results generated in response to GN IR # 13 and 21.

5.5 Issue - Trans-boundary Effects

5.5.1 Information Request #15

5.5.1.1 Issue Identification - Potential Effects of the Project Outside of Nunavut

5.5.1.2 Concern

Individual VECs effects analysis treats the trans-boundary nature of the geographic extent of residual effects in an inconsistent manner, resulting in at least one VEC with a residual trans-boundary effect not being reported in the trans-boundary effects analysis. As a result of inconsistent application of methodology the potential for additional unreported residual trans-boundary effects exists.

5.5.1.3 Rationale

The Trans-boundary Effects Analysis (Document G-3, Volume VIII) documents the proponent's assessment of potential trans-boundary effects resulting from the project. Table 6.4.1 in the Effects Assessment Methodology (Document A-5 Volume I) states that the geographic extent of a residual effect will be rated as **trans-boundary** if the effect extends beyond Nunavut. Accordingly, the effects assessment for each VEC or VSEC includes a spatial or geographic analysis. Some effects assessments refer to a residual effect being trans-boundary whereas others refer to the effect occurring in the Local or Regional Study Area. The proponent has identified the following VECs or VSECs subject to potential trans-boundary effects: caribou grizzly bears, wolves, migratory birds, marine mammals, air quality and climate change, and social and economic. As wolverine is attributed the same geographical rating as caribou, it is not clear why the residual effect for wolverine has not been carried forward to the trans-boundary effects analysis. Given the inconsistent application of the trans-boundary ratings in the effects analysis there is potential for additional VECs or VSECs to have a trans-boundary residual effects and not be reported in the trans-boundary effects analysis.

5.5.1.4 Request

The proponent is requested to review the geographic extent rating criteria for all VECs and VSECs where a residual effect is identified, confirm where there is a trans-boundary geographical extent and carry all residual trans-boundary effects forward to the trans-boundary effects analysis.

5.5.1.5 Response

The lifetime range of a wolverine is similar to the annual range of caribou (Figure 11.6-1, Section 11.8, Appendix G-6 of the DEIS), and both species may cross territorial borders. Based on a lifetime range, wolverines in the BIPR regional study area may potentially travel south into the Northwest Territories; thus, existing and proposed projects in the northern portion of the Northwest Territories, including EKATI, Diavik, Snap Lake, and Gahcho Kué could affect wolverine and caribou within the BIPR regional study area in Nunavut. However, while wolverine may cross into another territory once in their lifetime, caribou do so each year. Thus, caribou are exposed to effects from other projects at a greater frequency than wolverine. This is an important difference that calls for different cumulative effect considerations for these two species.

Potential significant effects of the Project could alter direct and indirect mortality rates, movements, and the reproductive productivity of wolverine. Indirect mortality, disturbance to movement, and decreased reproductive productivity, if these should occur, would be regional in scale. While the potential effects on wolverines would therefore appear to cross territorial

borders, wolverines that travel between the BIPR regional study area and the Northwest Territories would do so at such an infrequent rate that they would represent a very small proportion of the overall number of wolverines found in the Northwest Territories. Inversely, wolverine populations within the BIPR regional study area in Nunavut would have very few individuals that had migrated from the Northwest Territories. Therefore, these effects are not expected to reduce the numbers of wolverines in the Northwest Territories in a way that is statistically detectable, nor are the effects of projects in the Northwest Territories expected to affect the population of wolverines in the BIPR regional study area.

5.6 Issue - Project Alternatives

5.6.1 Information Request #16

5.6.1.1 Issue Identification - Alternative Methods of Carrying out the Project

5.6.1.2 Concern

The proponent has carried forth a discussion of the 3 highest rated alternatives of the 17 alternatives for transportation to the SGP reported by EBA. Rationale for the selection of the BIPAR project over the other options is provided. Additionally, the review of alternative road alignments is well documented and the rationale for selection of the preferred route is provided. However, while design requirements for the port are identified, an analysis of alternative locations has not been provided in the DEIS or supporting documents.

5.6.1.3 Rationale

The EIS Guideline requires the proponent identify alternatives to the project and alternative methods to carry out the project. The proponent is also required to provide the rationale for selection of the preferred alternative and rejection of others.

5.6.1.4 Request

The proponent is requested to outline the alternative port locations considered and rationale for the selection of the preferred site in comparison to other locations.

5.6.1.5 Response

Given the very high cost of road building in that part of the country and similarly high costs of moving freight by road on a tonne/kilometre basis, it was evident that transportation by sea into the central Arctic would offer distinctly lower comparative transportation costs. It was believed that significantly lower fuel costs would be possible to realize if fuel could be delivered by sea to a local port and hauled a short distance overland to the point of use. Additionally, the high cost of overland freight would preclude the possibility of the development of base metal mines due to the requirement to economically transport mineral concentrates to smelters unless a port was developed in the region. Obviously, a port site would need to be located as close as possible to the potential mines or groups of mines. The site selected as the best candidate site for the Bathurst Inlet Port was identified as a result of the following criteria:

1. It was necessary to find a point as far south in Bathurst Inlet as possible in order to minimize road construction and ongoing overland transportation with attendant high costs.
2. The water had to be deep enough to allow access by deep-sea vessels with a draft of 12 to 13 m.
3. Any proposed berth for a ship had to allow for overshoot on a docking attempt with no danger of grounding.
4. The site had to be accessible with a road and could not have excessively steep grades on the approaches.
5. Adequate room had to be available in the area to allow for the construction of port facilities including laydown areas, tank farm, and maintenance and residential facilities.

Areas farther south of the selected location did not offer this combination of attributes. Subsequent to the identification of this location extensive bathymetry work confirmed the assumption of deep water near shore and of approaches that were navigable between the site and previously established shipping routes to the north.

The suggestion that a road and port could be built to the north end of Bathurst Inlet ignores the prohibitive cost of such a venture and the loss of any economic advantage gained by accessing seaborne transportation.

Studies were then undertaken to confirm that a shipping route could be identified to connect southern Bathurst Inlet with known routes to the north. A study from the Canarctic Shipping Company Ltd. (Canarctic, 1993) had already identified shipping routes to service the Coronation Gulf. These Bathurst Inlet hydrographic studies were conducted in 1998 by the Canadian Hydrographic Service together with the Canadian Coast Guard. This work successfully identified a shipping corridor which was later inspected on-site by a ship's master who concurred that vessels of the size proposed could be safely sailed to and from the port site provided that specified navigational aids were put into place and that current studies be completed.

Environmental studies were also undertaken to ensure that the proposed site did not exhibit factors that were likely to preclude the development of a facility in this location. No environmental concerns of a nature to preclude proposed development have been identified as a result of the studies undertaken.

Land-side factors such as steepness of terrain, required excavation and proximity to other proposed facilities further dictated the exact proposed location along a few hundred metres of shoreline.

Alternatives for the port location are also discussed in DFO IR 4.

5.7 Issue – Legislation and Regulation

5.7.1 Information Request #17

5.7.1.1 Issue Identification - Legislation Applicable to the Project

5.7.1.2 Concern

The proponent has identified most legislation applicable to the project in Section 10 of the DEIS, however legislation or regulations applicable to wildlife (which are documented in the Wildlife Mitigation and Management Plan of the Wildlife Effects Assessment, Document D3) is not referenced in this section. Additionally, the Spill Contingency Planning and Reporting Regulations under the Nunavut *Environmental Protection Act* are not referenced in the DEIS.

5.7.1.3 Rationale

The EIS Guideline requires the proponent to identify all federal and territorial and related laws that require compliance in respect to the Project. The proponent is also required to provide a list of currently held permits and licences.

5.7.1.4 Request

The proponent is requested to identify all territorial legislation with which the project must comply.

5.7.1.5 Response

Section 10 in Volume I of the DEIS focuses on the required authorizations, permits, and licences that will be submitted as required in order to obtain permission for planned activities by the appropriate regulatory agencies in a timely manner. All of the legislation listed in the Wildlife Mitigation and Management Plan of the *Wildlife and Wildlife Habitat Effects Assessment*, Appendix D-3, do not require permits. The *Species at Risk Act, Migratory Bird Convention Act and Migratory Birds Regulations* and the *Nunavut Wildlife Act* all include regulations that must be complied with to protect the species of concern. The Wildlife Effects Assessment indicates that project activities will comply with these acts and regulations.

Table 5.7-1 indicates additional legislation and acts not listed in Table 10-1 of the DEIS that will be taken in to consideration (and contacted for permits if required) when planning Project activities.

Table 5.7-1
Additional Legislation

Regulatory Agency	Associated Legislation
Nunavut Tunngavik Incorporated	*Nunavut Land Claims Agreement*
Department of Community and Government Services, Nunavut	*Commissioner's Land Act*
Department of Community and Government Services, Nunavut	*Transportation of Dangerous Goods Act*
Department of Community and Government Services, Nunavut	*Fire Prevention Act*
Environment Canada	*Canada Wildlife Act*

(continued)

Table 5.7-1
Additional Legislation (completed)

Regulatory Agency	Associated Legislation
Department of Justice, Nunavut	*Engineers, Geologists and Geophysicists Act*
Department of Justice, Nunavut	*Labour Standards Act*
Department of Environment, Nunavut	*Environmental Protection Act*
Department of Environment, Nunavut	*Territorial Parks Act*
Workers Compensation Board, Nunavut	*Explosives Use Act*
Workers Compensation Board, Nunavut	*Worker's Compensation Act*
The Department of Culture, Language, Elders and Youth, Nunavut	Nunavut Archaeological and Palaeontological Sites Regulations
Transport Canada	*Transportation of Dangerous Goods Act*

5.8 Issue – Wildlife

5.8.1 Information Request #18

5.8.1.1 Issue Identification - A reference is given to an Appendix 1 for full results of the species search

5.8.1.2 Concern

The list of species identified as *unlikely* and *very unlikely* in the project area is not provided in Appendix 1. This appendix may be misidentified or misplaced.

5.8.1.3 Rationale

In order to assess the appropriateness and value of the species categories, the full results of the species search is required.

5.8.1.4 Request

The GN recommends that Bathurst Inlet Port and Road Joint Venture Ltd. provide the missing appendix.

5.8.1.5 Response

The missing appendix is supplied in this volume as Appendix 5.8-1. The designations of 'unlikely' and 'very unlikely' under the 'Occurrence' heading indicate the probability for the presence of the species in the Project area.

5.9 Issue – Cumulative Effects

5.9.1 Information Request #19

5.9.1.1 Issue Identification - Climate

5.9.1.2 Concern

The Proponent has indicated in sub-section 35.3.2 (Climate) that that the delivery of fuel to existing mines via the Project facilities may reduce GHG emissions by replacing part of the current over-land trucking route with ocean transport, which is less emissions intensive. They also state that a "complete life-cycle analysis of diesel fuel produced for, shipped to and used by the existing mines would be required to quantify the potential reduction in emissions."

5.9.1.3 Rationale

In order for NIRB to assess the comprehensiveness of the environmental effect assessment, this information is required

5.9.1.4 Request

To support this evidence, incorporate the findings of Climate IR #1 (same issue) into this cumulative effects assessment.

5.9.1.5 Response

The proponent will revise the air quality modelling study and assessment in response to a number of requests (see response to request GN IR #2 for full details). The corresponding reports (Appendices B-2 and B-4 of the DEIS) will be updated accordingly.

The revised air quality study will include updated emission inventories for all modelling scenarios and a comparison of these inventories to that of the current overland route.

5.9.2 Information Request #20

5.9.2.1 Issue Identification - Air Quality

5.9.2.2 Concern

There is a lack of quantitative analysis supporting the conclusion that the magnitude of potential air quality effects will increase in proportion to future increases in truck traffic and shipping. While the expected increases in traffic is stated, there is no dispersion modelling to support the conclusions. There is also a failure to support conclusions respecting the air quality effects of the project vs. the potential increase in traffic on the current overland route.

5.9.2.3 Rationale

In order for NIRB to assess the comprehensiveness of the environmental effect assessment, this information is required.

5.9.2.4 Request

To support the conclusions respecting the magnitude of potential future air quality effects and the conclusions respecting the project effects vs. the current overland route provide i) dispersion modelling results for the cumulative effects case, and ii) an annual emission estimate for all substances of concern comparing the project effects vs. the current overland route.

5.9.2.5 Response

The proponent will revise the air quality modelling study and assessment in response to a number of requests (see response to request GN IR #2 for full details). The corresponding reports (Appendices B-2 and B-4 of the DEIS) will be updated accordingly.

In response to this request two additional scenario will be included to reflect potential cumulative effects due to an increase in the number of users for the BIPR road. Based on estimated hauling requirements for the reasonably foreseeable future, mining projects in the region could require approximately 21,000 truck loads each year. This traffic volume will be used in the cumulative effects scenario.

The revised air quality study will also include updated emission inventories for all modelling scenarios and a comparison of these inventories to that of the current overland route.

5.9.3 Information Request #21

5.9.3.1 Issue Identification - Noise

5.9.3.2 Concern

The Proponent presents evidence that increased traffic volumes on the road and near the port facility may result in increased 24-hour average and maximum noise levels, but will not exceed the guideline value of 40 dBA. They do not present quantitative evidence such as site-specific noise modelling for the operations and future cases to support specific conclusions.

5.9.3.3 Rationale

In order for NIRB to assess the comprehensiveness of the environmental effect assessment, this information is required.

5.9.3.4 Request

Provide operations noise models for the road and the port for the operations and future cases to predict the increase of noise level in the environment. Should there be any excess above a noise criteria limit, then mitigation measures are to be specified in the models.

5.9.3.5 Response

The Cadna/A noise abatement software will be used to estimate noise levels during construction and operation of the Project (see GN IR #13). Separate scenarios will be run for the port (including the airstrip) and inland road. The noise effects assessment will be revised using model results, including the assessment of potential mitigation measures.

5.10 Issue – Spill Contingency Plan

5.10.1 Information Request #22

5.10.1.1 Issue Identification – Spill Planning and Response

5.10.1.2 Concern

The project is being proposed to provide transportation alternatives for the shipment of approximately 3 million tonnes of fuel and operating supplies annually. The project will involve the use of ocean going ships, barges and trucks to transport the material, requiring the storage and multiple transfer of significant volumes of fuel and dry goods. While the proponent will own and operate the infrastructure, third parties will own the fuel and operational supplies and contractors will be hired to transport the fuel and supplies. Multiple parties and interests are involved during the operational phase, responsibility for spill planning and response need to be clearly established and communicated.

5.10.1.3 Rationale

While detailed Spill and Emergency Response Plans can be prepared during the permitting stage, responsibilities need to be confirmed during the environmental review.

5.10.1.4 Request

It is recommended that Bathurst Inlet Port and Road Joint Venture Ltd. clearly document responsibilities for spill planning and response for all activities and phases of the project.

5.10.1.5 Response

During operations of the port and road proponent will ensure spill abatement equipment and supplies are stored and available at the port site at all high-risk locations with backup equipment supplies in the warehouse. Personnel will be trained in procedures for spill response. A designated spill response team will be nominated and contact information and procedures posted. Responsibility will be presented in the FEIS.

All spills will be reported on the 24-hour reporting line and within 30 days of the incident a detailed spill report will be filed.

In addition to and not withstanding the above, all road and port users will be responsible spill response and clean up for any spills that the user caused either jointly with other users or through its actions. It will be the proponents' responsibility to ensure that users adhere to this requirement. This requirement (spill response and clean up) will be a condition in all contracts, purchase orders or authorization to enter or use the port facility and / or road. The above conditions will additionally apply to the construction phase.

5.11 Issue - Waste Management

5.11.1 Information Request #23

5.11.1.1 Issue Identification - Sewage Sludge Management

5.11.1.2 Concern

The method of managing sewage sludge has not been confirmed by the proponent. The proponent intends to use prefabricated sewage treatment plants at both the port site and

Contwoyto Camp during construction and operation phases. Discharge of treated effluent will be to the marine and freshwater environment, respectively. The terms of reference requires documentation of how sewage sludge will be managed. On Page 4-49 of Document A3, the proponent states "Sludge from the STP will be removed to a suitable storage facility approximately every 2 months." The DEIS does not provide an indication of what is a suitable storage facility or what volume of sludge will be generated.

5.11.1.3 Rationale

The assessment of potential effects of sewage sludge management cannot be completed until the volume of sludge method of management is identified

5.11.1.4 Request

It is recommended that Bathurst Inlet Port and Road Joint Venture Ltd. clearly document the method for managing sewage sludge.

5.11.1.5 Response

Sewage sludge obtained from screening in the sewage treatment plant along with any sludge precipitated in the water and wastewater treatment plants will be dewatered and incinerated on site. Ash from the incineration process will be buried in designated cells of the landfill(s).

5.11.2 Information Request #24

5.11.2.1 Issue Identification - Solid Waste Management

5.11.2.2 Concern

Management of solid wastes from the project is not documented. The EIS Guidelines required the proponent to document how all types of waste will be handled, stored, transported and disposed of. The DEIS does not address this requirement. Section 7 of Document G4 provides some general direction on waste management but does not present a Waste Management Plan. The volumes, types and waste disposal methods are not identified in the DEIS or supporting documents.

5.11.2.3 Rationale

The project has the potential to generate a variety of wastes during construction and operational phases. Proposed volumes, types and methods of managing the wastes should be identified to enable a full assessment of potential effects.

5.11.2.4 Request

It is recommended that Bathurst Inlet Port and Road Joint Venture Ltd. clearly identify the volume, types and locations of waste generated during each phase of the project and the proposed methods for managing the waste.

5.11.2.5 Response

Multiple chamber in-line diesel-fired incinerators will be installed at the Port and Contwoyto Camps. These incinerators will be used for domestic wastes including food wastes, sewage sludge, construction wastes such as cardboard, wood planks, combustible scraps, and other general garbage. Hazardous wastes will not be incinerated on-site.

A detailed Waste Management Plan is presented in Appendix 3.2-1. It lists the type, source, and estimated quantities of wastes.

5.12 Issue - Hazardous Materials

5.12.1 Information Request #25

5.12.1.1 Issue Identification - Hazardous Materials Management has not been addressed in the DEIS

5.12.1.2 Concern

The EIS Guidelines require the proponent to identify the types and volumes of hazardous materials to be used or produced during the project. Additionally, a Hazardous Waste Management Plan was to be prepared. The proponent has addressed the main hazardous material to be stored and transported during the project, diesel fuel, but has not identified what other hazardous materials may be used/generated/transported, *etc*.

5.12.1.3 Rationale

The project has the potential to use/produce/transport a variety of hazardous materials during construction and operational phases. A full assessment of potential effects requires understanding of the types and volumes of hazardous materials involved and methods to manage them.

5.12.1.4 Request

It is recommended that Bathurst Inlet Port and Road Joint Venture Ltd. clearly identify the volume and types and hazardous materials involved in the project and management strategies to mitigate potential environmental effects.

5.12.1.5 Response

A detailed Waste Management Plan is presented in Appendix 3.2-1. It clearly identifies the volume and types of hazardous materials involved in the Project.

5.13 Issue - Socio-economic

5.13.1 Information Request #26

5.13.1.1 Issue Identification - Work Rotations

In the section *Effects Assessment* under *Effect Statement: Potential for rotational work schedules to disrupt aboriginal family unit/cohesion* it notes that the workforce rotation would be based on

two weeks on, two weeks off format based on the current industry norm for Nunavut and Northwest Territory mining developments. While it is understood that this rotation is current industry standard it would be interesting to know if the Proponent considered other workforce rotation options for this project or consulted with individuals in the region in terms of the format of the rotation.

5.13.1.2 Recommendation

The Proponent should provide some details on whether other workforce rotations were considered and whether consultation on the proposed workforce rotation occurred in the region.

5.13.1.3 Response

Proponent Rationale for selection of workforce rotation

The proponent has extensive experience in the north, with knowledge and understanding of the challenges and benefits of various work schedule options for northern workers, their families and communities. However, prior to determining the preferred workforce rotation for the Project, a comprehensive review of literature related to rotational work schedules and long distance commuting (LDC) was undertaken. This review highlighted current areas of concern and possible strategies to minimize disadvantages associated with rotational work schedules. It also reaffirmed the proponent's confidence that the industry standard workforce rotation of two weeks on, two weeks off, was the most suitable. It was determined that consultation with potentially affected communities, workers, and social service providers would be conducted during preliminary socio-economic data collection activities. The proponent was provided some community feedback related to workforce rotations obtained during interviews and preliminary research conducted by New Economy Development Group during their 2003 fieldwork. Additional and more focused follow-up consultations took place in 2006/2007 with representatives from social service agencies, youth in Nunavut Arctic College's pre-employment program, and with members in communities having either indirect or direct experience with different work schedule options.

The proponent's experience with and knowledge of issues related to employment in the north, coupled with results from a review of existing research on this subject, revealed the most appropriate option would be a 2/2 roster with workers flying in and out from local communities for two-week work rotations. Consultation with local communities revealed that although there are concerns associated with the proposed workforce rotation and LDC in general, there is no better alternative.

Summary of literature review

LDC is the preferred industry standard for several reasons: it is cost effective, spouses and family can remain in their home community with access to support and services, and it is generally believed to be the least disruptive for workers (Ritter, 2001).

Despite a recognized need for more research specific to rotational schedules overall, existing literature on the effects of the work rotation system on workers, their families, and their communities identifies effects on both family and community dynamics. Effects experienced at

the household level include: adjustment associated with absentee spouse/'intermittent husbands' and absentee parent (InterGroup Consultants Ltd., 1982; Shrimpton and Storey, 1989; Costa, 2004; InterGroup Consultants Ltd., 2005); burdening associated with increased responsibility and forced unilateral decision making (InterGroup Consultants Ltd., 1982; AMMA, 1997; Fouillard, 1997; Golder, 2002; InterGroup Consultants Ltd., 2005); increased concern and worry for the well-being of absentee relatives (InterGroup Consultants Ltd., 1982; O'Faircheallaigh, 1995; InterGroup Consultants Ltd., 2005); and increased spending resulting from cash income (Gagnon, 1992). Adverse effects on relationships are cited (Storey, 1991; Gibson, 1993; AMMA, 1997; Golder, 2002; Kuyek and Couman, 2003) and include: increased rates of family violence and break-ups (Storey, 1991), strain on extended familial relationships (O'Faircheallaigh, 1995), problems associated with increased availability of income contributing to substance abuse (InterGroup Consultants Ltd., 1982; Storey, 1991; InterGroup Consultants Ltd., 2005) and loneliness associated with separation from family (O'Faircheallaigh, 1995).

Effects on community dynamics include: the need for support services within the community and at the work site, lack of support for women, and inadequate childcare options (Golder, 2002). Impacts on traditional activities are also cited and include: the effect of rotational schedule on workers' involvement in community activities (InterGroup Consultants Ltd., 1982; Iverson and McGuire, 1999; InterGroup Consultants Ltd., 2005), participation of workers in subsistence activities, possible decline in traditional activities (Gagnon, 1992; O'Faircheallaigh, 1995; Golder, 2002) and reduced community involvement (Storey, 1991). Additional impacts to communities such as out-migration to larger communities (Storey and Hamilton, 2004), loss of skilled and employable workers (Golder, 2002), and absence of new employment opportunities within the community are noted (Gagnon, 1992).

Research examining advantages and disadvantages for women associated with rotational work schedules has also occurred. Research suggests that the 2/2 roster (two weeks in, two weeks out) is preferable among single women and those with a mature family; while a 4/3 roster (four days in, three days out) is preferable for women with young families (Costa *et al.*, 2006).

Summary of concerns related to workforce schedule expressed during consultation activities

Interviews with community members, elders, and social service providers in 2006 revealed that perceived effects associated with rotational work schedules were consistent with findings from existing research. For the communities of the Kitikmeot, concerns were associated with workers' access to traditional foods and participation in traditional activities, increased strain on already over-burdened social service providers, family stress, disconnection from the community and loneliness, inappropriate spending of income and its relationship to the cycle of abuse, and increased crime from fly in/out stopovers. Concerns over the possible increase in crime by workers on a rotational schedule were raised by community members in Cambridge Bay. A representative from the RCMP detachment stressed the importance of communication between the proponent and the local RCMP. It was suggested that effective communication could result in RCMP awareness of non-local employees within the community and of community members returning with income for possible substance abuse. Other concerns included the lack of security on charters, availability of drugs and alcohol at the work site, and inadequate/infrequent communication between families and workers during shifts.

During an interview with the Economic Development Officer for the Hamlet of Cambridge Bay concern was expressed over the brain drain effect - the loss of skilled and employable workers from the community in pursuit of outside opportunities coupled with the significance of rotational schedule issues for the community agencies providing health and wellness services.

Support for the selected workforce rotation was also expressed. Some interviewees mentioned the following benefits: increased income for participation in traditional activities, enhanced emotional well-being and self-esteem associated with employment, opportunities to access on site services, and absence from negative influences within the community such as alcohol, gambling or drugs, Inuit familiarity with rotational schedules, improved standard of living, and better health and nutrition for families of workers due to income and general benefits of capacity building, skill development and acquisition of transferable skills.

For additional information obtained during consultations and fieldwork see Appendix A-4, sub-appendix 1; Appendix F-8; and Appendix F-9 of the DEIS.

5.13.2 Information Request #27

5.13.2.1 Issue Identification - Area of Influence

In the section *Socio-economics* it notes that 15 communities within Nunavut and the Northwest Territories may be affected by the project. Further analysis throughout the DEIS notes various ways that these communities may be impacted by the development of the Bathurst Inlet Port and Road. It should be noted that for certain aspects of the project this area of influence may need to be expanded as there will be impacts on other communities, outside of these 15, that will be impacted. In particular, employees will come from other communities outside of the 15 noted and thus impacts will be felt in these origin communities.

5.13.2.2 Recommendation

In the course of outlining the impacts of the project in the DEIS the Proponent should consider increasing the area of influence for certain aspects of the project.

5.13.2.3 Response

The area of influence for the social and economic impact assessment was established/recommended by NIRB in Section 3.5 (Page 9) of the report entitled *Final Environmental Impact Statement (EIS) Guidelines for the Review of the Proposed Bathurst Inlet Port and Road Project* in December of 2004. In establishing the actual study area for analytical purposes, the BIPR team considered the NIRB suggested study area and also considered the benefits of increasing the study area. It was concluded that the 15 communities identified by NIRB go beyond the 'core' communities that experience direct effects from the Project and that a wider study area would not likely capture any additional 'core' communities. The study area did not limit assessment of potential social and economic impacts. Had analysis of biophysical effects, consultation with communities and government agencies, or the review of other reports and studies shown that there was potential for direct or significant indirect effects beyond this area, it would have been enlarged. The study area was also reviewed for the cumulative effects

analysis, and again it was determined that the study area boundary captured the area most likely to experience potential direct or significant indirect effects.

Regarding the comment, "It should be noted that for certain aspects of the project this area of influence may need to be expanded as there will be impacts on other communities, outside of these 15, that will be impacted. In particular, employees will come from other communities outside of the 15 noted and impacts will be felt in these origin communities," the majority of employment will be derived from within the area of influence based on the following criteria outlined in Appendix F-2 of the DEIS, *Socio-economic Effects Assessment*:

Key Characteristics of the BIPR Construction Phase:

- 260 jobs will be created. Approximately 30.0% (78 positions) of total construction employment will be Aboriginal workers, primarily from the Kitikmeot Region.
- Payroll is estimated to be $40 million per year; and
- Personnel would be transported between the Project and their local communities by charter aircraft; roster rotation will be 2 weeks on the job and 2 weeks out.

Key Characteristics of the BIPR Operations Phase:

- It is estimated that 57 full-time personnel will be employed for maintenance and operations activities including 6 people based in Cambridge Bay to manage the project;
- A target of 50% Inuit (Nunavut) workers at the commencement of operations, increasing to 75% within 10 years with as many recruits as possible coming from the Kitikmeot Region;
- Payroll is estimated to be $3.5 million per year;
- Approximately 150 people will be employed in the transportation of fuel and supplies at peak times during the winter months. The trucking payroll is estimated to peak at $9 million dollars per year; targeting 30% being Inuit (Nunavut) workers at the start of operations, increasing to 80% after 10 years; and
- Indirect jobs and contracts will be created through the supply of goods and services.

Additional points to consider:

- There is presently a shortage of skilled workers in Canada due to the demand from existing projects, including other major projects (current and/or proposed) within Nunavut and the NWT, such as Doris North, Diavik, EKATI, Mary River, and Snap Lake. Skilled workers that are sourced from outside the Project area will likely be drawn from a wide variety of urban centres;
- Communities advised they are interested in skills training, employment, and contract opportunities. These are considered a benefit to the Region;

- Unskilled labour sourced from within the study area will not be permanently removed from the communities, but will be flown in and out of their communities on regular work cycles, living in camps at Bathurst Inlet and Contwotyo Lake during construction; and
- The Project will meet the regional and territorial economic development goal of assisting in the creation of self-sustaining and self-sufficient communities by providing additional training and employment opportunities within the Kitikmeot Region, thus enhancing the positive effect on the local and Regional economy.

5.13.3 Information Request #28

5.13.3.1 Issue Identification - Treatment of Mining Developments in the Framework of the Project

In the section *Socio-economics* it notes that "it is predicted that proposed and potential future developments including Gahcho Kue, Hackett River, Hope Bay deposits and Izok Lake will use the Project facilities to import supplies and export products." On what basis does the Proponent make the inference that these projects will actually use the Bathurst Inlet Port and Road facilities? Has the Proponent has discussion with the Proponents of these potential mining developments? Given imperfect information related to the nature of how these projects might use BIPR facilities, the timelines of these proposed projects and activities associated with these projects it could call into question assumptions associated with BIPR development.

5.13.3.2 Recommendation

The Proponent should provide details on the information that was used to determine what projects might use BIPR facilities and what project's development might be positively impacted by BIPR development.

5.13.3.3 Response

Appendix A-3, Section 3 of the DEIS, describes the potential users and related benefits. The BIPR access route is a shorter haul and less dependent on the current winter road window. Details on distances and travel times are shown in Tables 3.2-1 and 3.7-1 for the existing winter road from Yellowknife and the proposed BIPR road respectively. This information was based on operations data from the existing winter road and estimates for the BIPR facility. The existing operating mines have expressed an interest in using the BIPR facility (BHP and RTZ) as well as Hackett River, which is in the advanced stages of preparing a DEIS. The projects listed in this DEIS all contributed funds to cover the costs of the original project feasibility study.

The functions served by the BIPR facility provide essential services for the development and operations of the Hackett River project as fuel and bulk supplies could be purchased and delivered to the port and then transported to the site faster and more economically.

The projects mentioned as potential users are in various stages of feasibility assessment and a definitive answer as to whether or not they will ever go into production is not possible at this stage. What is certain is that the existence of the BIPR would make exploitation of the potential resources more feasible. The development of base metal projects requires a transportation route

to get the raw product or concentrates to smelters or refining facilities. There are obviously no guarantees at this stage but the proponent is confident that the provision of a viable transportation route would enhance the feasibility of these projects

5.13.4 Information Request #29

5.13.4.1 Issue Identification - The Proponent's Industrial Benefit Commitments are Limited and Unclear

5.13.4.2 Issue

Community economic development and the evolution of local and regional economies have been identified as important local concerns, and Wage Employment Opportunities and Economic Development is one of the assessment VSECs. Industrial benefits planning (respecting, for example, bid packaging, the arrangements for providing local companies with timely information about requirements and procurement processes, and any local preference policy) will be a key contributor to success in delivering local and regional economic benefits. However, the draft assessment provides limited operations phase-only discussion of the business opportunities and the Proponent's commitments respecting delivering local opportunities.

5.13.4.3 Recommendation

The Proponent should provide a concise list of its construction and operations phase industrial benefits planning commitments in the DEIS in order to assess the Proponent's commitment to, and likely success in, delivering local business benefits.

5.13.4.4 Response

Other industrial benefits may include on-the-job and classroom training for trades persons, employment for locals such as cooks, waiters, janitors, labourers, trades persons, and foremen.

Industrial benefits may include the establishment of joint venture companies (Nunavut/local and others) for work required during construction and operation. These may include: security, camp catering, trucking companies, camp maintenance, freight forwarding/trans-shipping at the port, safety & environmental supply, and air transport.

Purchasing from "local" sources will be preferred where it is logistically feasible and provided cost premiums to do so are realistic. Camp catering is one area where we could expect that staffing and purchasing would be mostly with and through Inuit.

During construction the types of materials, supplies and equipment needed are largely unlikely candidates for local supply. It is anticipated that heavy mobile construction equipment would be provided by the proponent's own (Inuit-owned) company. Items to be purchased one time and sourced from the South would include steel for fuel tanks, wharfs and slabs, membranes for liners, prefabricated buildings, camp machinery and equipment including electrical power generation and distribution, water and sewer supply and treatment equipment, pumps, pipes, fittings, communications. It would not be considered feasible to direct such purchases through local firms unless they were already in existence.

Items required to maintain operations are more likely candidates to source through local firms which can plan on a predictable flow of business.

It would appear that the intervener is referring to Volume VII, Appendix F-2 of the DEIS, not F-7. The reference cited simply addresses a response to a specific VSEC, Wage Employment Opportunities and Economic Development. Other sections of the DEIS objectively discuss potential opportunities for the local economy and how the Joint Venture will support the community in taking advantage of them. These sections include the following excerpts which pledge the Proponent's commitments to socio-economic progress in the region.

Volume VII, Appendix F-2 of the DEIS, Section 5.2.3 – Sponsor's Corporate Values

All four of the corporate values embody a commitment to the Proponent's mission statement "To create a strong, viable and stable financial base for our business, from Inuit entrepreneurs and for employment opportunities for Kitikmeot beneficiaries of the Nunavut Land Claims Agreement."

Volume VII, Appendix F-2 of the DEIS, Section 5.3

Table 8.2 presents an overview of mitigation measures that the proponent has committed to implement throughout the entire life span of the BIPR project. These include potential effects on the wage economy, traditional economy and tourism.

Volume VII, Appendix F-2 of the DEIS, Section 5.5.6 – Economic Opportunities

"The Proponent together with Kitikmeot Region and local communities will support the potential for tourism development and will identify monitoring requirements for sustainable development for this industry. The Proponent may consider providing assistance to communities in the area of influence who may be interested in engaging in such an activity."

Volume VII, Appendix F-3 of the DEIS, sub-appendix 1 – Social and Economic Impact Assessment Matrix

The matrix includes construction and operations phase impacts and opportunities with mitigation/proponent commitments.

5.13.5 Information Request #30

5.13.5.1 Issue Identification - Impacts on Nunavummiut

The socio-economic analysis in the DEIS does not clearly outline the socio-economic costs and benefits that could accrue to Nunavummiut. The DEIS often presents the costs and impacts in terms of Nunavut and the Northwest Territories combined.

5.13.5.2 Recommendation

The Proponent should include more discussion of the impacts on Nunavut solely as this is of most importance for the purposes of the Government of Nunavut's review.

5.13.5.3 Response

As discussed in Appendix F-2 of the DEIS, *Socio-economic Effect Assessment*, Section 4, the effects assessment determined potential and 'net' social and economic effects and benefits of the Project on the communities, residents, and local and regional economies within the area of influence. To ensure the assessment considered the differences between the communities of Nunavut and the Northwest Territories, the impacts and benefits assessments were conducted separately, and their results reported separately. Potential impacts and benefits were discussed for both the construction and operations phases.

5.13.6 Information Request #31

5.13.6.1 Issue Identification - Rationale for 20-Year Project Life

The discussion under the section *Project Cost and Schedule* notes that the analysis is done on a project-life of 20 years.

5.13.6.2 Recommendation

The Proponent should provide some rationale for why only a 20-year life of project was used for the analysis when intuitively one might expect the time-frame of study for this road and port project to be longer.

5.13.6.3 Response

As outlined in the EIS Guidelines provided by the NIRB "…The inclusion of a time perspective, from the early planning of the Project through to its operation over the next few decades (20 years), is important in order to provide the NIRB with a full understanding of the Cumulative Environmental Effects of the Project in combination with other past, present and Reasonably Foreseeable projects."

Detailed in the *Cumulative Effects Assessment* (Appendix G-5 of the DEIS) are nine proposed developments that qualify as 'reasonably foreseeable.' Two of the projects may be classified as being induced by the Project: Izok Lake and Hackett River. The Project may facilitate improved access for surface transport to these projects, thus enhancing their feasibility. Table 2.2-3 in Appendix G-5 of the DEIS outlines the features of these projects and their projected life spans. Projected life spans in this table range from 12 to 16 years and several are designated as 'not stated' or 'dependent on mining operations.'

Based on these operating parameters for prospective projects and the EIS guidelines, a project life of 20 years seems a reasonable time horizon given the guidance from NIRB.

5.13.7 Information Request #32

5.13.7.1 Issue Identification - Insufficient Use of Literature on the Socio-economic Effects of Northern Resource Development and Infrastructure Projects

A review of references listed in the supporting documents for the Proponent's Social and Economic Assessment suggests that it has made only limited use of the extensive documents

currently available on the socio-economic effects of northern resource development and infrastructure projects. The 2006 Review of Socio-economic Impacts states that in identifying and assessing VSECs of the Project, it made use of, among other things, a "comparative analysis of socio-economic reports for comparable projects impacting the same communities such as Doris North." Yet, the only report it cites is the analysis prepared for the Doris North project. Similarly, the 2003 Review of Socio-Economic Dimensions states that: "Based on the experiences in other northern areas, it is known that projects of this nature have certain known human and financial costs on families, community life and the demands for public services." However, it cites only one study undertaken for the National Round Table on the Environment and the Economy in support of its assessment of the potential impacts of the Project.

5.13.7.2 Recommendation

The Government of Nunavut needs to be assured that the Proponent has adequately reviewed and taken into account the experiences of other northern development projects in assessing the effects of the proposed BIPR Project on the key VSECs that it has identified in its Social and Economic Impact Statement. As such, the Proponent should conduct a more comprehensive review of the existing literature on the socio-economic effects of northern developments and provide an accessible summary of its main findings. Particular attention should be given to concerns that have been raised about the socio-economic effects of developments similar to the proposed BIPR Project, as well as to the various policies, programs and initiatives that have been undertaken to address them.

5.13.7.3 Response

The following published reports were reviewed during the social and economic effects assessment conducted for the Project:

- *A Socio-Economic Impact Assessment of the Proposed Jericho Diamond Project in the North Slave Geological Province Nunavut*. Robert Hornal and Associates Ltd, 2003.
- *Assessment of Socio-Economic Effects*. Section 5.4 in the *Final EIS for the Doris North Project*. Miramar Hope Bay Ltd., 2005.
- *Human Environment of the High Lake Project*. Volume 3, Section 1 and Related Appendices. Wolfden Resources Inc, 2006.
- Social, Economic and Cultural Components. Section 4.21.4 in the *Meadowbank Gold Project Draft Environmental Impact Assessment Part 1: Report*. Cumberland Resources Ltd., 2004.
- *Socio-economic Impacts*. Section 6.0 in the *Final EIS for the Doris North Project*. Miramar Hope Bay Ltd., 2003.

The reports contained in the Appendix of the DEIS, referenced in IR #32, were only two of the reports considered. Both are considered preliminary and previously unpublished documents that helpfully provided a profile of key communities within the Project area of influence.

5.13.8 Information Request #33

5.13.8.1 Issue Identification - Requirement for a More Detailed Analysis of Project Impacts

The Draft Social and Economic Impact Assessment identified a number of potential cultural and social effects from the BIPR Project anticipated for Nunavut communities. It also highlights the need for various mitigation measures to address these effects; these will be undertaken by the Proponent working together with other public and private agencies. Concerns about increased "strains on community services" and about "community preparedness" are articulated in the Proponent's *Report on Community Consultation* and in the 2006 *Report on Socio-economic Impacts*. But, beyond this, the analysis gives little attention to the Project's effects on the programs, services and institutions that will be responsible to deal with social issues arising at the community and regional levels during its construction and operations phases. It says very little, in particular, about the capacity of existing programs and institutions in Nunavut communities to address the effects that may be generated by the proposed Project.

5.13.8.2 Recommendation

The Proponent should prepare a more detailed analysis of the effects of the BIPR Project on community programs, services and institutions. Particular attention should be given to the ability of community institutions to effectively address the cultural and social impacts resulting from this Project.

5.13.8.3 Response

Community programs, services and institutions in the Kitikmeot and in Nunavut:

In the communities of the Kitikmeot, government departments/agencies and the Hamlet governments, are responsible for community services. Funded mostly by the Department of Community and Government services, the Hamlet governments deliver services such as water and waste management, housing, wellness services and recreation.

Community Services can be categorized into the following groups: social, health, wellness, safety and security, recreation, and other.

Social services include daycare (children 18 months and older), housing (subsidized), and women's shelter (shelter, food and psychiatric nursing care). Of the Kitikmeot communities within the Project's area of influence all, with the exception of Bathurst Inlet and Omingmaktok, provide these services.

Health Services include the Regional Health Centre, located in Cambridge Bay, which provides 24-hour emergency care, short-term care, palliative and birthing care, and a physician on staff. The community health centre also falls into this category, providing primary health care, tele-health service, and a nurse's station. There are community health centres in Kugluktuk, Gjoa Haven and Taloyoak. Between 2002 and 2003, visits to the health care centres were as follows: Kugluktuk (11,263), Cambridge Bay (8,363), Taloyoak (6,236) and Gjoa Haven (8,957). A significant number of these visits were attributed to respiratory and hearing problems, injury and poisoning. For issues of staff shortage there are tele-health services in lieu of a regularly visiting doctor or specialist.

Wellness services are provided by Community Wellness Centres and can be found in Cambridge Bay and Kugluktuk. Among the many services offered are: child protection, initiating alcohol and drug counselling, and a hotline service. In the Hamlet of Cambridge Bay, the Wellness Centre also provides programs for drug and alcohol, gambling and addictions, family violence, counselling and an elders centre and program. The Wellness Centre in Cambridge Bay provides invaluable support to the community however, workers cite being overburdened with huge caseloads, and limited resources as major barriers to providing quality care.

The RCMP and Fire Department provide safety and security services to the communities of the Kitikmeot. Bathurst Inlet and Omingmaktok do not have these services within the community but obtain services from the detachment in Cambridge Bay.

Recreational services, such as sports and youth programs, elders programs and traditional social activities/programs are provided through the Community Recreation Centre. There are limited facilities in some communities but access is given to all residents.

Other services include water delivery, roads and public transportation, waste services, grocery stores and communication – found in all communities but Omingmaktok and Bathurst Inlet - and banking, post office, legal services and public libraries – found in Cambridge Bay.

Challenges, Concerns and Issues Facing Community Institutions:

The following information was obtained from Interviewees during fieldwork and consultation activities involving residents of Kugluktuk (2006/2007), Cambridge Bay (2006/2007), Bathurst Inlet (2007), Omingmaktok (2007), Taloyoak (2007) and Gjoa Haven (2007). Interviewees in 2006 were aimed at identifying community service-related issues of concern with the Project, with the identification of potential effects, and with the development of recommendations.

Interviews with residents involved in the provision of health and wellness services resulted in the following list:

- Capacity issues: a large number of medical staff is non-Inuit and non-local resulting in cultural and language barriers and failing to meet the Government's objectives around Inuit capacity building and hiring.
- Lack of resources: staff is overworked, caseloads are too large and there are inadequate resources to hire additional personnel or to provide much needed services within the community.
- Issues facing families: absenteeism associated with rotational work schedules creates stress for worker, their families and spouse and the community. Development in the region has resulted in workers returning home with monies that are poorly managed or spent on gambling, drugs, or alcohol. The link between family violence, abuse and improper spending is a major challenge for community service providers.
- The high cost of nutritious food results in poor nutrition and health.
- Importance of community preparedness and need for involvement and collaboration in planning for change and possible impacts.

- Suicide and depression are serious concerns for the communities.

Interviews with safety and security service providers resulted in the following comments:

- The RCMP requires additional resources to address the increase in criminal activity and to adequately provide services over such a large area.
- Increased development creates increased income which results in increased criminality and alcohol/drug-related issues.

Additional comments and concerns included:

- Housing shortages.
- Uncertainty regarding ability to deal with influx of new residents as a result of development projects and the possible burden on existing services that are already overburdened.
- Lack of infrastructure in some communities forces residents to relocate.

Project-related concerns

1. Ability of services to address/manage issues related to rotational work schedule and stress caused to the individual and family:
   - "Our programs and services are stretched to the limit already and managing issues connected to fly-in/fly-out and development in the region is already a challenge" (Cambridge Bay, 2006).
   - "Sometimes there's a problem from Nunavut, from Kitikmeot, sometimes they should check that some young people get a job somewhere else and they have a problem taking drugs to work, they bring drugs home when they come back home…I know that this problem has been going on in Kitikmeot, young people working at the mines buy drugs and if they are going to start that project they should have someone work very hard on that because maybe some young people might want to bring drugs home" (Kugluktuk, 2007).
   - "Well with any development we've got an increase of money, someone with low income coming back to the community with a tone of money, you know, well they'll have the other factors influencing them such as alcohol and drugs – we have attacks of infidelity when people go to work at an area, a mine" (Cambridge Bay, 2006).
2. Inadequate resources:
   - "The awareness centre has gone through some staff turnover. Our biggest concern is that the turnover is too high. We need to make it more attractive for people to stay – the commitment is there but not the money commitment – budget constraints. An influx of money into the centre would be great" (Kugluktuk, 2006).
3. Influx of visitors, workers, and income:
   - "Anytime there's more people, more money, there's more problems – like alcohol, more drugs, more crime – they all go hand in hand" (Cambridge Bay, 2006).

- "If there are charters bringing non-local people into the community, there isn't good enough security and people can bring alcohol and other things in that will cause problems" (Bathurst Inlet, 2007).
- "People might come here and when they do they could bring with them problems" (Cambridge Bay, 2007).
- "The issue that I want to see tackled is when the road and port open up there's going to be more traffic and more goods coming through which includes alcohol and drugs. So I'd like to see a plan in place, the regional leaders of Kitikmeot can work on it but I'd like to see the proponent measure some options to see how they'll tackle this rather than say it's the community or region's responsibility. Working together on this issue can make a difference for everyone in the Kitikmeot region" (Kugluktuk, 2007).

4. Existing issues may be compounded by new, currently unknown problems associated with the project:
   - "We have one of the highest social issues in Canada and unfortunately its going to take some time before it gets any better – maybe years or so, maybe decades, maybe even the next generation, to finally get better" (Kugluktuk, 2007).
   - "We have a hard enough time dealing with the number of clients we see now. I don't know how we could see more people – there's isn't enough time in the day or staff to see them" (Cambridge Bay, 2007).
   - "It is impossible to say what the impacts might be when we don't know how many people might come here and what kind of problems they might bring with them" (Cambridge Bay, 2007).

Conclusion

The issues raised by individuals involved in the provision of community services and members of the communities are mostly existing issues such as family stress and violence, drug and alcohol abuse, overburdened health care providers, and inadequate resources. The communities stressed the importance of working with the community service providers to plan for and address concerns and existing issues and to ensure that any impacts associated with the Project does not compound the existing issues. Community service providers from the Wellness Centre in Cambridge Bay and Social Services in Kugluktuk recommended working together to develop plans prior to construction.

The Bathurst Inlet Port and Road Project has the potential to enhance the quality of life for residents in the Kitikmeot by reducing the cost of goods, providing income and employment and facilitating development in the region. However, the Project must be aware of the concerns and existing social conditions within the communities in the Kitikmeot in order to avoid compounding these problems.

5.13.9 Information Request #34

5.13.9.1 Issue Identification - Requirement for More Analysis of Traditional or Land-based Harvesting

The *Social and Economic Impact Assessment* discusses potential effects of the BIPR Project on "traditional pursuit skill levels" and on "participation rates in traditional pursuits" among residents of impacted Nunavut communities. Supporting documents briefly analyze the role of the "traditional economy" in the so-called mixed economy which currently supports Nunavut communities. However, this assessment fails to deal with the traditional economy or traditional activities in an integrated or holistic fashion. It neglects the crucial role of households and extended families in structuring the harvesting activities of community members, and of ensuring the coordination and distribution of income and other economic benefits from subsistence and commercial harvests. Also, it doesn't incorporate the findings of the extensive literature on the traditional or land-based economy in Nunavut, in particular, the detailed analyses of the dynamics of this economy, the conditions making for its viability, its contribution to household income, and its function in sustaining Inuit culture.

5.13.9.2 Recommendation

The Government of Nunavut will be unable to adequately assess the Proponent's predictions about the effects of the BIPR Project on traditional activities in Nunavut communities until it is provided with a more detailed account of the dynamics of and role played by the traditional economy in Inuit community life. As such, the Proponent should prepare a more detailed and comprehensive analysis of the continuing role of the traditional economy in Nunavut communities, with attention to the crucial part played by households and extended families in structuring this economy. In undertaking this analysis, the Proponent should make use of the growing literature on the land based or traditional economy in Nunavut.

5.13.9.3 Response

Please see Appendix 5.13-1 of this volume for a supplement for improved understanding of the role of the traditional economy in Nunavut.

5.13.10 Information Request #35

5.13.10.1 Issue Identification - Access Control and Monitoring Program for the Road

It is unclear how the Proponent (or any other entity which may seek an investment in the project in the future) will control access to the proposed road and continuously monitor tourist use of the road at the Contwoyto Camp, including the intended activities of tourists in Nunavut. Access to the road includes both the use of the road itself as well as crossing the road by foot/skidoo etc. In addition, it is unclear as to the nature of conditions that will be requested in any permit that may be issued to for the road. Of the 211 km of the proposed road, 82 km passes over Inuit Owned Lands and 129 km crosses Crown land.

The proposed access control and monitoring program may effectively eliminate the potential for locals and tourists to use the road throughout the entire year, potentially having a great impact on tourism and other activities in the region.

5.13.10.2 Recommendation

It is unclear how the Proponent (or any other entity which may seek an investment in the project in the future) will control access to the proposed road and continuously monitor tourist use of the road at the Contwoyto Camp, including the intended activities of tourists in Nunavut. Access to the road includes both the use of the road itself as well as crossing the road by foot/skidoo etc. In addition, it is unclear as to the nature of conditions that will be requested in any permit that may be issued to for the road. Of the 211 km of the proposed road, 82 km passes over Inuit Owned Lands and 129 km crosses Crown land.

The proposed access control and monitoring program may effectively eliminate the potential for locals and tourists to use the road throughout the entire year, potentially having a great impact on tourism and other activities in the region.

5.13.10.3 Response

The primary concern in establishing access controls is safety for users of the road while the secondary concern regards the responsibility for environmental issues emanating from the use of the road. Such responsibility rests upon the proponents who would build and manage the road but responsibility cannot be assigned without authority to implement controls.

The road is intended for use by large trucks hauling heavy loads under a variety of weather and visibility conditions. These trucks, together with maintenance equipment operating on the road, will be equipped with radios to maintain contact with dispatchers and supervisory personnel and will be expected to be quickly advised of any hazards that appear or of conditions requiring an emergency response or the implementation of a Standard Operating Procedure necessitated by a changed condition. Radio contact is also necessary to avoid meeting vehicles in a spot not designed to allow passing of vehicles. Radio contact allows one vehicle to pull over to a widened pull-out to allow another vehicle to safely pass. When visibility makes travel hazardous, vehicles are instructed to stop and radio their positions.

In the event that ‘tourist’ vehicles should appear on the road and their presence should be unknown to the road operations personnel there is a danger of collision. Moreover, if emergency conditions should arise the location of tourist vehicles may be unknown, escalating the danger to both the occupants of such vehicles and potential rescuers. There are no services or fuel available to private vehicles north of Yellowknife, some 570 km south of the proposed Contwoyto turnoff or 780 km from the proposed port site, so it would be foolhardy for an unauthorized tourist to embark on such a winter journey in the first place. There is, of course, no access in the summer so that is not a consideration. We cannot count on the existing Tibbitt-Contwoyto Winter Road to filter out unauthorized vehicles as the operators of that road are not authorized to restrict access.

It is impractical and unnecessary to try to prevent snowmobiles from crossing the road in winter. Such crossings will be infrequent and snowmobile operators must only exercise a degree of caution commonly required in the operation of the machines. Snowmobiles or ATVs can not be operated on the road in the presence of other traffic.

If a tourist operator wished to use the road for access using a private vehicle, it would be necessary to make specific arrangements with the Managers of the road. Such arrangements may include an escort or, potentially, orienting the tourist operator into the required road operating procedures and responsibilities, ensuring radio compatibility and ensuring adequate insurance coverage was in place.

5.13.11 Information Request #36

5.13.11.1 Issue Identification - The Need for Additional Wildlife Officers

The extent of consultation regarding the proposed solution of hiring of additional Wildlife Officers to patrol during prime hunting season is not described in the DEIS. Hiring additional Wildlife Officers will imply a budgetary commitment on the part of the GN that needs to be addressed. The extent of the current documentation on consultation does not indicate that these discussions have occurred. In order for the GN to assess its ability and/or willingness to support this proposed solution further information is required.

5.13.11.2 Recommendation

It is recommended that the extent of these consultations and their outcomes be included in the consultation summary portion of the DEIS.

5.13.11.3 Response

No consultation with government officials have been conducted in regard to hiring additional wildlife officers. Consultation will occur during the environmental assessment and review process.

5.13.12 Information Request #37

5.13.12.1 Issue Identification - Need for Tourism-related Discussion in the Baseline Report

Many communities within the area of influence have identified growth in the tourism industry as a goal for local economic development initiatives. Without an understanding of the extent to which the tourism industry is currently operating in Nunavut, the potential implications of the proposed project on the tourism industry cannot be determined.

Section 1.3.1 in Volume 7; Appendix F-7 identifies that the baseline report will consider tourism. Section 1.3.10 in Volume 7; Appendix F-7 notes that "Nunavut is focusing on the diversification of the economy through tourism", and includes a listing of popular tourist attractions within the area of influence. However there is little qualitative and no quantitative tourism-related information in the baseline report.

5.13.12.2 Recommendation

It is recommended that baseline conditions for the tourism industry be described in greater detail and included in the DEIS and that the comprehensiveness of the impacts assessment portion of the DEIS be re-evaluated in the context of this information.

5.13.12.3 Response

Tourism in Nunavut

"Tourism is widely viewed as a sector that will form one of the key building blocks of our future economy. It has been singled out as one of the three pillars of economic growth, along with fisheries and mining development" (Nunavut Tourism Strategy, 2006).

In 2001, the Conference Board of Canada predicted that second to the exportation of raw materials, tourism will become the Territory's greatest export (Conference Board of Canada, 2001).

The tourism industry in Nunavut produces external capital, promotes Inuit culture and encourages the protection of the territory's resources (Government of Nunavut, 2006). It is a sector of tremendous growth potential. Niche markets with potential to generate increased tourism revenue include: eco-tourism, sport fishing, hunting and park exploration. Future growth is dependent on the development of appropriate standards and regulations, infrastructure, product development, and promotion and marketing (Government of Nunavut, 2006).

The Government of Nunavut's Department of Economic Development and Transportation (ED&T) considers the wise and sustainable use of the land as key to the economic future of Nunavut. "Nunavut's economic traditions are based on harvesting, and Nunavummiut continue to maintain strong ties to the land and to the knowledge that permits the use of the resources in a sustainable manner. Nunavut's economy is being built on these traditions with new developments in mining, fisheries, cultural industries and in tourism" (Government of Nunavut, 2006).

There is an abundance of tourist attractions in Nunavut as outlined in Nunavut Tourism's "Nunavut Travel Planner":

- arts & culture;
- floe edge tours;
- canoeing, rafting, and kayaking;
- camping & hiking;
- birding;
- parks (Northwest Passage Territorial Park, Kugluk Territorial Park);
- wilderness lodges;
- sport fishing;
- wildlife; and
- cruises.

Tourism in the Kitikmeot Region

Tourists come to the Kitikmeot region to fish, hunt, canoe and view wildlife and scenery (NPC, 2004). Sport hunting and guiding are significant contributors to the sector; in 2001, 83 sport hunts were sold to non-resident hunters by the communities of Cambridge Bay, Omingmaktok and Bathurst Inlet (Robert Hornal & Associates, 2003). There are four main tourism lodges in the Kitikmeot region: High Arctic Lodge on Victoria Island, Bathurst Inlet Lodge at Bathurst Inlet, Plummers Arctic Lodge on the Tree River, and Elu Inlet Lodge located south of Cambridge Bay (NPC, 2004).

Of the 170 Inuit-owned businesses in operation in the region in 2006, 26 were tourism- and culture-related (Gartner Lee Ltd, 2006).

Cambridge Bay

In 2006, the Hamlet of Cambridge Bay was home to 40% of the 170 businesses in the Kitikmeot (Gartner Lee Ltd, 2006). There are numerous business that have contributed to the tourism industry in Cambridge Bay including: Arctic Island Lodge, Enokhok Inn, Green Row Executive Suites, Ikaluktukiak Co-op Hotel, Kitikmeot Foods Ltd., Arctic Coast Visitors Centre, B & J Fly fishing Adventures, Central Arctic Tours & Outfitters, Ekaluktutiak Hunters & Trappers Organization, Elu Inlet Lodge Ltd, Kioleut Handy Crafts, and Top of the World 2000 (Gartner Lee Ltd, 2006; Nunavut Tourism, 2008).

Tourism operators, tourist attractions, activities and sites around Cambridge Bay include: the Elu Inlet Lodge (fishing, bird watching, hiking, boating), High Arctic Lodge, Allen's Outfitters (sport hunting and fishing), Frontiers North (Muskox tours), The Travelling Naturalist (bird watching tours), Arctic Coast Visitors Centre and Kitikmeot Heritage Centre (guided walking tours), Uvajuq Territorial Park, archaeological sites, and an abundance of wildlife and ecotourism activities (Gartner Lee Ltd, 2006; Nunavut Tourism, 2008).

Sport hunting is an important contributor to the economy of several Kitikmeot communities such as Cambridge Bay, Omingmaktok and Bathurst Inlet. In 2001, sport hunts brought in close to $2.5 million to these communities (Webster, 2002; Gartner Lee Ltd, 2006).

Cruise ship visitors visit Cambridge Bay annually and contribute to the developing tourist industry in the community. In 2005, 1,423 summer cruise ship tourists visited the Arctic Coast Visitors Centre and participated in activities such as wildlife observation, hunting and fishing, and visiting historical sites (Gartner Lee Ltd, 2006).

Kugluktuk

Kugluktuk is a popular tourist destination in the Kitikmeot and the regional headquarters for the Department of Economic Development and Transportation. The community considers mining and mineral exploration as the main vehicle for its future economic growth; however, tourism and arts and crafts have been identified as areas for development (RT & Associates, 2005). Some of the businesses/organizations that have contributed to the tourist industry in Kugluktuk are: the Coppermine Inn, Enokhok Inn, Coronation Restaurant & Catering Ltd, Aime's Arctic Tours, Anavilok Intrinsik Arts, Coppermine Tours, Kitikmeot Hunters and Trappers Assn,

Kugluktuk Angonaitit Association, Kugluktuk's Visitor's & Heritage Centre, Qilaut Originals, and Webb Outfitting Ltd (Gartner Lee Ltd, 2006).

Tourist operators, activities and attractions in Kugluktuk include: Webb Outfitters (sport hunting for caribou, grizzly and other animals), The Tree River Lodge (sport fishing), Kugluktuk Visitor and Heritage Centre, Kugluk/Bloody Falls Territorial Community Park (national heritage site), and the Coppermine River (canoeing, archaeological sites, wildlife).

Every Easter Kugluktuk celebrates the Nattiq Frolics, an annual traditional festival featuring Inuit games, ice chiseling, seal hunting and skinning and snowmobile races (Nunavut Tourism, 2008).

Bathurst Inlet

In addition to mineral exploration, tourism, hunting, fishing, and trapping are the main economic activities in Bathurst Inlet area (Gartner Lee Ltd, 2006). The pristine beauty and the traditional way of life at Bathurst Inlet have major tourist appeal, bringing visitors from all over the world to explore the area. The Hiukitak River watershed is an important traditional harvesting area for the Inuit of Bathurst Inlet and Omingmaktok and is home to an abundance of wildlife and fish (NPC, 2004).

The Bathurst Inlet Lodge (established in 1969) was a former Oblate mission and Hudson's Bay Trading Post purchased by Cambridge Bay Staff Sergeant, Glenn Warner. The Warner family and Bathurst Inlet Inuit residents became full partners in the lodge in 1984 (Gartner Lee Ltd, 2006; Bathurst Inlet Lodge, 2008). The lodge has been operating for over 30 years, and is an internationally renowned eco-tourism destination (Bathurst Inlet Lodge, 2008).

Omingmaktok

Tourism, hunting, fishing and trapping are the main economic activities in Omingmaktok. The Omingmaktok's Hunters and Trappers Organization is the sole tourism related business providing outfitting services and organizing the yearly Kalvik Frolics, the community's most important festival (Gartner Lee Ltd, 2006; Nunavut Tunngavik Inc, 2006). Visitors are drawn to the area for its natural beauty, wildflowers, wildlife and scenery. Of the many animals in the area, the top species harvested in Omingmaktok between 1996 and 2001 were arctic char, cod, trout, caribou, and arctic ground squirrel (Gartner Lee Ltd, 2006).

Gjoa Haven

Tourism is an important industry in Gjoa Haven. Cruise ships have brought in large groups of tourists to the community and it is believed that there are potential opportunities associated with future cruise ship business. Local businesses that have provided tourism-related services include: the Amundsen Hotel, Avaalu, Central Arctic Ventures, Gjoa Haven Hunters and Trappers Association, and Porter's Outfitters and Tours.

The two main tourist operators are Central Arctic Ventures (historical and cultural tours focused on the Northwest Passage, dog-team rides, sport fishing, birding, and camping) and Gjoa Haven Outfitters and Guides (dog sledding, wildlife and bird viewing, and fishing and hunting trips) (Gartner Lee Ltd, 2006).

Areas, activities and sites of interest for tourists visiting Gjoa Haven include: The Northwest Passage Territorial Historic Park, the Northwest Passage Trail Project (walking tour through Gjoa Haven), Utuhiksalik area of the Back River, O'Reilly Island, Wall Bay, and an abundance of wildlife (caribou, muskox, char, seal, waterfowl) and ecotourism activities (Gartner Lee Ltd, 2006; Nunavut Tourism, 2008).

Taloyoak

Although there are traditional and wage economies in Taloyoak, many residents rely heavily on traditional activities and harvesting. Tourist attractions in the area include the Rasmussen Lowlands – a prime range and nesting area for waterfowl, historic and archaeological sites – stone blinds, stone and sod houses, and Middle Lake – a popular camping and fishing area for local people. Wildlife is abundant in the area with residents harvesting species such arctic char, caribou, geese and ringed seal (Nunavut Wildlife Management Board, 2004; Gartner Lee Ltd, 2006).

Well known for its handicrafts and carvings, the community had aspirations of becoming a centre for tourism and arts and crafts and articulated this vision in its 2001 Community Economic Development Plan (Gartner Lee Ltd, 2006). Among the 20 businesses in Taloyoak, several have contributed to tourism including: adventure/ecotourism operators, Boothia Ventures Ltd., Boothia Inn, Paleajook Co-Operative Hotel, Paleajook Co-Operative Ltd., Qirnalugaaq Production, and Taluq Design (Gartner Lee Ltd, 2006; Nunavut Tourism, 2008).

Significance of tourism to Nunavut's economy

Employment from government, mineral exploration/mining, and tourism are the three main sectors of the wage economy in Nunavut (Robert Hornal & Associates, 2003). The territory's cultural industries connect the traditional economy to the wage and cash based economy via a wide range of activities such as carving and guiding (Government of Nunavut, 2006).

It is an important and developing industry and a valuable source of income in the Kitikmeot and other regions within the territory. There is a lack of reliable and detailed statistics related to visitation and revenues generated by the sector however, the significance of the industry is undeniable. It is estimated that between 2002 and 2003, approximately 33,000 tourists visited Nunavut – representing $30 million of revenue to the territory (Milne, 2006).

According to the Nunavut Tourism Strategy, the sector supports the objectives of learning and self-reliance outlined in the Bathurst Mandate. It represents the potential to promote, strengthen and support Inuit culture, land conservation, cultural facilities, to improve quality of life and develop positive role models (Government of Nunavut, 2006).

The Government of Nunavut's Department of Economic Development and Transportation cites the following in support of promoting and investing in the sector's growth in its strategy for tourism development in Nunavut:

1. Nunavut has an abundance of natural and cultural resources.
2. Nunavut's products have substantial market growth potential.

3. There is a high return on investment dollars spent on the tourism industry in Nunavut – the current $4 million investment may be generating close to $60 million.
4. The industry is labour-intensive – approximately 500 people are employed in hospitality and there are an estimated 3,000 artisans and carvers.
5. Tourism has the potential to promote traditional activities and maintain Inuit Qaujimajatuqangit (Inuit traditional knowledge) in the production, promotion and purchase of arts and crafts, traditional foods, clothing, *etc*.
6. The sector offers opportunities for employment creation at the community level.
7. Baby boomers have formed a new 'elite tourist' group with resources and interest in the territories many tourist attractions.
8. Alternative tourism (*i.e*., ecotourism, aboriginal cultural tourism) are becoming increasingly popular and Nunavut can meet the increasing demand for this type of experience.

With a general growing interest among what can considered 'elite tourists,' Nunavut is well positioned to take advantage of the ever increasing number of travelers wishing to participate in aboriginal cultural experiences. Characterized as highly active, with a proclivity towards novel, intellectually stimulation, and participatory activities, this type of tourist has both the specific interest and the disposal income required for northern travel. Nunavut offers not only a variety of nature-oriented outdoor activities such as wildlife viewing, hiking and canoeing, but has tremendous opportunities for tourists to experience Inuit culture and heritage (Lang Research Inc, 2007).

Some of the challenges to the development of the tourism sector in Nunavut, identified in the territory's tourism strategy, include: remoteness, high cost of travel, seasonality resulting in short seasons and difficulties retaining year round employees, inadequate resources (including human resource capital) and lack of capacity of tourism partners, and a need for inter-sectoral cooperation (weak links between tourism partners). Pagnan (2003) considers the high cost of transportation and maintaining infrastructure in the Arctic, the short summer tourist season, and the vulnerability and limited opportunity to diversify associated with nature-based tourism, as key challenges to the sector's growth and sustainability.

Project Impacts to tourism: perceptions from BIPR Community Consultation

The Bathurst Inlet Port and Road Project's community consultation activities have sought community and stakeholder views, concerns and input as they relate to the proposed project and to the lives of residents in communities in Nunavut. Tourism is an important and growing sector of the economy in the territory and with many Nunavummiut participating in the industry it is an important area for consideration of potential project-related impacts. In an effort to obtain input from those participating in this and other sectors, interviews, community and stakeholder meetings and focus groups were conducted. Opportunities to comment or express viewpoints on potential impacts to tourism were provided (For more details see Appendix A-4 of the DEIS, *Community Consultation*).

The following tourism-related comments and issues were raised:

1. Port and road's potential to enhance the tourism industry: development attracts visitors, promotes Nunavut and improves infrastructure.
2. Bathurst Inlet's pristine beauty and traditional way of life: key factors in its attractiveness to tourists - is threatened by the proposed port.
3. Development at Bathurst Inlet could attract new residents and adversely affect ecotourism.
4. Development at Bathurst Inlet could enable former residents and relatives to move back to the community by providing infrastructure and tourism-related employment opportunities may exist.
5. The proposed road and airstrip could assist in tourism-related travel to and in/around Bathurst Inlet.
6. If the port encourages people to reside at Bathurst Inlet it could destroy the lodge.
7. Development (mining and infrastructure) may affect wildlife and nature – key components of the touristic appeal of the Kitikmeot region.

5.13.13 Information Request #38

5.13.13.1 Issue Identification - Impacts on Local and Regional Transportation Patterns

The DEIS and supporting documents do not clearly state the changes to the existing transportation patterns on either the barge service or traffic patterns on the Tibbitt to Contwoyto Winter Road that will result from the project or present an analysis of potential impacts to existing transportation systems and patterns.

Section 5.3 of the DEIS acknowledges difficulties with the Tibbitt - Contwoyto Winter Road and benefits provided by the project; however an analysis of transportation pattern shifts is not presented. Tables 3.4-1 and 3.5-1 in the Abridged Feasibility Study appear to indicate that all diesel fuel and operating supplies currently being delivered by existing barge and winter road infrastructure will be delivered through the project. Section 3.5 states that only 10% of operating supplies to Nunavut communities will be delivered through the project with the remainder being transported on the existing barge system.

5.13.13.2 Recommendation

The Proponent should provide an analysis of the potential impacts to local and regional transportation pattern shifts resulting from the project.

5.13.13.3 Response

The following sections of the DEIS addresses the issue of impacts to local and regional transportation pattern shifts:

- Volume I of the DEIS, Section 35.2.3.3 – Projected Operational Periods and Road Traffic Densities

- Appendix A-2 of the DEIS, Section 5.7 – Effects of the Operation of the Bathurst Inlet Port and Road Project on the Social and Economic Environment of the N.W.T.
- Appendix A-2 of the DEIS, Sections 2.7.2 and 2.7.3 – Road Operations and Contwoyto Lake Winter Ice Road Operations, respectively.

5.13.14 Information Request #39

5.13.14.1 Issue Identification - Impacts on West Kitikmeot Barge Service

Removing 100% of the diesel and approximately 10% of operational supplies to the annual load shipped on the West Kitikmeot barge system is expected to have some impact to the viability and current level of barge service. Reduced freight volumes could affect tariff rates, frequency of service and ongoing employment from barge operations. An assessment of potential impacts to the existing barge service is necessary, especially as it is proposed to continue to fulfill a vital service after the project is implemented.

Section 5,3 of the DEIS states the project would not remove the need for the regular community barge resupply system from the south; however details on potential impacts to freight costs, schedules, locations of goods purchasing and potential effects on employment of barge network employees are not provided. This issue is not addressed in the Socio-Economic Effects Assessment (Volume VII, Document F2).

5.13.14.2 Recommendation

The Proponent should provide an analysis of the potential impacts from the project to the West Kitikmeot community barge system addressing issues including future freight tariffs, schedules and employment.

5.13.14.3 Response

We do not believe that the removal of 100% of the diesel and approximately 10% of operational supplies shipped through Hay River to the West Kitikmeot communities will have a significant effect on employment of barge network employees. The barge crews are composed to fulfill functional requirements and are not dependent on the amount of cargo (Tug-Boat Captain/Pilot, First Mate, Mechanic, Galley crew, and Deck Hands). The complement of onshore workers in Kitikmeot communities will still be required regardless of the origin of the cargo.

The barge network will still continue to service the Mackenzie River Sector, the North Slope of Alaska, the Great Slave Lake Sector, and the Western Arctic Sector including reduced tonnage into the Kitikmeot communities. The existence of another option for delivery of bulk diesel into the West Kitikmeot communities will help alleviate the pressures NTCL has recently experienced in delivering sufficient quantities of fuel to Inuvik and the North Slope of Alaska. The reduced demand for services to West Kitikmeot could result in tariff increases of up to 9% to fully replace the lost revenue (see calculation in Table 5.13-1). However, increased demand for shipments to other sectors in the barge network as a direct result of the growth induced by the Project could reduce the extent of this effect.

Table 5.13-1
Calculation of Potential Tariff Increase

Description	
Storage, handling and barging revenue for 22,000,00 litres fuel @$0.573 per litre	$12,606,000.00
Storage, handling and barging revenue for 586 T of dry cargo @ $615.73 per tonne	$360,817.78
Annual revenue lost by NTCL to BIPR	$12,966,817.78
Loss per tonne over 250,000 T shipped annually by NTCL	$51.87
% loss based on $575 per tonne tariff	9.0%
Increase in tariff required to neutralize loss	9.0%

5.13.15 Information Request #40

5.13.15.1 Issue Identification - Cumulative Impacts on Traditional Land Use Patterns

The Proponent's Cumulative Effects Analysis states: "Increased mineral development in the West Kitikmeot region of Nunavut facilitated by the Project will limit the traditional land use of the aboriginal groups within the cumulative effects assessment area of influence…although the Project does not itself encroach on land used by the Aboriginal populations, future mineral developments will create a much larger footprint that may encompass traditional lands." It also highlights increased risks to water and air quality from ARD, sedimentation of aquatic ecosystems, and dust. However, the Proponent doesn't address how these potential cumulative impacts will be mitigated, monitored or managed, or the role that it will play in undertaking these functions—either on its own or in cooperation with other parties. This is in contrast to other sections of the Cumulative Effects Analysis that specifically deal with issues of mitigation and monitoring.

5.13.15.2 Recommendation

The Proponent should provide details on how it proposes to participate in mitigating, monitoring and managing the cumulative impacts of future developments "facilitated by the Project" on traditional land use patterns in the West Kitikmeot. The Proponent should also be required to link this additional analysis to its treatment of impacts on local Inuit land use patterns in its Social and Economic Impact Assessment.

5.13.15.3 Response

Addressing cumulative effects is holistic in nature and to be successful, must be a collaborative effort between project proponents, communities, and territorial and federal government agencies and businesses that have a stake in the various projects that may occur as a result of development of the Project. It is beyond the capability and control of the Proponent to fully assess and mitigate the adverse effects of future mineral exploration and extraction projects.. However, a number of mitigation measures were outlined in the Social and Economic Management Plan (as

outlined below) that are within the control and capability of the BIPR project, and that may be applicable to mineral exploration projects (and other types of projects) in the Kitikmeot Region. Although they may not address all potential cumulative effects of other projects, it is expected that the success of these mitigation measures, as implemented in the local communities, will significantly help to reduce the cumulative effects of future Projects that affect the communities. Details of these measures are summarized below in Table 5.13-2 and are outlined in more detail in the Appendix F-2 of the DEIS, Section 5.0, Management Plan.

In addition to the above, the following additional measures could be implemented:

- Implement an overarching approach to the mitigation of cumulative effects in a proactive fashion, including the sharing of knowledge, expertise, and resources across projects to avoid and reduce potential effects, in contrast to what might be considered the more cost-effective approach of addressing a significant effect after it has already occurred.
- Support all Project proponents and government agencies (Responsible Authorities) with the identification and evaluation of lower impact alternatives.
- Provide and support robust effects analyses and monitoring mechanisms for the biophysical, social, cultural, and economic environments.
- Provide and support risk assessments to evaluate the degree of uncertainty of any anticipated adverse effects.

In addition to the efforts to be made by the Project, it is expected that all other mineral exploration and infrastructure projects will also conduct cumulative effects analyses within the area of influence and will also adopt mitigation measures that will help to eliminate and/or reverse significant or adverse impacts. Together, it is anticipated that the cumulative effects of secondary projects will be minimized.

Effects monitoring will play a fundamental role in determining the overall success of impact management. Potential monitoring methods that may be implemented and coordinated with BIPR monitoring by multi-project Proponents with support of government agencies include:

- Establishment of indicators that measure social, economic, and cultural change and a corresponding spatial extent.
- Identifying methods for assessing the effectiveness of mitigation.
- Incorporating adaptive management.
- Outlining a plan for designating community representatives who will receive training on monitoring methods and will be responsible for monitoring and reporting impacts in their community.

The BIPR Project Team will develop a stringent Cumulative Effects Monitoring and Mitigation Plan to be included in the Final DEIS and will be readily accessible for input to proponents, communities, and territorial and federal government agencies and businesses.

Table 5.13-2
Social and Economic Mitigation Measures

Potential Effect	Nunavut		Northwest Territories	
	Construction Phase	**Operations Phase**	**Construction Phase**	**Operations Phase**
Potential for reducing participation rate in traditional pursuits	The proponent will support traditional forms of economic activity. Through the implementation of a favourable work rotation schedule of two weeks in and two weeks out, Inuit will be encouraged to return to the land on a regular basis. If needed, the proponent will be prepared to implement cultural awareness programs in the work camps, providing traditional economic pursuit training, and Inuit cultural activities such as story-telling.		n/a	The Proponent could employ elders, hunters, and trappers to teach the youth who are working at the port and road site.
Potential for the creation of indirect contract opportunities due to spin off effect of Project job creation	Possible joint ventures with Inuit corporations could increase number of jobs			
Potential for impact on tourism industry	Mitigation measures will include controlled access to and continuous monitoring visitor use of the road, and their intended activities upon arrival in Nunavut.		n/a	
Potential long-term effect on skill levels of traditional purists	The Project will support traditional forms of economic activity. Through the implementation of a favourable work rotation schedule of two weeks in and two weeks out, Inuit will be encouraged to return to the land on a regular basis. If needed, BIPR is prepared to implement cultural awareness programs in the work camps, providing traditional economic pursuit training, plus Inuit cultural activities such as storytelling, serving country food, and celebrating Inuit events during the work schedule.		The Proponent could employ elders, hunters, and trappers to teach the youth who are working at the port and road site.	

5.13.16 Information Request #41

5.13.16.1 Issue Identification - Direct Employment Opportunities

Employment and job opportunities have been identified as important community concerns, and Wage Employment Opportunities and Economic Development is one of the assessment Valued Social and Economic Components. The current direct employment information does not provide the basis for assessing the project's effects

5.13.16.2 Recommendation

The Proponent should provide lists of the occupations (by NOC code) required by the project during the construction and operations phases, indicating the annual person-years of employment (for construction) and the average annual person-years of employment (for operations) involved.

5.13.16.3 Response

Tables 2 and 5 in Appendix A-2, sections 2.6 and 2.7, show the anticipated work forces during the construction and operations phases respectively. Table 3 shows a forecast of the monthly construction labour force requirements over the construction period. Table 5.13-3 below provides the NOC codes as requested.

Table 5.13-3
Occupations by NOC Code

NOC Code	Occupation	Quantity		
			Operations	
		Construction	Summer	Winter
071	Site Supervisor	3		
721	Road Foreman	6		
729	Quarry/Pit Foreman	3		
737	Drill/Blast Crew	15		
743	Crusher Crew	15		
742	Dozer/Loader/Grader Operators	63		
741	Truck Drivers	40		
732	Serviceman/Labourers	18		
624/645	Camp/Catering	20		
071	Tank erection Supervisor	1		
721	Tank building Foreman	2		
729	Welders	10		
726	Steel Builders	8		
721	Concrete Foreman	2		
737	Concrete Batcher	2		
737	Loader Operators	2		
761	Concrete Helpers/Finishers	4		

(continued)

Table 5.13-3
Occupations by NOC Code (completed)

		Quantity		
			Operations	
NOC Code	Occupation	Construction	Summer	Winter
721	Pile Driving Foreman	2		
737	Pile Driver Operator	2		
737	Crane Operators	2		
761	Skilled Labourers	40		
072	Project General Manager		1	1
011	Controller (part-time)		1 (p/t)	1
144	Purchasing Agent		1	0
111	Accountant		1	0
141	Secretary/clerk		1	1
112/122	Personnel/Safety		1	0
721	Site Manager		1	1
742	Equipment Operators		2	2
761/762	Labourers		2	2
645	Catering		3	3
646/665	Security/Emergency measures/coms		2	1
742	Road Maintenance Operators		0	3
741	Drivers		0	8
761/762	Labourers		0	1
731	Port Maintenance Mechanic		1	1
732	Port Serviceman		0	1
724	Electrician		1	1
228	Instrument Technician		0	1
731	Haul Truck Mechanic		0	3
732	Haul Truck Serviceman		0	1
	Total	**260**	**17 +**	**31**

5.13.17 Information Request #42

5.13.17.1 Issue Identification - Local Wage Employment Estimates

Employment and job opportunities have been identified as important community concerns, and Wage Employment Opportunities and Economic Development is one of the assessment VSECs. The draft assessment provides limited baseline information, asserts that certain numbers of direct jobs will be created, and states Inuit employment targets. No information is provided in support of the direct job creation numbers or Inuit employment targets, or the likelihood that they will be achieved, and it is not clear how or whether the project employment requirements (including the types and duration of employment) have been taken into account.

5.13.17.2 Recommendation

The Proponent should provide estimates of the local direct wage employment resulting from the project construction and operations, and describe the basis for these estimates.

5.13.17.3 Response

Appendix F-2 of the DEIS, Tables 6-2 and 6-3 show the direct employment estimates for construction and operations phases.

5.13.18 Information Request #43

5.13.18.1 Issue Identification - Employment Multiplier Effects

Employment and job opportunities have been identified as important community concerns, and Wage Employment Opportunities and Economic Development is one of the assessment VSECs. The draft assessment provides limited information on the project's 'spin-off' effects and how they have been assessed.

5.13.18.2 Recommendation

The Proponent should provide estimates of the amount and broad types of local indirect and induced employment resulting from the project construction and operations, including the basis for these estimates.

5.13.18.3 Response

A summary of the wage and employment benefits is provided in Appendix F-2, Section 4.3 of the DEIS. The indirect and induced benefits are qualitatively described as a quantitative analysis would be highly speculative since the BIPR is viewed as a catalyst to future development of currently undefined scope. Table 5.13-4 shows a summary of employment opportunities in person-years based on the road construction and operations only.

The potential spin-off effects from development of new mines in the area are undeniably large. The economic effects of BIPR servicing existing mines was reviewed in Appendix F-10 of the DEIS. A summary of its findings follow.

For the 20-year period from 2008 to 2027, the economic impacts for Nunavut as a result of the BIPR Project include:

- Personal Expenditures (consumption) will increase by $41.8 million; Government Current Expenditures by $9.4 million; Gross Fixed Capital Formation (investment) by $199.0 million; Exports by $165.0 million; Imports by $212.6; and Gross Domestic Product (GDP) by $207.6 million.
- Employment in Nunavut will increase by 754 persons-years measured on a labour force basis; of which 445 (about 59%) will go to non-aboriginal employment while 311 (41%) will go to aboriginal employment.

Table 5.13-4
Summary of Employment Opportunities in Person-Years

Sector	Person-Years				Remarks
	Direct	Indirect	Induced	Total	
Agricultural, Fishing & Forestry	0	0	5	5	Intermittent supplies to camps
Mining, Quarrying & Oil Wells	8	0	Indefinite	8+	Drill & Blast for Road Construction. Enhanced feasibility of mining prospects
Manufacturing Industries	0	0	0	0	
Construction Industries	228	25	0	253	Volume II Appendix A-2 Section 2.6.4 Table 3 minus quarry operators
Transportation and Storage	2,340	0	Indefinite	2340+	Volume VII Appendix F-2 Section 4.2.2 Table 6-3. Future mining prospects.
Communication & Utility	25	0	0	25	
Trade Industries	0	0	0	0	
Finance, Insurance & Real Estate	0	0	0	0	
Community, Business, Personal Services	0	25	0	25	Supply of goods and services to BIPR personnel in Cambridge Bay
Households	0	0	0	0	
Total	**2,601**	**50**	**5**	**2,656**	

For the 20-year period from 2008 to 2027, the economic impacts for the rest of Canada as a result of the BIPR Project include:

- Total cumulative provincial GDP, will increase by $102.2 million, with the largest four increases in Ontario, Alberta, Quebec, and British Columbia.
- Total cumulative provincial employment will increase by 1,603.0 person-years, with the same largest four increases by province as above.

New mines that are developed in direct response to the Project are expected to have a similar effect on the local, regional, and national economies.

5.13.19 Information Request #44

5.13.19.1 Issue Identification - Training Commitments

Employment and job opportunities have been identified as important community concerns, and Wage Employment Opportunities and Economic Development is one of the assessment VSECs. Training will be a key contributor to success in achieving local employment targets. However,

the draft assessment provides no discussion of construction phase training and unclear commitments with respect to operations phase training.

5.13.19.2 Recommendation

The Proponent should provide a concise list of its construction and operations phase training commitments in the DEIS.

5.13.19.3 Response

During road and port construction there will be opportunities for training at the entry level positions of general and shop labourers, truck drivers, small equipment operators, camp attendants, and kitchen helpers. This provides an opportunity for new employees to become familiar with the many aspects and responsibilities of working in an industrial setting in camp situations. Safety and job-specific skills are taught. Such knowledge and experience is a prerequisite to jobs requiring more training and greater skill levels. Provided personnel with adequate education are available, there will also be opportunities in administrative jobs such as warehousing and administration, environmental monitoring, and surveying.

In the operating phase there will also be opportunities for training as fuel handlers, fork lift operators, loader operators, mechanical apprentices, trades helpers, and camp maintenance specialists working in the areas of water and sewage treatment as well as power generation. Dispatchers, safety supervisors, training officers, and security officers will be needed. There will be many jobs to be filled as truck drivers hauling fuel and various forms of freight. Because this is a long-term situation there will be opportunities for progressive training that allows employees to develop skills to operate larger units, undertake more senior duties, and to be trained as supervisors.

It is the intention of the proponent to hire and train as many Nunavummiut as can be integrated into the work force while maintaining a safe and efficient workplace. Ideally, 'local' personnel would fill all positions, but realistically it is recognized that there will be a mix of local and non-local personnel, but the ratio of locals will increase over time.

5.13.20 Information Request #45

5.13.20.1 Issue Identification - Statistical Socio-Economic Data and References

Some socio-economic statistical information was not well sourced in the text, charts, tables, footnotes and reference lists. In order to review the appropriateness and the correctness of the statistical information included in the DEIS and the FEIS, it is very important that detailed information about the data sources used be provided.

5.13.20.2 Recommendation

The proponent should provide detailed sourcing for the data in the text, charts, tables, footnotes and reference lists. It is especially true for data sourced to Statistics Canada where a great amount of survey data is available. The name of the survey and the year of that survey, along with a catalogue number or CANSIM table number should be indicated (*e.g.*, Statistics Canada, 2001 Aboriginal Peoples Survey, Catalogue # XXX). It is not sufficient to put only the website

link. These links could change in the future or could already have changed. It would also be time consuming to verify each link to determine which survey was used.

5.13.20.3 Response

As per the recommendation of the Government of Nunavut, Appendix F-7 of the DEIS will be revised to provide detailed sourcing modifications (text, charts, tables, and footnotes) in the Final EIS to aid in citing statistical information utilized. A revised Reference List for this appendix is provided here as Appendix 5.13-2.

5.13.21 Information Request #46

5.13.21.1 Issue Identification - Survey conducted on behalf of the proponent

The proponent indicates that a questionnaire was administered in two communities, the results of which were provided in volume 7, Appendix F-9, section 3.2 of the DEIS. Some information and results were provided for the communities of Cambridge Bay and Kugluktuk. There is little information regarding the methodology used to conduct this survey and the quality of the data.

5.13.21.2 Recommendation

The proponent should provide the methodology for the above-mentioned survey (*e.g.*, sampling method and size), explain why the survey was conducted only in two communities, and provide information on how the data was processed and weighted as well as information on the data quality (*e.g.*, response rates, data limitations to take into consideration).

5.13.21.3 Response

The 2003 report *Review of Socio-economic Dimensions of the Bathurst Inlet Port and Road Project*, prepared by the New Economy Development Group, presents results from a literature review, community profiles, results of a questionnaire during community visits to Cambridge Bay and Kugluktuk, and recommendations as they relate to the proposed Bathurst Inlet Port and Road Project. The following provides details of the questionnaire including methodology and data limitations.

The questionnaire was designed with the purpose of collecting a sample of opinions from community members regarding the proposed Bathurst Inlet Port and Road Project. Information obtained from the questionnaires was used to provide feedback to the Project team on areas of concern and interest for stakeholders, to identify information gaps, to highlight areas for additional research and to provide information for a series of Project-related recommendations.

106 in-person interviews/questionnaires were conducted during visits to Cambridge Bay and Kugluktuk in 2002. One local resident for each community coordinated and administered the questionnaires. Residents of Bathurst Inlet, wintering in Cambridge Bay at the time of the fieldwork, were invited to participate in a focus group discussion aimed at obtaining feedback on the themes listed below. Participants did not complete questionnaires in Cambridge Bay but took 15 copies away with them with the understanding that they would be returned at a later date. A month after completion of the fieldwork, a single questionnaire was returned on behalf of the residents of Bathurst Inlet and served as a summary of the community's views on the project.

Data from fieldwork in Cambridge Bay and Kugluktuk was collected and analyzed. An external reviewer with considerable relevant experience provided input and peer review.

Key themes covered in the questionnaire included:

- general awareness and impression of the Project;
- employment opportunities;
- training;
- business opportunities;
- effects on wildlife;
- effects on family, Inuit culture and public services; and
- cumulative effects and opportunities.

Results of the questionnaire were summarized in the aforementioned report, and provided information for the preliminary stages of an impact assessment and insight into areas of concern and interest for respondents from Cambridge Bay, Kugluktuk, and Bathurst Inlet.

Limitations of the questionnaires administered during the 2003 fieldwork include:

- Inadequate representation of all potentially affected communities within the scope of the proposed Project.
- Uncertainty of research skills of local community questionnaire coordinators.

The value of the questionnaires includes: early identification of areas of concern and interest for community members, identification of areas for further research and provision of information, and understanding of levels of awareness and support for the proposed Project.

Given the fact that subsequent fieldwork, consultation, and socio-economic work has been conducted by other consultants, the proponent is confident that any oversights or potential errors associated with the questionnaire data have been adequately addressed and that significant opportunities have been provided for a wider range of issues, opinions, and concerns to be expressed by community members from all potentially affected communities.

5.14 Heritage Resources

5.14.1 Information Request #47

5.14.1.1 Issue Identification - Up-to-date Archaeological Resource Surveys

In these sections there is reference to archaeological work being conducted in 2000 and 2001 as well as possible some work being conducted in 2002. There are references to the fact that development plans for disturbance at these times were not finalized. All potential areas of disturbance must be finalized and reviewed for archaeological resources before it can be said that the area has been adequately investigated from and an archaeological perspective.

5.14.1.2 Recommendation

It is recommended that the proponent compare 2000, 2001 and 2002 development plans with the most up to date development plans and clearly indicate if all disturbance areas have been surveyed or evaluated for their archaeological resources.

5.14.1.3 Response

Work completed in 2000 consisted of a site file search only (see Appendix F-1 of the DEIS, Section 4.5.2). In 2001 and 2002, field studies were completed to provide field inventories and site assessment specific to the routing (see Appendix F-1 of the DEIS, Section 4.5.3) identified at that time. The current routing and borrow source locations have been compared to the previous surveys; only the reroute at the Mara River crossing (see Appendix F-1 of the DEIS, Section 6.2) will require assessment relative to the previous route surveys. Other outstanding field work may be associated with the locations of the construction camps, specific quarries and borrow sources, and the associated access roads. Some of those locations are currently unknown but will be assessed once the information is available.

5.14.2 Information Request #48

5.14.2.1 Issue Identification - Status of Work on Archaeological Sites

Table 5.2.1 list the archaeological resources found within the project area. The last column makes mitigation recommendations; for those entries that indicate "Further Study" it is unclear what if any action has been taken.

5.14.2.2 Recommendation

It is recommended the proponent provide information about the status of work on archaeological sites for which the archaeological recommendation is "Further study" even if the response to this is the regulator (CLEY) did not approve the work. The proponent also indicates that final field work will be done the prior to road construction, what plans are in place for this work to be conducted.

5.14.2.3 Response

The sites listed on Table 5.2.1 are an inventory of all archaeological sites along the route and in the port area. The recommendations in this table represent the information provided on the site forms and are not specific to this project.

For the project-specific recommendations relative to the individual sites in conflict with the Project, please refer to Appendix F-1 of the DEIS, Table 6.2-1. Section 6.2 indicates that all mitigation will occur “under summer conditions prior to any site preparation and ground disturbance.”

5.14.3 Information Request #49

5.14.3.1 Issue Identification - Protection of Archaeological Resources

The proponent acknowledges that the project with increase human activity in the areas where the archaeological resources are located. Indication as to what the proponent will do in order to assist with the protection of these resources is unclear.

5.14.3.2 Recommendation

It is recommended that the proponent consider ways in which it could assist with the protection of these sites from human distance.

5.14.3.3 Response

The proponent has proposed to monitor specific areas to determine disturbance by user activities (Appendix F-1 of the DEIS, Section 7.2.1). Depending on the results of this program, required mitigation measures will be determined. The proponent has committed to having a qualified archaeologist undertake all monitoring of archaeological sites and this individual would design an appropriate mitigation program for approval by CLEY.

6. HEALTH CANADA

6. Health Canada

6.1 Introduction

This chapter includes the issues and information requests from Health Canada, and the Proponent's responses to them.

6.2 Issue – Country Foods

HC has identified a gap in the draft environmental impact statement related to potential project-related contamination of foods harvested and consumed by people in the study area.

An assessment of country food issues was not identified in the draft environmental impact statement (EIS) for the Bathurst Inlet Port and Road Project (BIPR). At a minimum, the human health impacts related to the potential contamination of country foods gathered from the area of this project should be considered.

The draft EIS indicated that hunting, trapping and fishing occurs in the area of the proposed BIPR. Therefore, the following information requests are required in order for the proponent to determine possible impacts related to of potential country food contamination from the perspective of human health.

6.2.1 Information Request 1

6.2.1.1 Request

Identify country foods (e.g. edible vegetation such as berries, the tissues (e.g. meat and liver tissues) of fish and wild game, etc.) gathered from the project area and consumed by local residents or by persons hunting or fishing in this area on an occasional basis.

6.2.1.2 Response

A preliminary country foods baseline assessment was conducted (Appendix 6.2-1 of this volume).

The identified country food species that are consumed by local residents in the area are shown in Table 6.2-1 herein. These species have been found to exist in the proposed Project area, within a 500 m radius on either side of the road, in freshwater lakes and streams, and marine waters in Bathurst Inlet.

The primary species consumed are caribou, arctic hare, ringed seal, Canada goose, lake trout, and blueberry. These are the selected species for evaluation. The primary animal tissues consumed are muscles from terrestrial animals, muscle and blubber from seals, and muscle from lake trout. There is a very limited use of organs that retain metals as a food source (such as liver and kidney).

Table 6.2-1
Country Food Species for the BIPR Project

Category	Common Name	Species Name
Salmonids	Lake trout	*Salvelinus namaycush*
	Arctic char	*Salvelinus alpinus*
	Arctic grayling	*Thymallus arcticus*
	Cisco whitefish	*Coregonus autumnalis*
	Lake whitefish	*Coregonus clupeaformis*
	Broad whitefish	*Coregonus nasus*
Cods and Burbots	Tomcod	*Gadus sp.*
	Arctic cod	*Boregadus saida*
	Saffron cod	*Eleginus gracilis*
	Polar cod	*Arctogadus glacialis*
Smelts	Capelin smelt	*Mallotus villosus*
	Rainbow smelt	*Osmerus mordax*
Pikes	Northern Pike	*Esox lucius*
Flounders	Arctic flounder	*Pleuronectes glacialis*
	Starry flounder	*Platichythys stellatus*
Seals	Ringed seal	*Phoca hispida*
	Bearded seal	*Erignathus barbatus*
	Spotted seal	*Phoca largha*
Large Mammals	Caribou	*Rangifer tarandus*
	Muskox	*Ovibos moschatus*
	Grizzly bear	*Ursus arctos horribilis*
Small Mammals	Arctic hare	*Lepus arcticus*
	Ground squirrels	*Spermophilus parryii*
	Wolverine	*Gulo gulo*
	Wolf	*Canis lupus*
	Arctic fox	*Alopex alopex*
	Red fox	*Vulpes vulpes*
Birds	Canada goose	*Branta canadensis*
	Rock ptarmigan	*Lagopus mutus*
	Long-tailed duck	*Clangula hyemalis*
Plants	Blueberry	*Vaccinium sp.*
	Crowberry	*Empetrum sp.*
	Salmonberry	*Rubus sp.*

6.2.2 Information Request 2

6.2.2.1 Request

Identify potential contaminants taking into consideration all project activities.

6.2.2.2 Response

The potential contaminants to the Project area, as they affect soil, freshwater, and marine environments is discussed in Appendix 6.2-1.

The potential contaminants to the Project area, as they affect soil, freshwater, and marine environments are discussed in the Draft Environmental Impact Statement (DEIS), Volume I. The following describes results in the DEIS.

Road development is expected to have a negligible short- and long-term effect on freshwater ecosystems. Increased road traffic may increase the risk of accidents such as fuel and supply spills. The impact would depend on the type of spill, the quantity spilled and the location along the road, with a localized effect. Port impacts will also be negligible to freshwater systems (Volume I of the DEIS, Section 16).

Marine environments were assessed for potential impact from oil spills along the port and shipping route. Effects from small oil spills ranging up to a few tenths of a tonne were ranked negligible. Large spills were determined to be highly unlikely, with an impact from moderate to high. There is a negligible impact on marine waters from the road (Volume I of the DEIS, Section 29)

The project would cause direct disturbance to terrestrial ecosystems along the proposed road route. The continuous use of the road may result in roadbed contamination from lubricants, oils, greases, and metals from trucks deposited as dust or road runoff. The overall effects on soils and vegetation will be localized and limited. The impact assessment from this factor was low. Soil impacts from the port are assessed to be moderate, from the risk of accidentals fuel spills (Volume I of the DEIS, Section 22).

There were no significant effects predicted for environmental media, there should subsequently be negligible effects on country foods (*i.e.*, ringed seal and lake trout). Most predicted effects would be caused by an accidental spill. The area has no significant sources of hydrocarbons and road traffic is expected to have a low effect on the ecosystem (Volume I of the DEIS, Section 21).

Although organic contaminants may degrade over time, metals do not. Dust produced from trucks will settle in the general vicinity of the road onto local vegetation and soils. The formal country foods baseline assessment will focus on natural concentrations of metals in the environmental media such as water, soil, vegetation, and wildlife.

Nearby mining projects suggest the land may be highly mineralized and naturally high in base metal concentrations. It is necessary to establish baseline concentrations to ensure any future monitoring distinguishes between natural concentrations in country foods and anthropogenic activities that cause these levels to increase.

6.2.3 Information Request 3

6.2.3.1 Request

Identify contaminants of potential concern (COPCs) based on the feasibility of pathways of potential contaminants into country foods harvested from the project area.

6.2.3.2 Response

The COPCs were identified by comparing concentrations of environmental media with CCME guidelines. Ideally, water concentrations are compared with CCME Protection of Aquatic Life and soils are compared with CCME Protection of Human and Environmental Health for Residential and Parkland Use. The selected COPCs were based on surface waters, as no baseline soil samples are currently available**.**

Soil sampling along the proposed route and the 500 m study area boundary will be collected in the summer of 2008 to supplement the current country food baseline report. This will identify any additional metal COPCs from soil concentrations. From the surface water baseline conducted in 2007, the identified metal COPCs are: aluminum, cadmium, chromium, copper, and iron. These were in turn examined in all selected country food for evaluation (Appendix 6.2-1).

6.2.4 Information Request 4

6.2.4.1 Request

Identify potential human receptors who may consume country foods harvested within the study area.

6.2.4.2 Response

The human receptors and primary country food harvesters are the Inuit. The Inuit are further divided into three groups, and two of these (the Bathurst/Perry/Ellice group and Nunamuit group) have hunting and habitat boundaries along the proposed road. These two groups reside in the Kitikmeot region of Nunavut.

For the country food baseline report, both Inuit adults and toddlers were evaluated as the most relevant receptors (Appendix 6.2-1). Although recreational users may also harvest along the proposed route, the Inuit live and harvest country food from the region regularly and would be affected the most by any potential contaminant. Additionally, toddlers are sensitive to contaminants due to their life stage.

Therefore, any significant impacts on country food will likely manifest in Inuit toddlers before Inuit adults and non-Inuit recreational users. Inuit toddlers are assessed in the country foods baseline report, and any health risks or lack of health risks will be conservative to all other human receptors.

6.2.5 Information Request 5

6.2.5.1 Request

Based on information above, the proponent should determine if further assessment of human health risks from country foods is needed or whether periodic monitoring of levels of COPCs is needed in the country foods under study.

6.2.5.2 Response

Overall, the country food baseline study found that foods are within acceptable limits for metal concentrations. Soil baseline metal concentrations data were not collected and therefore not included when selecting the COPCs to evaluate. This data is required for the metal selection process and will be collected in the summer of 2008.

Seal muscle tissue cannot be modelled based on the current available data and parameters. The Inuit have indicated that seal muscle and blubber constitutes a significant portion of country food diets. Attempts to collect fresh or dried, but not smoked, seal muscle and blubber for analysis during the summer of 2008 will be made. Hopefully, this can be done in cooperation with harvesters, who will submit samples of previously harvested animals.

Measured and modelled concentrations of other plant and animal tissues do not indicate any potential risks. The resulting exposure ratios are all well below acceptable levels. However, additional environmental media baseline data collection is required before the potential effects can be assessed with any certainty. This will be completed in the summer of 2008. Once data are obtained and potential effects formally assessed, the need for ongoing monitoring will be evaluated. However, at this point monitoring would likely only be required in the event of an accident or malfunction along the road.

6.2.6 Information Request 6

6.2.6.1 Request

If it is determined that no further assessment or monitoring is necessary, a rationale should be provided to support these statements.

6.2.6.2 Response

To reduce the uncertainty of the predicted metal concentrations in country foods, additional sampling of tissue and environmental media will be conducted during the 2008 field season. These include: soil samples, caribou and seal (from harvesters), lake trout, and vegetation samples, which are the most useful and relevant for the country food baseline. Interviews will also be conducted to determine the consumption quantity and frequencies of the most relevant country foods.

7. INDIAN AND NORTHERN AFFAIRS CANADA

7. Indian and Northern Affairs Canada

7.1 Introduction

This chapter contains the issues, concerns, rationales, and information requests from Indian and Northern Affairs Canada, and the Proponent's responses to them. To maintain consistency with other chapters, the concerns and rationales have been placed before the information request here, in contrast to INAC's format, which supplied the request before the issue.

7.2 Issue – Project Rationale

7.2.1 Information Request 2.1

7.2.1.1 Issue Identification – Clarification of Project Rationale

There are possible discrepancies within the stated project rationale, associated in particular with the degree to which the new project will (i) reduce dependence on transport to/from current land-locked areas (or the coast) via the winter road, (ii) increase potential for and reduce costs of shipping of fuel from Bathurst inlet to more southerly operations, and/or (iii) increase options for transport of fuels and other supplies to other coastal communities.

Within the project description, it appears that there has been an attempt to demonstrate that current Kitikmeot and ISR region residents would be direct beneficiaries via increased access to cheaper goods and supplies, when the case for this might be relatively weak in comparison with the case for economic spin-offs associated with increased mineral resource extraction opportunities.

Appendix F-10: *Bathurst Inlet Port and Road: The Economic Benefits for Nunavut and Canada* did not formally assess economic benefits to northerners other than indirectly via enhanced operational efficiency/viability of Kitikmeot region mining activities.

There are other issues associated with the project justification as well. For example, if the annual fuel and supply haul period from the proposed port to Contwoyto Lake staging area is restricted to the January 31st to April 30th period as formally proposed, this would result in essentially the same timing implications associated with current use of the Tibbitt to Contwoyto Winter Road, and the associated transportation cost benefits are not immediately apparent, since there would be an added requirement to move fuel and supplies to the new port facilities in addition to the over land/ice transportation costs.

7.2.1.2 Concern

The case for lower landed fuel and material costs at Cambridge Bay or other coastal communities in the Kitikmeot Region or Inuvialuit Settlement Region, and other direct benefits, might be over-stated.

7.2.1.3 Rationale

Based on the DEIS, impacts to some VECs cannot be absolutely precluded either through avoidance or mitigation. It is important, therefore, that residents of the region have information that is as accurate as possible about the reasonably anticipated benefits and costs.

7.2.1.4 Request

The EIS would benefit from an enhanced description about the anticipated south to north or north to south movement of goods and services within periods of 2-5 years, 5-10 years, 10-20 years and beyond. A more concrete base case should be developed, without reference to e.g., fuel supply via ship from Europe of the middle east or other highly speculative events, unless the proponent specifically seeks approval for such events as core aspects of the project. Consideration of fuel transport via deep oceanic tanker has not been considered in the DEIS, and would significantly complicate the review of an already complicated project.

7.2.1.5 Response

The Tibbitt to Contwoyto Winter Road would only affect shipments to the mines south/west of Contwoyto Lake. The operational period is currently controlled by break-up in the southern portion of the Tibbitt to Contwoyto Winter Road. Use of the northern portion could possibly continue for at least two more weeks. The BIPR would be able to service the mines north of Contwoyto Lake year-round with the construction of additional all-weather roads from Contwoyto Lake to the mines. A discussion on the operational periods and road traffic densities is presented in Volume I of the DEIS, Section 35.2.3.3.

7.3 Issue – Project Alternatives

7.3.1 Information Request 3.1

7.3.1.1 Issue Identification – Project Alternatives

The DEIS does not contain adequate assessment of alternatives within the project and alternatives to the project.

7.3.1.2 Concern

The DEIS makes reference to 17 alternative project configurations that have previously been evaluated, toward selection of the preferred BIPAR option. These are not described at all in the DEIS, however. Furthermore, only three short-listed of 17 alternatives are discussed in Appendix G-1 (while four alternative road routes are shown on Figure 5.6-1 of the DEIS (Vol. I)). All alternatives presented in the 2007 DEIS are based on work that was completed in 2006 and 2007, most of it not in direct association with this proposed project.

The information provided is cursory. Only six pages of analysis are afforded this issue in the entire DEIS and appendices, including figures. Additional information is undoubtedly available in the EBA (2007) report referenced in Appendix G-1; however, this needs to be provided in the BIPAR EIS as well. The decision criteria used to rank the 17 alternatives (or three short-listed

options) are not evident. Perhaps more importantly, several questions arise regarding the proposed project and alternatives that are not addressed in the DEIS:

- What port locations were considered within Bathurst Inlet?
- Why the choice of vessels for fuel supply of up to 50,000 tonne capacity and 213 m length?
- Why the choice for the fuel storage volumes at the port (220,000,000 L)?
- Why was the Contwoyto Lake terminus site chosen and what alternatives were considered? Could this impede future development of an all-weather road in future decades?
- What specific road alignments were considered in the context of route selection options such as maximizing traverses over exposed bedrock, and minimizing travel times, wetlands and surface water crossings, and wildlife habitat areas?
- Which, if any, of the options would allow extension of the operational window beyond Jan. 31 - Apr. 30, while minimizing environmental impact potential (e.g. to caribou populations on breeding and calving grounds, or to surface water resources)?

7.3.1.3 Rationale

The BIPAR EIS is not complete and cannot be adequately evaluated in terms of regional or cumulative impacts without better information on how various alternative routes and solutions for fuel and materials transport have been optimized in the context of ecologically sustainable economic development.

7.3.1.4 Request

The Proponent should provide a much more detailed description and analysis for all alternatives within the project that were considered, as well as alternative means of carrying out the project. This should include a summary of the developments that lead to the 2003 project proposal.

A more complete and current list and analysis of alternative means of carrying out the project should be provided, including but not limited to a combined all-season road and winter road BIPR option. Formal applications for the Hackett River Project have been submitted, however the Izok Project has yet to be advanced. In light of this, an analysis of the option of constructing a portion of the BIPR road to all-weather standards to facilitate the development of the Hackett River project, followed by a winter-only road to Contwoyto Lake warrants consideration. Any proposed transportation routes that may have been announced since the alternatives assessment was completed should also be provided.

The assessment of alternatives within the project need to better consider finer-scale decisions for each major component (port, vessel type selected for fuel transport, fuel storage options, road, location and nature of construction and operations camps, airstrip, quarries and granular borrow areas), clearly indicating how the siting and size have been optimized in light of the overall need.

The alternatives and analysis presented should reflect the current development scenario in the Kitikmeot Region.

7.3.1.5 Response

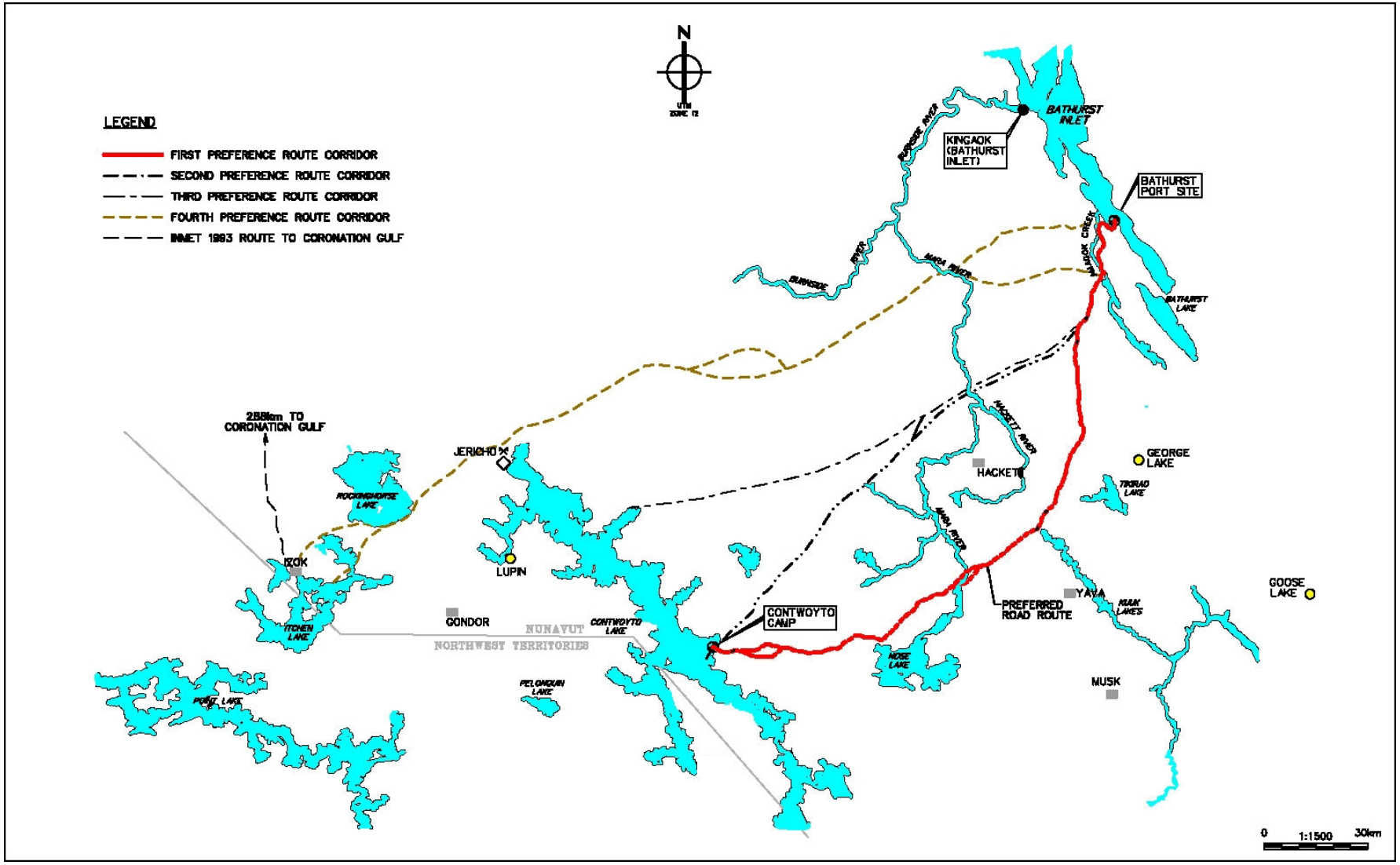
Given the very high cost of road-building in the Project area and similarly high costs of moving freight by road on a tonne/kilometre basis, it was evident that transportation by sea into the central Arctic would offer distinctly lower comparative transportation costs. Studies were then undertaken to confirm that a shipping route could be identified to connect southern Bathurst Inlet with known routes to the north. A study by Canarctic Shipping Company Ltd. (Canarctic, 1993) had already identified shipping routes to service the Coronation Gulf. The Bathurst Inlet hydrographic studies were conducted in 1998 by the Canadian Hydrographic Service together with the Canadian Coast Guard. This work identified a suitable shipping corridor that was later inspected on-site by a ship's master who concurred that vessels of the size proposed could be safely sailed to and from the port site provided that specified navigational aids were put into place and that further current studies be completed.

Geowest Environmental Consultants Ltd. was contracted by the Department of Transportation, Government of Northwest Territories in 1999 to conduct a route analysis to examine the feasibility of developing an all-season road between Yellowknife and Rae-Edzo in the south and Bathurst Inlet in the north. Included in this study was the identification of two northern (north of Contwoyto Lake) and two southern routes from Contwoyto Lake/Lupin Mine to Bathurst Inlet.

In 1999, Nishi-Khon/SNC-Lavalin and J.D. Mollard and Associates conducted a comprehensive route selection and terrain analysis of the study area to identify a feasible all-weather route among competing alternatives between a port on Bathurst Inlet and the south end of Contwoyto Lake (Nishi Khon/SNC-Lavalin and Kitikmeot Geosciences, 2001). As shown in Figure 7.3-1, a number of competing alternative route corridors were investigated based on construction, operating costs, terrain controls plus the following factors:

- location of existing and possible future mine and mineral resource developments in western Nunavut;
- locations of small and large lakes and major river valleys along prospective alignments;
- terrain types and conditions, including topography, landforms, soils and rocks and their characteristics, surface drainage, permafrost and wetland conditions;
- distribution of rock and granular borrow for construction on and near the route;
- environmental controls, impacts and mitigative measures;
- location of environmentally sensitive areas (*i.e.*, caribou calving grounds);
- cultural and heritage resources; and
- comparative lengths of haul routes.

The rationale for the current project configuration is its reduced construction and operating costs due primarily to flatter topography over the length of the road alignment, thereby requiring less terrain disturbance for construction, as well as reduced borrow and quarry material needs.



Source: Nishi Khon/SNC-Lavalin and Kitikmeot Geosciences (2000).

Figure 7.3-1 Route Alternatives for All-weather Road

The selection of the current Project transportation route addresses the issues raised in the draft West Kitikmeot Regional Land Use Plan by the Nunavut Planning Commission (NPC, 2005) with respect to route selection for a transportation corridor and guidelines for developing a transportation corridor. The BIPR Project option has the support of the West Kitikmeot Inuit organizations (NPC, 2005).

It was believed that significantly lower fuel costs would be possible to realize if fuel could be delivered by sea to a local port and hauled a short distance overland to the point of use. Additionally, the high cost of overland freight would preclude the possibility of the development of base metal mines due to the requirement to economically transport mineral concentrates to smelters unless a deep water marine port was developed in the region. Obviously, a port site would need to be as close as possible to the potential mines or groups of mines. The site selected as the best candidate site for the Bathurst Inlet Port was identified as a result of the following criteria:

- It was necessary to find a point as far south in Bathurst Inlet as possible to minimize road construction and ongoing overland transportation with attendant high costs.
- The water had to be deep enough to allow access by deep-sea vessels with a draft of 12 to 13 m.
- Any proposed berth for a ship had to allow for overshoot on a docking attempt with no danger of grounding.
- The site had to be accessible with a road and could not have excessively steep grades on the approaches.
- Adequate room had to be available in the area to allow for the construction of port facilities including laydown areas, tank farm, maintenance, future bulk materials storage, and accommodations facilities.

Areas farther south of the selected location did not offer this combination of attributes. Subsequent to the identification of this location extensive bathymetry work confirmed the assumption of deep water near shore and of approaches that were navigable between the site and previously established shipping routes to the north.

The suggestion that a road could be built to the north end of Bathurst Inlet ignores the prohibitive cost of such a venture and the loss of any economic advantage gained by accessing seaborne transportation.

The proposed road corridor was located with due consideration of several factors. The route was intended to maximize utility to a number of mineral deposits that could potentially be developed, to be the most easily constructible consistent with requiring the least disruption to the environment, and to be a reasonably direct route connecting the Tibbitt-Contwoyto Winter Road to the proposed seaport. Given the constraints imposed by virtue of the road location which itself is constrained by terrain, the only choice was to choose a port site on the west side of Bathurst Inlet. The selected site met the necessary criteria.

Environmental studies were also undertaken to ensure that the proposed site did not exhibit factors that were likely to preclude the development of a facility in this location. No environmental concerns of a nature to preclude proposed development have been identified as a result of the studies undertaken.

Land-side factors such as steepness of terrain required excavation and proximity to other proposed facilities dictated the proposed port location along a few hundred metres of shoreline.

The chosen peninsula indicates the proximity of resistant bedrock, steeper near shore slopes and a viable water depth close to shore all of which favour a port location. A similar approach was taken for selecting the most feasible location of the Contwoyto Lake Camp.

The targeted vessel size (50,000 tonne) falls within the Handymax category of cargo ships and is considered optimal for the bulk carriers and tankers that could economically service the port over its life time.

We do not believe that the Project could impede future development of an all-weather road as it can be integrated into a future road network and provide service/maintenance centres for such a development.

The 220,000,000 litres of fuel storage capacity at the port was based on supplying Diavik, Ekati, Jericho, Izok and the local communities. Diavik and Ekati were estimated at 155,000,000 litres, Izok at 18,500,000. Transhipping to the local communities such as Gjoa Haven, Cambridge Bay, Kugluktuk, Taloyoak, and Hope Bay account for 16,000,000 litres. The remaining fuel would be consumed by other users including Hackett River, Hood River, George Lake, Goose Lake, Jericho and other active exploration prospects as well as the port operation. Building fuel capacity at the port will be staged to reflect port and road services that are contracted along with the overall development schedule in the Kitikmeot Region.

7.4 Issue – Project Description

A well developed Project Description is critical to conducting an environmental impact assessment, including determining potential environmental impacts, risks, mitigation and monitoring requirements. Overall, Indian and Northern Affairs Canada (INAC) finds the Project Description to be conceptual and lacking certain critical details. In addition, a few components of the DEIS are self-contradictory with regard to project components or details. Such discrepancies merit resolution so that there is a clear understanding of the proposed project by all participants to the decision-making process.

It is clear that several aspects of the proposed project are not adequately documented within the DEIS. In particular, clarifications are sought on (i) materials handled at the port; (ii) camps/staging areas; (iii) anticipated road use; (iv) the airstrip; and (v) marine transportation.

7.4.1 Information Request 4.1

7.4.1.1 Issue Identification – Materials Moving through the Port

The project description included in Volume 1 of the DEIS does not describe the types of materials anticipated for shipment via the proposed port on Bathurst Inlet other than diesel fuel, or for storage at the lay-down and storage areas. Figure 7.3-2 (Vol 1, p.24) shows "material laydown/rock quarry" area, but does not provide any details of design principles for adequate containment. Additional materials that need to be considered in the environmental assessment include the following:

- Various appendices to the DEIS (*e.g.* - Vol. II) make reference to the shipment and storage of concentrates from base metal mining. No plans were located for the storage or transport (terrestrial or marine) of concentrate, with the appropriate environmental safeguards.
- Given the obvious proposed users of the transportation route, it is reasonable to assume that process chemicals used especially in base and gold metal mining will be transported in the future, including but not necessarily limited to cyanide.
- It is stated on p. 25 of Vol. I that-

    - "The ammonium nitrate prills will be barged or trucked to site in 1.5 tonne tote bags, packed in containers. Until mixed with fuel oil, ammonium nitrate is not an explosive, is stable, and requires no special storage facility."

This statement applies only to the explosive potential. Both diesel and ammonium nitrate must also be considered as potential contaminants (if released) in their own right, and must be handled and stored accordingly. Note also that it would be expected that the constituents of ANFO will be shipped and stored not just during road construction but also for the purposes of mining re-supply. Several sections of the EIS require adequate clarification in this regard.

7.4.1.2 Concern

Failure to adequately anticipate materials transport and handling will result in loss of opportunity to address environmental, safety, and associated concerns during project planning, both within the port area and along the larger transportation corridor.

7.4.1.3 Rationale

The economic feasibility assessment and environmental impact assessment should be more fully aligned in terms of expectations for future project activities.

7.4.1.4 Request

The proponent should either indicate the limitations around materials that may be transported, handled and/or stored in the foreseeable future, or provide plans for the safe and environmentally benign movement and storage of various mining-related or other hazardous substances or other potentially contaminating materials.

7.4.1.5 Response

Fuel and petroleum products will be the biggest commodity at this time and these products will be stored in a contained area. Concentrate storage at this time is conceptual. Concentrate

storage will be the responsibility of the mine operators and will be constructed to ensure that all products are unloaded and stockpiled with provisions to safeguard the environment. Hazardous materials will be shipped in approved containers either in dry or liquid form as recommended in the MSDS sheets with containers inspected prior to shipment.

7.4.2 Information Request 4.2

7.4.2.1 Issue Identification – Additional camps/staging areas

It is evident from the project description (Vol. 1) that there will be a requirement for at least two construction camps, not just the Contwoyto Lake camp.

7.4.2.2 Concern

Environmental issues associated with the port construction (and operational era?) camp facilities have not been addressed in the DEIS. Anticipated issues might include sewage treatment and discharge (including localized eutrophication), solid waste management, various aspects of materials handling, and over-exploitation of local natural resources by employees and contractors.

7.4.2.3 Rationale

The proponent has provided figures of the proposed port and camp layout; however, the overall level of detail is too superficial relative to regulatory interest at the EIS review stage, since it is both highly conceptual and lacks adequate accompanying descriptions about important design principles to be incorporated during subsequent preliminary and detailed design.

7.4.2.4 Request

The port camp, and any additional temporary or longer term camp and construction or operational staging area should be fully described in the project scope. Number of seasonal or long-term occupants should be described, along with expectations for solid and liquid waste generation, water needs and medical as well as other basic needs.

7.4.2.5 Response

There will be two permanent camps for this Project: one at the Bathurst Port site and one at Contwoyto Lake. The port camp will be a 150-person complex and the Contwoyto Lake camp will be a 20-person camp. The 150-person camp at Bathurst port will initially be used for port and road construction. Additionally, there will be two mobile 60-person construction camps, complete with potable water systems and sewage treatment plants. These camps will be staged at the Bathurst Port site and Contwoyto Lake and will be relocated as road work progresses.

The overall Bathurst Port site layout is shown in Appendix A-3 of the DEIS, sub-appendix A, DWG 300-41-35-21, and Contwoyto Lake facility is shown on DWG 400-41-35-02.

There will be a fifth camp mobilized to the Bathurst Port site for initial construction work at the Bathurst port. This temporary camp will remain on the barge for the first year and used until the permanent Bathurst port camp is ready for occupancy.

Occupancy is estimated at 57 people during construction for each mobile construction camp. Total available accommodation during construction will be for 270. Construction labour force requirements are stated in Appendix A-2 of the DEIS, Section 2.6, Table 3. Peak operating labour during the winter months will be 150 people; 28 will be directly employed to operate the port and maintain the access road; the remaining people will be contract drivers. All will be accommodated at the port site. During the summer months, 12 people will be needed for maintenance. All operating personnel will be seasonal.

Solid wastes generated during construction and operations will include wood construction scrap, cardboard boxes, plastics, insulation, tires, used equipment parts, filters, and metal scraps. Liquid waste generated during construction will include waste oil, degreasers, paint thinners, sealants, and antifreeze. All waste disposal on-site or off-site will be subject to the Waste Management Plan.

Medical wastes such as needles or contaminated material will be incinerated or shipped to a licensed disposal facility off-site. All such hazardous materials to be shipped will be properly packaged, labelled, contained, and stored before shipment.

Potable water will be produced by desalination and peak requirement at the port will be 10,000 gallons per day. Disposal of sewage sludge is described in the GN IR 23 and incineration is described in the GN IR 24.

A clinic staffed with EMTs will be available 24 hours per day, 7 days per week. Minor medical treatment will be handled on-site. Emergency air medical evacuation will be provided. Serious injuries will be stabilized on-site and airlifted to the nearest suitable location given the circumstances and medical details; the options are Cambridge Bay, Yellowknife, or Edmonton.

Other basic personal needs will be available for purchase at the commissary; basic Personal Protective Equipment will be available in stores at the port warehouse.

7.4.3 Information Request 4.3

7.4.3.1 Issue Identification – Road

It is very difficult for the reader of the DEIS to gain an adequate appreciation of the anticipated amount and type of traffic on the proposed road. Reviewers were particularly interested in expectations for use outside of the Jan. 31 – Apr. 30 annual window.

7.4.3.2 Concern

The particulars of seasonal use of what was originally proposed as an all-weather road is viewed by INAC as an extremely important aspect of the project from the perspective of avoidance or mitigation of project impacts, both under current climate regimes and under future altered climatic conditions. For example, finfish use of surface waters for most species is transient based on migrations. Stream crossings and various maintenance activities along the crossings if they occur at an inopportune time relative to fish movements.

It is stated on p. 25 of Vol. I of the DEIS that –

> "During spring migration, almost all of the animals in the Bathurst caribou herd could move through the Project area. The road will operate between January and April, so there will be no interaction between traffic on the road and caribou during spring migration. There will be far fewer caribou along the road during the winter hauling seasons."

In addition, the road traverses important caribou calving grounds.

There is a strong seasonal component to surface runoff and freeze-thaw cycles in the active layer. It is relatively clear that proposal of an all-weather road open for use year-round would elevate various concerns about impacts to fish, wildlife and surface water supplies. Nonetheless, it is apparent from an evaluation of the proposed construction schedule and road maintenance schedule that there is anticipated to be some use of the road year-round. A large number of rock-filled ford crossings of surface flows is proposed, and the implications of vehicular traverses of such crossings during mid-winter and mid-summer (or during peak run-off periods) are likely to be very different.

Finally, there is expected to be significant pressure once the road is built to use it for especially the transportation of mining supplies and concentrate outside of the four month, January to April

period. The possible future relaxation of restrictions on seasonal use of the BIPAR road alignment should be considered in the context of the larger environmental implications. INAC acknowledges the proponent's plans to limit public access; *i.e.* -

"Public access to the road will be restricted due to safety issues. A gatehouse will be located at the Bathurst Inlet port and the Contwoyto Camp operations to monitor and dispatch traffic, and will be active year round. Similar to the existing TCWR, use of the all-weather road will be monitored under radio/satellite communications control to let all users know where vehicles are, to schedule departures and arrivals, and monitor operations for safety."

(BIPAR DEIS, Vol. 1, p. 36)

7.4.3.3 Rationale

DEIS addresses primarily road use after freeze-up (Jan. 31 - Apr. 30) period and would not address concerns for wildlife impacts or surface water quality issues associated with other proposed activities outside of this window, including the construction phase activities.

7.4.3.4 Request

INAC requests more detailed estimates (along with the identified degree of uncertainty) regarding the predicted types, volume and seasonality of use of the road in each of the following categories:

- Heavy equipment use during the construction phase, including periods outside of the Jan.-Apr. window, and expected degree of wetland and stream crossings;

- Lighter vehicle transit during the construction phase, including smaller vehicles and ATVs;
- Routine fuel and freight haulage, and worker transit trips, from January to April during the post-construction operational phase, especially for mine supply (Bathurst Inlet to Contwoyto Camp);
- Routine fuel and freight haulage from January to April during the post construction operational phase (Tibbitt to Contwoyto Camp and continuing north);
- All traffic associated with worker/contractor movements and road/route maintenance outside of the Jan.-Apr. window;
- Incidental traffic by regional residents and works outside of the Jan.-Apr. window. It should be confirmed that the current development scenario in the Kitikmeot Region is reflected in the estimates provided.

7.4.3.5 Response

Construction heavy equipment will include:

One Fuel Tanker	One 988 Cat Front End loader
One 150 T Crane +45 t counter weight	One Front shovel
One 50 T Crane + 15 t counter weight	One Cat 14 H grader
Two Fuel Trucks	One Cat 16 H Grader
One Service Truck	Two excavators
One Explosives truck	Seven 777 Cat end dump Trucks
Two 15 Passenger Van	Two 769 End Dump Trucks
Two 38 Passenger Bus	One 100 ton Float and Tractor
One tank drill	One portable Crushing and Screening Plant
Four air trac c/w compressors	One portable Batch Plant
Two D10 Cat Dozers	Two Power Generators
Two D9 Cat Dozers	Four 4x4 ¾ ton pick – ups
Two D8 Cat Dozers	Two crew cabs
Two 992 Cat Front end Loaders	Three ATVs

Outside the January to April period, maintenance equipment will be used to repair, maintain and upgrade the road and will include:

One 14 H Cat grader	One excavator
One 16 H grader	Two 4x4 pick – ups
One 988 Front End Loader	One 15 Passenger Van
Two 796 Cat End dump Trucks	Two ATVs

Traffic outside the January to April window will be limited to routine maintenance and repair for approximately one month during the spring and one month in the fall.

Routine fuel and freight haulage will vary from year 1 to year 20 and this will be based on operating mine supply requirements.

Road will be closed except for maintenance and light local traffic outside of January to April. Regional residents will have access and may utilize the road during the summer. It is anticipated that these visitors will travel from Bathurst Inlet to Contwoyto Lake by ATV.

7.4.4 Information Request 4.4

7.4.4.1 Issue Identification – Road embankment construction design

The design intent for the roadway embankment is not clear.

7.4.4.2 Concern

Based on extensive granular embankment case history review and experience at several Arctic locations, fill depths of 1.6 and 2.0 m were recommended by the Proponent for ice rich and flood plain soils respectively. It would be helpful if the case histories studied were documented or summarized as they relate to this Project.

The use of large diameter rock at the base of the embankment was noted in the DEIS to improve cross drainage. INAC questions if the use of this material could potentially cause a cooling influence (via convection) contributing to eventual aggradation (mounding) of permafrost below the embankment. Will the allowance for cross drainage be sufficient to prevent alteration to the natural hydrological regime and permafrost conditions in the vicinity of the road? How much reliance is placed on cross drainage compared with engineered crossings such as fords, arch culverts and bridges? How will a lower embankment height facilitate improved crossdrainage?

7.4.4.3 Rationale

Without more information, INAC is unable to assess the full extent of impacts to sensitive permafrost terrain. It is recognized in the DEIS that alterations to surface flows and ponding can result in both permafrost effects and shifts in plant communities. It is important, therefore, to understand the potential for alterations in surface hydrology associated with the road design and configuration.

7.4.4.4 Request

The Proponent is requested to provide (i) additional information with respect to the design intent(s) and the results of any geo-thermal modeling completed for the roadway embankment; and (ii) re-consider whether the proposed design will have the intended benefit of substantially facilitating cross-flows of near-surface and surface waters in lowlands portions of the route.

7.4.4.5 Response

The main design intent is to preserve as much as possible the existing conditions over the tundra. By leaving the organic mat in place the benefits of natural insulation and erosion protection

provided by the vegetation are retained. The statement of enhanced drainage conditions was made relative to previous road embankment on permafrost designs (usually of sand and gravel and up to 3 m in height). By using large diameter (open work) rockfill as a subbase, water can more easily percolate through the roadbed. The reduced height of the road embankment is inherently less of a barrier to flow than a higher embankment.

Previous road embankments on permafrost were designed to keep the active layer within the embankment and prevent freeze-thaw activity in the subgrade beneath the road. This usually resulted in mounding of the frost front beneath the road and restrictions or ponding of shallow subsurface water. The use of large diameter rockfill substantially reduces the tendency for the permafrost to rise under the road as the pores in the rockfill will contain air/water at the ambient conditions.

Fords, culverts and bridges will be used at distinct streams, rivers and watercourses. However, in the lowlands or across ephemeral streams that do not have a well-defined channel, the open-work rockfill design will not significantly impede cross drainage.

No geothermal modeling has been done specifically for this project to date, but similar designs for road embankments on permafrost have been successfully used on other projects in the Arctic region (*e.g.*, Diavik, Rankin Inlet to Baker Lake Road).

7.4.5 Information Request 4.5

7.4.5.1 Issue Identification – Refinements to Road Alignment

It is unclear if the limitations for road construction described in Table 8 have been used to refine the proposed road alignment.

7.4.5.2 Concern

The terrain along the road corridor has been classified based on air photo review and field classification. Table 8 identifies limitations for the road location based on parent material types; *e.g.*, lacustrine. In several cases, it has been recommended that certain terrain types be avoided *e.g.,* boulder fields. It is unclear if the proposed road alignment has taken these concerns into account. If not, will adjustments be made to the alignment at a later date, and if so, at what stage in the project implementation.

7.4.5.3 Rationale

Without more information, INAC is unable to assess the full extent of impacts to unique landforms and sensitive permafrost terrain.

7.4.5.4 Request

INAC requests that information with respect to avoidance of problematic or sensitive areas be incorporated in a final proposed alignment.

7.4.5.5 Response

The limitations noted in Table 8 have been taken into account to the extent possible based on scale and level of investigation. During the detailed engineering phases refinements will be made as more information becomes available.

7.4.6 Information Request 4.6

7.4.6.1 Issue Identification – Airstrip

The DEIS is very vague on the airstrip component; i.e. –

> "The airstrip will be used year round for operating personnel and light/perishable (food) cargo movements. A 75 m by 75 m helicopter landing area will be provided at a gravel pad adjacent to the northwest end of the airstrip."

The DEIS does not describe critical components such as the inter-relationship with other project components, infrastructure associated with the airstrip, expected number and types of flight, or expected influence of overflights on avian or mammalian wildlife. Will the airstrip have storage facilities for Aviation gas and / or Jet B?

7.4.6.2 Concern

No environmental assessment of the airstrip component of the project has been provided to date (limited analysis has been completed of aircraft noise: Appendix B-3).

7.4.6.3 Rationale

The airstrip, like all other individual project components, needs to be assessed to develop a better understanding of the overall project implications.

7.4.6.4 Request

Each BIPAR project component (i.e. -port, tank farm, fueling and truck storage area, port camp, road, Contwoyto camp, et cetera) merits consideration of the rationale, possible alternatives, and optimum configuration – both in isolation and holistically with other project components.

7.4.6.5 Response

This information supplements the information in Volume I of the DEIS, Section 7.3.1.5:

The airstrip is oriented in a NNW/SSE direction which is favourable for the take-off and landing of fixed wing aircraft as the prevailing winds are from the northwest to north sector. This convenient location is downwind of the accommodations and is not expected to have any adverse affects from noise or dust on personnel residing at the site. A short spur road from the airstrip to the main road will be constructed as shown on Drawing 300-35-01, Appendix A-3 of the DEIS.

Aircraft refuelling services will not be provided. Aircraft will be required to have sufficient fuel on board for a return trip. A limited amount of Jet B fuel will be kept in drums stored in a

contained area for helicopters providing local service as required. When refuelling helicopters, drip pans and camlock mechanisms will be used.

No de-icing facilities will be provided.

Aircraft using the strip will have to use visual flight rules (VFR).

Most construction equipment and bulk freight will be transported to the site by ship or the Tibbitt-Contwoyto Winter Road. Lighter and perishable materials and staff will be flown in on a routine basis. Current estimates are two to three flights per week during construction and one to two flights per week during operations.

Monitoring for caribou or other wildlife on the airstrip will be carried out. If necessary, caribou may have to be moved or herded off the airstrip prior to landings or departures.

7.4.7 Information Request 4.7

7.4.7.1 Issue Identification – Controlling fuel spills in surface runoff

The DEIS is missing important information to how the diesel fuel will be stored and dispensed.

7.4.7.2 Concern

Are there drip/spill plans or berms being used when transferring diesel fuel from the tank to the equipment being used at the camp? Would surface runoff from fuel storage and transfer areas be treated for more than suspended sediments, prior to discharge into fishbearing waters?

7.4.7.3 Request

The Proponent should provide more detailed information on the transferring of diesel fuel from the tanks to the equipment at the camps.

7.4.7.4 Response

All fuel storage areas will be in containment with a berm and have an impervious liner. In addition sumps will have an oil separator and spill abatement supplies will be on site. Fuel dispensing at the tanks will have sumps with oil separators and spill abatement supplies available. Fuel dispensing at the camp and Port Site by fuel truck will employ drip pan and shut off valves on dispensing nozzles. Camlock mechanisms will be used for nozzle and hose connections.

7.4.8 Information Request 4.8

7.4.8.1 Issue Identification – Fuel handling and spill response plans

The Proponent has not presented sufficient information on project construction and operations, with regard to petroleum hydrocarbon spill prevention and response.

7.4.8.2 Concern

INAC is concerned that in this section of the DEIS, there is no mention of a spill contingency plan. There are going to be 73 trucks (58 being fuel trucks) operated on the road on an annual basis. Accidental and chronic releases of fuel might occur during:

- Marine transport;
- Offloading from tankers at the proposed port;
- Transfer by fuel lines to the tank farm;
- Transfer to B-train tanker trucks and along lines and valves connecting the filling station with the ten 220,000 L tanks;
- Transfer to barges at the barge facility, for delivery to coastal communities and other supply areas;
- Transport along the roadway;
- Offloading at the Contwoyto Lake staging area;
- Storage at the Contwoyto Lake staging area;
- Subsequent transfers for delivery to mines and other areas.

In addition, there is expected to be potential for low volume releases associated with general handling and disposal/recycling of waste oils; materials handling at maintenance facilities; temporary fuel storage, transfers and use during various construction activities; *et cetera*. It must be made evident that the spill contingency plan will be put in place without reading the Environmental Management Plan. Adequate planning for all expected uses of fuel/hydrocarbons needs to be addressed both from a spill response and release prevention perspective. In addition, INAC seeks re-assurance from the project proponent that – as part of fuel transfers via barge – fuel will not be stored in barges for extended periods, nor over winter.

7.4.8.3 Rationale

Given the large volumes of petroleum hydrocarbons that would be transported, handled and stored, an ability to respond to spills is an essential component of environmental impact minimization.

7.4.8.4 Request

INAC requests more specific details regarding spill contingency plans found in Volume 8 of the DEIS.

7.4.8.5 Response

During the preliminary and detailed engineering phases of the project, a comprehensive Spill Contingency plan will be prepared as part of the BIPR Environmental Plan. The plan will be supported by detailed procedures which will be published in the Project Environmental Health and Safety Procedures Manual. Copies of the relevant procedures will be given to all operations personnel and a thorough review will be a part of their prerequisite training. This plan will be provided in the FEIS.

Appendix G-4 of the DEIS outlines the objectives and framework for the BIPR Oil Spill Response Plan with an emphasis on the port facilities. In response to INAC's concerns, the following brief description of action items is presented to supplement the information in Appendix G-4 of the DEIS:

- Marine Transport – Shipping companies must have approved contingency plans as outlined in Sections 4.1 and 4.2 of Appendix G-4 of the DEIS.
- At all fuel transfer points:
    - Fuel transfer hoses will be fitted with camlock mechanisms.
    - Drip pans will be used.
    - Spill kits with sorbent material, mini booms, spark-proof shovels, goggles and sealable containers will be stationed close by.
    - Personnel attending to the transfer will be trained in fuel handling and spill response procedures.
    - Container levels will be closely monitored to avoid overfilling.
- Along the road:
    - All vehicles will have spill kits on board to contain the spill as soon as possible.
    - Spill prevention and response will be a part of driver training.
    - Assistance can be summoned over the mandatory radio system.
    - Trained Emergency Response Team and equipment will be dispatched to assist in containment and clean up of larger spills.
- Spills on Snow and Ice:
    - Form a berm with the snow at the edge of the spill and line with plastic sheeting.
    - Collect contaminated snow and ice and place in drums or a lined containment area.
    - If permission can be obtained from authorities the oil may be burnt off.
- Spills on water:
    - Use booms to contain the slick.
    - Use absorbent pads to mop up the floating oil.
    - Recover oil from water with skimmer or suction.

7.4.9 Information Request 4.9

7.4.9.1 Issue Identification – Utilities, power supply and water supply

Utilities, Power Supply and Water Supply.

7.4.9.2 Concern

Data showing the amount of water being taken from Contwoyto Lake was not found in the EIS. Information on both daily and yearly water use should be provided. Information on water treatment, including a discussion of the adequacy of treatment should be provided. If waste water will flow in the direction of another camp downstream, this should be discussed as well.

7.4.9.3 Rationale

INAC requires more information in order to fully understand the effects of the project on water quantity and quality based on proposed operations at the Contwoyto Lake camp.

7.4.9.4 Request

The Proponent should provide a more detailed plan for taking water from Contwoyto Lake, including amount, water treatment measures, and wastewater issues.

7.4.9.5 Response

Water from Contwoyto Lake will require a 5 m deep wet well with an insulated line to the water tank. The camp will be sized to accommodate 20 persons and quantity of water is estimated at 70 gallons per person per day (1,400 gal per day or 6.5 cubic m per day). During operations additional personell will be utilizing this facility for showering and meals, which will increase the demand to 10 cubic m per day.

However, during construction water demand increases as the crew size will average 60 persons which increases the demand to 4,200 gallons/day (20 cubic m). Potable water will be tested for type of treatment required and the potable water system will have a UV filter. Waste water will be process through a sewage treatment plant utilizing membrane bioreactor technology and discharge onto the tundra.

7.5 Issue – Valued Ecosystem Components

7.5.1 Information Request 5.1

7.5.1.1 Issue Identification – Baseline assessment and Evaluation of Project impacts to land forms and permafrost features

The DEIS (especially as documented in Vol. I) has overlooked important VECs, especially eskers as important geomorphic forms and wildlife habitat, other important geomorphic forms and permafrost features, and wetlands in general. This is in spite of the inclusion of these in the NIRB 2004 Final BIPAR Project EIS Guidelines.

7.5.1.2 Concern

According to the NIRB, 2004, Final BIPAR EIS Guidelines –

> "Reasonable goals for reclamation normally include the re-establishment of stable physical landforms and land-use productivity, and the long-term physical and chemical stability of water resources. The Closure and Reclamation Plan shall

> discuss reclamation methods, the feasibility of those methods in the north, schedule and timeframe."

Furthermore, according to the guidelines –

> "Baseline description shall include, but not be limited by, the following Biophysical components and processes within the Regional Study Area:

4.6.2.1 Terrestrial Environment:

1. special, sensitive, or unique geological or landform features (including inventory of wetlands and their function in the Local Study Area);
2. …
3. surface geology and soils (including eskers);
4. coastal and marine Geology, processes and stability;
5. sediment mobility;
6. granular sources and characterization;
7. permafrost and ground ice conditions;
8. fluvial geomorphology and stability of stream and river crossings;
9. coastal and seabottom stability;
10. areas of ground instability and flood zones, if any;
11. seismicity; and
12. existing or proposed protected areas, special management areas or conservation areas, such as those proposed by caribou co-management boards and land use plans."

Several of these have not been adequately documented at a geographic (or temporal) scale that is conducive to project planning. In particular, the BIPAR DEIS has not considered unique or important landforms within the proposed project footprint as Valued Ecosystem Components. The DEIS does not provide an adequate baseline description of important landforms, including wetlands, eskers, or major permafrost features including massive ice deposits (ice-core hills and eskers, e.g.); nor does it evaluate potential project impacts to such features.

Eskers are important geomorphic features in their own right, but also provide micro-habitat variations for plants, and are important denning grounds for terrestrial mammals such as wolverines, wolves, and bears.

According to Table 21.2-2 (Vol. I., p. 66), 26% of vegetation on 347 ha of esker in Local Study Area (LSA: within 0.5 km on either side of the road and around staging areas) will be lost or disturbed. The loss of esker habitat and area is not identified as a project impact (no other vegetative habitat will be as affected on a percent basis).

Furthermore, it is not clear from the DEIS how much esker area would be affected by road alignment versus borrow areas. The loss of esker as potential denning habitat was apparently not

one of the criteria used in evaluating routing options. According to Appendix D-8, "Wolf denning and pup rearing habitat occurs mainly in esker complexes, which is limited habitat throughout the local and regional study areas."

The main body of the DEIS does not provide adequate summary of baseline status of "riparian tall shrub" plant associations or wetlands in general.

If esker habitat was considered as part of road and quarry siting criteria, a different alignment might have been proposed.

7.5.1.3 Rationale

Eskers within the LSA are significant and important regional features, with heights of up to 20 m and lengths of more than 30 km. The biophysical assessment justifies a higher degree of concern for such features.

7.5.1.4 Request

INAC requests that the proponent re-consider choice of VECS, which should include important/unique landforms and permafrost features, as well as wetland features. This should lead to an in-depth analysis of the project with these VECs in mind.

7.5.1.5 Response

Eskers will not be used as quarries for road construction materials. The road alignment passes overtop of eskers for short stretches. Approximately 47,489 m^2 of esker surface has been identified in the DEIS as potential road surface. This is defined as a soil loss. Approximately 5 m on either side of the road is considered lightly degraded for a total of 50,105 m^2. This effect is described in the DEIS in the context of the effects in the use of the road during the operations stage (Appendix D-2 of the DEIS). That is, continuous use of the road may result in contamination of the road bed and edges with lubricants, oils, grease, and metals from the trucks and deposited as dust or from road runoff. This may result in a gradual contamination of the soils along the road bed edges. Little mitigation can be carried out for this contamination. Good management practices such as ensuring regular maintenance of vehicles should reduce soil contamination. Cleaning up leaks or spills immediately will also reduce the potential effect on the soils.

An example of an esker associated with the road is included in Figure 7.5-1. The plan will be to avoid eskers when possible. In this case, during the design of the final alignment, the road can avoid the esker by moving south. The quarry can also be moved southwest to a rock outcrop to avoid the esker. Once the final alignment has been designed including avoidance of eskers where possible, the surface area of disturbed eskers will be revised.

On closure, quarries will be re-sloped to ensure stability and where appropriate will be seeded with native species to help stabilize the surface. The native seed mix is described in the *Closure and Reclamation Plan* (Appendix G-6 of the DEIS). Esker material is generally coarse textured and has a low moisture and nutrient holding capacity such that the establishment of vegetation on the esker material will be more difficult to achieve than on other materials. If re-vegetation establishment is insufficient, other standard practices will be used to control erosion.

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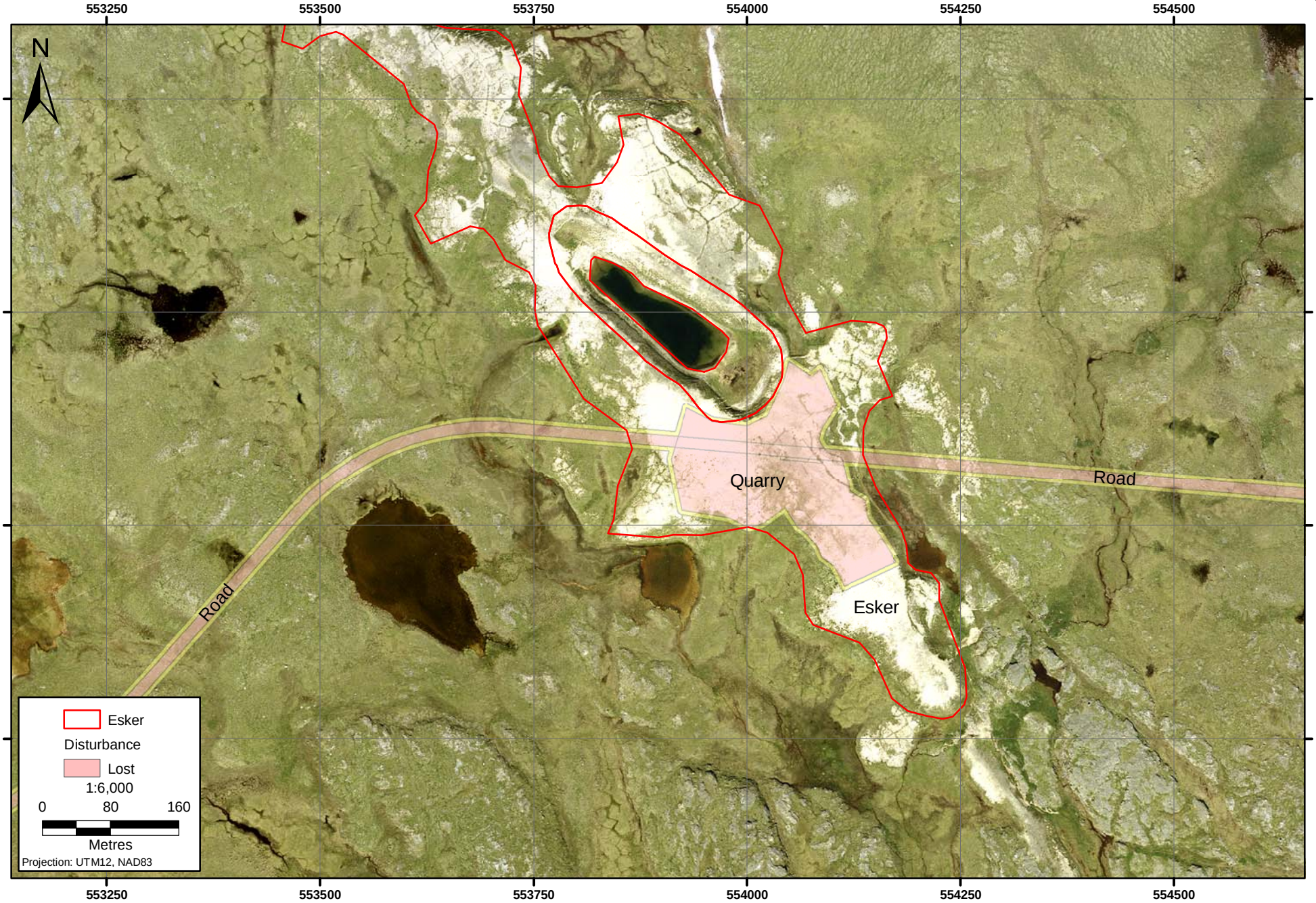


Eskers and Proposed Road
Bathurst Inlet Road and Port Project

FIGURE 7.5-1

the BATHURST INLET PORT AND ROAD PROJECT

Rescan™

Permafrost is recognized as a VEC in the DEIS and the practices to minimize the effect on permafrost are addressed in the DEIS (Appendix D-2 of the DEIS).

Methodology:

Valued Ecosystem Component Selection

VECs associated with ecosystems and vegetation were identified based on a review of baseline study results, plant status (particularly as it relates to conservation, cultural importance, and use by wildlife species), and comments received by regulatory agencies and the public. The VECs include:

- sedge communities (wetlands);
- riparian areas (tall riparian shrub, birch seep);
- esker complexes;
- lichen veneer;
- beach materials (littoral communities);
- sensitive plant communities and associations;
- rare, locally uncommon or significant plant species or species groups; and
- species of ecological importance to Inuit and wildlife.

Due to the inherent sensitivity of the Arctic environment to disturbance, all plant communities and associations (map units, ecosystems) are included as a VEC. However, this effects assessment will pay particular attention to ecosystems with especially sensitive ecological functions such as: riparian, wetland, and esker ecosystems.

The baseline vegetation survey conducted in 2001 mapped all the wetlands, riparian areas, and eskers. Tables 4.2-1 and 4.2-2 in Section 4.2, Appendix D-1 of the DEIS show the amount of disturbance to these areas.

Plant species or species groups considered as rare or significant (*e.g.,* from a regulatory, cultural, or wildlife perspective) were also included as VECs (Section 3.1, Appendix D-1 of the DEIS). Rare plant species include those designated by COSEWIC and SARA, those of interest to the government of Nunavut, and species identified in McJannet and McJannet *et al*., (1993; 1995). Species of ecological importance include those that are of cultural value to Inuit and those that are of importance to wildlife. No rare plant species were identified in the study areas during baseline studies, and as such they will not be assessed further.

7.6 Issue – Meteorology and Climate Effects Assessment

INAC has only limited specific information requests at this time, pending more detailed review of the DEIS. The reconstruction of climate norms (1971 – 2000) for the port area appears reasonable. The Appendix B-1 assessment attempted to quantify the amount of greenhouse gases that will be generated as a direct result of the project, and rated the potential impact as

"moderate" for the simple reason that the estimate would comprise more than 1% of the total projected emissions from the NWT and Nunavut. m^3

7.6.1 Information Request 5.2

7.6.1.1 Issue Identification - Climate Change Influences on DEIS assessments

Of greater interest to INAC is the possible influence that climate change might have on the expectations for project – environment interactions, and project planning/design.

7.6.1.2 Concern

Climate change is of major concern to arctic residents, based on recent observations of relatively rapid ecosystem-scale responses to climate change, with impacts that are likely to be of much higher magnitude than in more southerly regions. Longer-term, synoptic changes in climate 'norms,' as described in the DEIS, Appendix B-1, could influence one or more of the following:

- Seasonality of fish and wildlife migrations and other life cycle traits,
- Average and upper end air temperatures, leading to permafrost degradation and associated failures,
- Severity and frequency of storms,
- Magnitude of frequency of extreme rainfall events, potentially leading to alterations in hydrograph profiles for various surface water flows in the vicinity of the project footprint,
- Changes in erosional tendencies of surface runoff, and/or effects associated with wind erosion or drying,
- Changes in sea ice,
- Presence, persistence and severity of ice fog,
- Other.

7.6.1.3 Rationale

Given the scope of the project and possible longevity, it will be important to assess whether the various EIS assessments and conceptual design features are robust in the face of various climate change predictions over a time horizon of ~20 to 50 yr.

7.6.1.4 Request

INAC would appreciate some analysis about how future climate change scenarios (including both temporal changes in averages and changes in more extreme events) might influence the EIS conclusions and project design.

7.6.1.5 Response

Effects of the environment on the Project have been discussed in Appendix G-2 of the DEIS. More information is provided below.

Freshwater Fish Response

Climate change events such as gradual warming in the north may have several effects on fish species. These effects could include:

- Extended summer season – an earlier freshet would lead to earlier spawning times, and a later fall onset would cause later migration times out of streams into the lakes. Such an extension of the season would alter the reduced risk timing windows of several fish species, including Arctic grayling, lake trout, and whitefish. This would change the instream works window and shorten that period; however, it would not have a significant effect on the Project because the majority of the crossings do not require instream work. Furthermore, it is possible that an extended summer could lead to lower water levels and the dewatering of some small streams. This could block migration routes of some fish species back to larger bodies of water prior to the onset of winter.
- Increased rain and flood events – more running water along the road route would likely increase sedimentation rates at stream crossings. Increased mitigation measures such as bank reinforcement, re-vegetation, and silt curtains would be required..
- Changes in permafrost – ground heaving due to changes in permafrost beyond the engineering design for the road can cause damage to the road and/or stream crossings. If these events do occur, construction equipment may be required for repair work outside of the construction phase of the Project. Increased mitigation effort will be required.

Meteorology and Climate Response

Currently climate change predictions for the Arctic in 2100 include a 5ºC increase in mean annual temperature, a 20% increase in precipitation, and an almost complete disappearance of continuous summer sea ice cover (IPCC, 2007). Increases in the occurrence of extreme events (floods, storms, *etc.*) are also predicted.

As stated by the intervener, it is generally found that Arctic climate change will be more rapid than in other regions of the world. However, predictions about secondary effects are associated with much larger uncertainties than the primary effects of increased average temperature and precipitation.

In particular, it might well be assumed that earlier melting of sea ice will strongly influence seasonality of fish and wildlife migrations, but detailed predictions and corresponding changes in wildlife management strategies are associated with large uncertainties as they depend on details of melting, *etc*.

The main influence of rising air temperatures on permafrost would be an increase of the active layer depth in the summer. Actual active layer depth is highly variable, and may range from less than a metre to several metres, depending on soil conditions. In addition, the road embankments are not designed to remain frozen year-round and so overall the changing permafrost conditions should not hinder Project operations.

The severity and frequency of storms is likely to increase, as are other extreme events, even though no good predictions for the magnitude of this change exist. In the context of the Project, this might mean more shut-downs of trucking operations. Depending on the frequency this might be compensated for by higher traffic volumes during normal operations.

Extreme rainfall events are predicted to increase. Currently, the stream crossings are designed to a Q25 event, *i.e.*, the maximum flow to occur once every 25 years. The flow associated with the current Q25 event will occur more frequently in the future and the future Q25 flow will be larger. As with storm frequency this would lead to an increase in shut-downs of trucking operations, which might be compensated for by higher traffic volumes during normal operations.

Changes in tertiary effects like erosion through changes in surface runoff or wind, drying, or ice fog are extremely difficult to predict given their complexity and the uncertainties in primary climate change predictions. Also, there interactions with the Project will be marginal since changes in erosion, drying, or ice fog will likely not influence the project significantly beyond a change in disruption of operation, and the Project will not have significant influences on them.

The predicted reduction in sea-ice cover will positively influence the Project since increase accessibility of the port increases the economic viability by increasing potential shipping volumes.

In summary, given the uncertainty of climate change predictions and the highly complex interaction of these changes with effects that will influence either Project operations of the influence of the Project on the environment, commitments beyond a general preparedness to adapt environmental management and Project operations to changing circumstances would not be appropriate.

Wildlife Response

The wildlife response to the issue of altered future climate has been addressed through two principal issues – A) changes in calving areas for the Bathurst caribou and B) changes in the timing of sea ice breakup and freeze-up for the Dolphin and Union and the Peary Caribou herds. These assessments are included below:

Note 1: Wildlife species other than caribou were not evaluated for the potential effects of climate change. For most species, the increased climatic variability will result in greater variability in habitat availability and hence life history parameters. Due to the uncertainty involved in these assessments, no predictions were made for species other than caribou.

From Appendix D-3 – Wildlife Effects Assessment:

Disturbance to Feeding and/or Breeding

Note 2: The following effects assessment investigates the potential effects of the project if the calving area of the Bathurst caribou herd changes. Climate is not named specifically as a cause of this shift, but is the most likely driver of large scale shifts in calving area. A reference to climate will be added to the final EIS.

Evaluating the Effects of Caribou Avoidance

The potential effects of caribou avoidance of the port facility, Contwoyto Camp and the road will be evaluated separately. Caribou avoidance of major developments has been reported to range from 3 to 33 km depending on the type of facility and season (see background section). Caribou avoidance during movement and the potential for the road to act as a barrier to migration are discussed in Section 4.1.3.3.

The port facility is expected to produce relatively moderate levels of visual and auditory disturbances due to the level of activity, lighting and infrastructure present. Under current conditions, the inferred seasonal home ranges of caribou overlap the port facility site during the calving and post-calving periods for the Bathurst caribou and during the calving and summer periods for Ahiak caribou. The peninsula on which the port is located is also identified as a caribou water crossing location. Hence, the likelihood and degree of avoidance by caribou is expected to be high and at the moderate to high end of the observed scale of caribou response during these periods. This potential effect will occur during both construction and operations phase until closure.

Under current conditions, the inferred seasonal home ranges of caribou overlaps the Contwoyto camp site during the Bathurst calving period and is marginal to the summer range for Ahiak caribou; however, during spring migration post-calving, summer and fall migration periods for the Bathurst herd, caribou are relatively common in the area of the Contwoyto camp. Hence, the likelihood and degree of avoidance are expected to be low and at the low end of the observed scale of caribou response during these periods. Contwoyto Camp is a small, 20 person camp which will produce relatively low levels of visual and auditory disturbance. This potential effect will occur during construction and for the lifetime of the camp until closure.

The road covers the largest area of the RSA and the potential effects of the road are greater than those of the port or camp, having the highest potential to impact caribou behaviour and cause indirect habitat loss. Caribou are known to avoid active gravel roads, even at very low traffic densities (Dau and Cameron, 1986; Lawhead, 1988). Avoidance appears to be negligible on roads without traffic and climb steeply with the amount of traffic (Dyer *et al.*, 2002).

The effects of the road are evaluated for the three future scenarios (detailed in section 4.1.2.6):

1. the calving grounds remain in the current location;
2. the calving ground expands or shifts to Contwoyto and Nose Lakes; or
3. the calving ground shifts to the east side of Bathurst Inlet.

Under current conditions (Scenario 1), inferred caribou seasonal home range overlaps with the RSA during the calving, post-calving and summer periods for the Bathurst herd and during the summer and winter periods for the Ahiak herd. Caribou are expected to avoid the road during periods when active hauling is occurring (1 January to 30 April) and to a much lesser degree outside the active hauling season (1 May to 31 Dec) when a very low volume of traffic for inspection and road maintenance is expected.

If the Bathurst herd calving ground shifts or expands to Contwoyto and Nose Lakes (Scenario 2), the calving ground would overlap the RSA and may result in higher levels of indirect habitat loss at this important period for caribou. If vehicles were prohibited from driving on the road during this period, this effect would likely be mitigated, but represents a much higher probability of adverse effects than the current scenario.

If the Bathurst herd calving ground shifted to the east side of Bathurst Inlet (Scenario 3), the degree of overlap between the calving ground and the RSA would be reduced or eliminated. Hence, the potential effects of the Project on this herd's calving ground would also be reduced or eliminated.

Disruption to Movement

Dolphin and Union Herd

If shipping activity breaks ice in Dease Strait or the Queen Maud Gulf during the migration period, Dolphin and Union caribou migration may be blocked or animals may fall through recently broken or thin/unstable ice. Analysis of satellite collar data from Dolphin and Union caribou indicate that spring migration occurs from April 21 to July 9, while fall migration occurs from October 21 to December 3 (Mathieu Dumond, Government of Nunavut, *unpublished data*). COSEWIC states that shipping and ice breaking make Dolphin and Union caribou "vulnerable to die-offs similar to those that have affected Peary caribou" (COSEWIC, 2004). The draft WKRLUP also expresses concern for caribou at ice crossings between Victoria Island and the mainland and stipulates that shipping "may not take place outside the normal open water season between July 1 and October 15" (NPC, 2005).

Shipping activities for the Project are planned to occur only during the open water season with no ice breaker support in Dease Strait or the Queen Maud Gulf to extend the normal shipping season. Changes in sea ice coverage through climate change may alter period of ice cover and the migratory dates of these caribou by altering the quality, coverage and timing of thaw and freeze up (COSEWIC, 2004). The primary concerns related to shipping in Arctic waters are accidents and malfunctions resulting in pollution which are not necessarily related to climate. This effect is addressed in Appendix E-6 of the DEIS.

Peary Caribou

Peary caribou from the Prince of Wales-Somerset and Boothia Peninsula groups cross the shipping route through Peel Sound and Franklin Strait during movement between calving areas on Prince of Wales Island and wintering areas on Somerset Island and the Boothia Peninsula (COSEWIC, 2004; Miller *et al.*, 2005). Inuit groups and biologists have expressed concern over the effects of shipping and ice breaking on the inter-island movements of Peary caribou (Miller and Gunn, 1978, 1980; COSEWIC, 2004). During spring migration, the majority of Peary caribou cross Peel Sound and Franklin Strait from May through June over ice (COSEWIC, 2004; Miller *et al.*, 2005). However, data are not available for the period when caribou cross Peel Sound and Franklin Strait during fall migration. Traffic from the proposed shipping route was mentioned as a specific concern by Inuit hunters at meetings of the Kitikmeot Hunters and Trappers Association (COSEWIC, 2004). Peel Sound and Franklin Strait may remain over 50% ice-covered for most of the year, only breaking up from mid-August to mid-October in some

years (Figures 4.1-18 and 4.1-19). Examination of expected shipping seasons for a ten year period in the Peel Sound area, indicated only three years showed an open water shipping season of more than three weeks and four years showed a likelihood of no open water shipping season, except for pockets of less than one week scattered through the summer (Dickins, 2004; Chapter 3, Appendix E-10 of DEIS). Climate warming may change the timing of freeze-up and break-up of sea ice, potentially disrupting Peary caribou inter-island movements (COSEWIC, 2004). If ice-breaking occurs in Peel Sound and Franklin Strait, even using of ice-tolerant ships, Peary caribou migration may be disrupted by open water, partially frozen tracks left in the ice by ships, and animals are at risk of drowning as they cross freshly frozen or unstable ice (COSEWIC, 2004).

7.7 Issue – Noise

7.7.1 Information Request 6.1

7.7.1.1 Issue Identification – Noise effects to wildlife from blasting/underwater noise in Bathurst Inlet

The formal assessment of noise-related impact potential excluded any consideration of ship's noise (including underwater acoustic disturbances) and blasting at quarries during road and site construction.

7.7.1.2 Concern

The anticipated traffic-related noises appear to have been adequately assessed in the DEIS, with a focus primarily on human perceptions and effects, as opposed to wildlife aversion/effects. According to the DEIS –

> *The assessment for construction of the port and road is based on Snap Lake results for construction* (Table 4.1-3).

It was not clear what construction-related activities his would include. In addition, no details of model and modeling parameters/assumptions were provided in the DEIS support material. Such information must be included in the Final EIS.

The evaluation of noise impacts on wildlife appears to have been cursory. According to the DEIS –

> *For a detailed discussion of the effects of noise on wildlife see Appendix D-3 of the DEIS (Wildlife and Wildlife Habitat Effects Assessment).*
>
> *Research indicates that animals may habituate to periodic noises if the noises are predictable. Insome studies, for example, animals were not affected by airplane noise when they could see the airplane before hearing it, but responded negatively when the noise occurred without warning* (Weisenberger *et al*., 1996; Conomy *et al*., 1998).

Additional relevant information was not found in Appendix D-3. It also appears that no description of possible wildlife effects associated with blasting (*e.g.* during critical periods, or near occupied denning sites) has been provided in the DEIS.

7.7.1.3 Rationale

It was unclear to INAC reviewers why the project construction schedule did not consider modifying the type and intensity of various activities in relation to caribou migrations and calving, raptor and carnivorous mammal reproductive periods, or even fish windows. Such an encumbrance on the project construction schedule is typical for other similar types of activities within and beyond the region of interest. Relaxation of scheduling around wildlife effects avoidance periods would require a very strong technical substantiation with a very low degree of uncertainty about predicted impacts.

7.7.1.4 Request

INAC requests that the Proponent extend the assessment of noise-related impact potential to include especially blasting at quarries, and underwater noise transmission and area of influence with Bathurst Inlet. The focus should be much more on wildlife than humans, relative to the information presented in the DEIS (including appendices). In addition, there needs to be strong substantiation for any recommended acceptance of blasting during critical reproductive, migratory and other periods of important wildlife species, including raptors, waterfowl, other bird species, carnivorous mammals, and ungulates.

7.7.1.5 Response

A noise modelling study will be conducted using site specific data that will be collected in 2008. See response to GN IR #13, Section 5.4.2 of this volume.

The subject of this query (noise due to blasting) for freshwater fish was identified in Appendix C-4 of the DEIS, Table 4.1-1, assessed in Tables 4.3-1 and 4.3.2, and addressed in Sections 4.4.2, 4.5.2.1 for freshwater fish.

Setback distances to fish-bearing streams from quarries will be calculated based on the Nunavut guidelines.

Considerations regarding sensitive animal windows and the construction schedule were made in the DEIS (Figure 5.3-1; Table 5.3-1; Table 5.4-1 of Appendix D-3 of the DEIS) and were crucial in the mitigation and management suggestions. Relevant references can be found in Sections 5.3.3.2 and 5.4.3.2 of Appendix D-3 of the DEIS, and some information from these sections is reproduced below (Tables 7.7-1 and 7.7-2; Figure 7.7-1).

Table 5.3-1 of Appendix D-3 of the DEIS.

Table 7.7-1
Wildlife Sensitive Periods Applicable to the Project

VEC	Activity	Sensitive Period[1]
Caribou	Spring migration[2]	April 15 to June 4
	Calving[3]	June 5 to June 15
	Post calving[4]	June 16 to July 20
Muskox	Late winter/Calving	April 1 to June 15
Grizzly Bear	Growing/Cub rearing	May 16 to October 15
Wolverine	Denning/Kit rearing	March 15 to September 15
Wolves	Denning/Pup rearing	May 15 to September 15
Migratory Birds	Nesting/fledging	June 1 to July 31
Raptors	Nesting/fledging	May 5 to September 1
Waterfowl	Nesting/fledging	June 1 to September 1

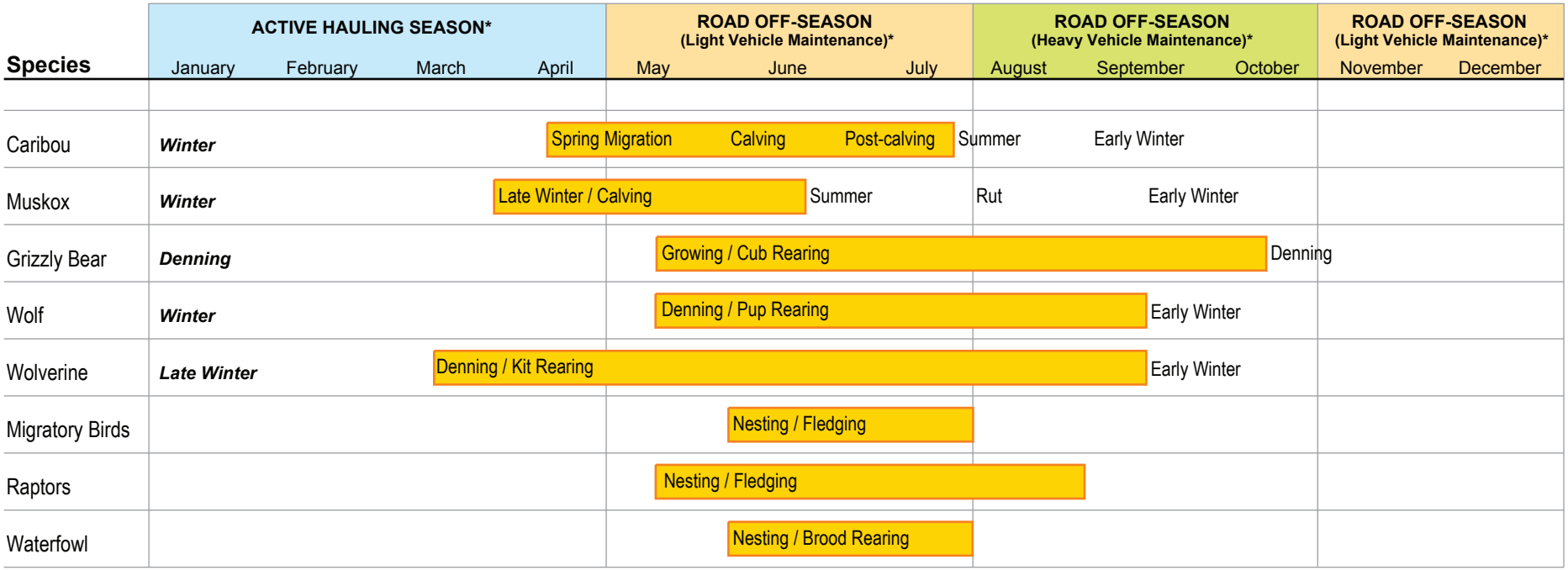
[1]Sensitive period that may interact with Project construction or operations. For complete life history stages, see Chapter 2.
[2]During the spring migration, the majority of Peary caribou cross the ice on Peel Sound and Franklin Strait from May through June. No timing data are available for fall migration.
[3]Calving: Bathurst June 5 to June 15; Ahiak: June 5 to June 20.
[4]Post calving: Bathurst June 16 to July 20; Ahiak: June 21 to July 25.

Table 5.4-1 from Appendix D-3 of the DEIS.

Table 7.7-2
Caribou Sensitive Periods Applicable to the Project

Caribou Herd	Activity	Sensitive Period[1]
Bathurst	Spring Migration	April 15 to June 4
	Calving	June 5 to June 15
	Post Calving	June 16 to July 20
Ahiak	Spring Migration	April 15 to June 4
	Calving	June 5 to June 20
	Post Calving	June 21 to July 25
Dolphin and Union	Spring Migration	April 21 to July 9
	Fall Migration	October 21 to December 3
Peary[2]	Spring Migration	May 1 to July 1
	Fall Migration	unknown

[1]Sensitive period that may interact with Project construction and operations. For complete life history stages, see Chapter 2.
[2]Limited data available for Peary caribou ice migrations. During the spring migration, the majority of Peary caribou cross on the ice over Peel Sound and Franklin Strait from May through June. No timing data are available for fall migration.



Legend

Sensitive Period**

NOTE: Timing of Sensitive Periods may shift due to climate change and/or project activities, therefore, wildlife monitoring will be undertaken to note any change in these dates.

** Dates provided in the Project Description (Appendix A-2 of the DEIS)*

*** Dates reflect literature review of wildlife in the project area, consultation with Inuit and local biologists, government regulations and baseline studies.*

the BATHURST INLET PORT AND ROAD PROJECT

Sensitive Periods Coinciding with Timing of Road Seasons

FIGURE 7.7-1

Rescan™

Noise-related impact potential for marine mammals has been addressed in Appendix E-5 of the DEIS.

7.8 Issue – Surface Waters

7.8.1 Information Request 7.1

7.8.1.1 Issue Identification – Water extraction from un-named creek at port site

It is proposed on p. 26 of Vol. I that water will be drawn from an un-named creek at the Bathurst port facility site, and "used for concrete, granular fill materials washing and potable use"

7.8.1.2 Concern

More information on the predicted impact to the un-named creek is needed. This should include seasonal, annual and minimal flows, the estimated volume of the un-named creek. If water will be released to the un-named creek, information on this should also be provided, including whether it will be treated.

7.8.1.3 Rationale

This information is necessary to verify that water utilization rates will not impair other important functions.

7.8.1.4 Request

Adequate information on seasonal and annual flows, and minimum stream flow requirements is a prerequisite to evaluating acceptability of this and indeed all proposed water sources.

7.8.1.5 Response

The amount of water to be extracted from Un-named Creek during the construction period is estimated to be approximately 155 m^3/day, of which 100 m^3/day would be for construction purposes during the summer (*i.e.*, concrete, compaction, dust control, and washing aggregate) and 55 m^3/day would be potable water for the construction camp. The camp, once completed, will have a potable water demand of 45 m^3/day. A hydrometric station will be installed in the spring of 2008 to quantify the annual volume, peak flow discharge and low flows.

A discharge measurement was taken at Un-named Creek on August 19, 2001 which was 0.14 m^3/s. The drainage area at the mouth is 63.9 km^2 and approximately 6.8% of the basin consists of lake cover. For the purposes of the preliminary assessment of the flow conditions in Un-named Creek, it is assumed that Un-named Creek is hydrologically similar to Atitok Creek. Atitok Creek has a drainage area of 217 km^2 and is the smallest arctic station monitored by the WSC in the Arctic northern mainland. Although other WSC hydrometric stations are closer in proximity (*i.e.*, Burnside River and Gordon River), catchment area is believed to be a stronger influence on hydrologic characteristics than proximity for the monthly distribution of flows. Based on the regional analysis described in Appendix C-1 of the DEIS, average annual runoff was estimated to be 225 mm.

The discharge regime of Un-named Creek was estimated using the average monthly flow distribution from the Atitok Creek historical data set, as indicated in Table 7.8-1 below.

Table 7.8-1
Un-named - Estimated Monthly and Annual Runoff

	Atitok Creek	Un-named Creek Estimate		
Month	Monthly flow distribution %	Runoff in mm	Average Monthly Discharge m^3/s	Runoff in dam^3
Nov	0	0	0	0
Dec	0	0	0	0
Jan	0	0	0	0
Feb	0	0	0	0
Mar	0	0	0	0
Apr	0	0	0	0
May	6	13	0.31	831
Jun	66	149	3.55	9,521
Jul	6	13	0.31	831
Aug	5	11	0.26	703
Sep	14	32	0.76	2,045
Oct	3	7	0.17	447
Total	100	225	-	14,378

Note: that 1 dam^3 (cubic decameter) equals 1,000 m^3, and that 1 mm depth of runoff from an area of 1 km^2 produces a volume of 1 dam^3.

The flow measurement conducted on August 19, 2001 is in the same order of magnitude as the estimate of the average monthly discharge indicating this to be an adequate preliminary estimate for the discharge of Un-named Creek.

Based on the above estimates, the lowest monthly flow in Un-named Creek is expected in October. During this month, the maximum estimated water demand of 155 m^3/day (0.0018 m^3/s) during construction represents 1.1 % of the available flow. Assuming that the flow estimates presented in Table 7.8-1 are reliable, it is reasonable to suggest that the water demand presented would not be substantial during any month where flow exists in Un-Named Creek. Water demand during the winter will be satisfied by desalination of water from Bathurst Inlet in the above mentioned volumes.

7.8.2 Information Request 7.2

7.8.2.1 Issue Identification – Hydrological data

Appendix C-1 discusses hydrographic data availability and mean monthly discharge estimates for watersheds influenced by the proposed project; however, the information summary is largely derivative, and detailed underlying data would be useful.

7.8.2.2 Concern

Underlying data are needed, along with assumptions, so that flow projections and seasonal trends can be better understood. Annual runoff for the area ranges from approximately 200 to 250 mm, depending on latitude and precipitation amounts, of which the freshet period can be greater than 70% of this volume. Where did this data come from and can it be provided? Does this data have a range of at least 25 years?

Additional questions arising from the initial review of the hydrological assessment follow:

Reference; DEIS Vol.2 A-2 Sect. 3.2

- Figure 10 and 13: Are these extreme daily maximums or monthly highs or average monthly highs (1956-1982)?
- Figure 11 and 14: Is this the mean monthly precip? …or the average of extremes? Should include max and min monthlys for period of record. Figure 12 and 15: Provide wind roses. Consider combining Contwoyto Lake and Lupin records.

Reference; DEIS Vol.2 A-2 Sect. 3.4

- Where are the calculations on precipitation and runoff? The numbers and precipitation profile don't add up (For example figure 15).
- Estimated hydrology of Amageok Creek and Mara River?

Reference; DEIS Vol. 3 B-1 Sect. 2.2.2

- Table 2.2-3 & figure 2.2.-4: Monthly rainfall(mm) at the Port, Lupin, Kugluktuk and Cambridge Bay for the period of August 2001 to August 2004. Are there any data collected from September 2004 to the present date (March 2008)?
- Table 2.2-4: Precip Climate Normals for Lupin and Bathurst Inlet. How were the monthly averages calculated?

Reference; DEIS Vol. 3 B-1 Sect. 2.3.2

- Not enough info about the climate along the road; specifically precipitation. The Proponent should indicate the year(s) the data from Figure 2.3-4 was taken. INAC is concerned about Figure 2.3-4 Adjusted Climate Normals for Precipitation at Lupin…This figure does not show a timeline…What year(s) is this data taken from? Where does this data come from?

Reference: DEIS Vol. 3 B-5 Sect. 3.2

- Concerns: Table 3.2-1 and Figure 3.2-1: Total Monthly Precip at Bathurst Inlet and Regional Meteorological Stations, August 2001 to August 2002…. Provide data that is more recent!! Also provide a longer time period of data! Recommend 25 year period.

7.8.2.3 Rationale

Underlying data descriptions needed to assess accuracy of EIS assessment/predictions.

7.8.2.4 Request

INAC requests that the Proponent provide more detailed information on the hydrograph of the actual or estimated data for various streams, including the particulars of the underlying data.

7.8.2.5 Response

Background information to the annual runoff selected for the road route can be found below or in Appendix C-1 of the DEIS, pages 2-7 to 2-9.

Average Annual Runoff

Runoff is a measure of the hydrological response of a watershed to natural precipitation. It is a parameter that is normalized by watershed area, so that watersheds of different sizes can be compared directly. Another attractive feature of runoff as a hydrological parameter, is that it is presented as a water depth in millimetres (mm) over an entire watershed, allowing direct comparison with precipitation totals. Runoff is calculated by dividing the total flow volume (m^3) observed at a monitoring station with the basin area (m^2) draining into the site.

Average annual runoff from the Gordon and Burnside River basins for the period of record was 219 and 241 mm, respectively. This suggests that, on average, 73 to 86% of the annual precipitation measured at Bathurst Inlet (279.2 mm) and Lupin Airport (299.2 mm) will produce runoff. Annual average runoff was 224 mm at Qinguq. Precipitation normals at the Baker Lake climate station, operated by Environment Canada, was 270.4 mm. This suggests that runoff from the Qinguq basin is in the same range as the Burnside and Gordon rivers. Kane and Yang (2004) presented a range of runoff coefficients from 0.35 to 0.85 for basins in similar latitudes. Therefore, the runoff coefficient derived for this area appears to be in the high range and presents a conservative estimate for runoff calculations from precipitation. Annual runoff increases from the south to the north and appears to reflect the regional distribution of permafrost. Lower basin yields are observed in the zone of discontinuous permafrost, and higher yields are observed in the continuous permafrost zone (HBT AGRA Limited, 1993). Since runoff is normalized by watershed area, results from these larger watersheds can be reasonably extrapolated to the smaller basins. The annual runoff from the smaller watersheds in the study area is estimated to be between 200 to 250 mm.

Monthly Flow Distribution

Based on 16 years of data for the Gordon River, maximum discharge occurs in June, with flows decreasing through the summer months into fall and winter (Figure 2.5-1 in Appendix C-1 of the DEIS). September shows a slight increase in flow due to increased precipitation in late August and September. Mean annual flows are deceptively low, with a five-month period of no discharge from December to April; therefore, the active season discharge was calculated which excludes these months.

Freshet contribution to the annual hydrograph of 70% was derived from the stations listed in Table 2.4-1 of Appendix C-1 of the DEIS. Average freshet contributions to the annual hydrograph for the period of record ranged as high as 65% for the WSC Atitok Creek Station and in a single year of record was as high as 94%.

Table 2.4-1 of Appendix C-1 of the DEIS gives the period of record for the WSC hydrometric monitoring stations, which ranges from 10 to 32 years. The only station that was available with greater than 25 years of data was the Burnside at the Mouth station.

Response to Reference; DEIS Vol.2 A-2 Sect. 3.4

- Estimated hydrology of Amagok Creek and Mara River?

Amagok Creek and Mara River Hydrologic Characteristics

The drainage areas at the road crossing for Amagok Creek and Mara River are 1107 and 1811 km^2, respectively. For the purposes of the preliminary assessment of the flow conditions in these rivers, it is assumed that they are hydrologically similar to Gordon River. The Gordon River has a drainage area of 1,530 km^2 and is in reltively close proximity to the Mara and Amagok rivers. Although other WSC hydrometric stations are closer in proximity (*i.e.*, Burnside River), catchment area is believed to be a stronger influence on hydrologic characteristics than proximity for the monthly distribution of flows. Based on the regional analysis described in Appendix C-1 of the DEIS, average annual runoff was estimated to be 225 mm.

Amagok Creek and Mara River Estimated Discharge Regime

The discharge regime of Amagok Creek and Mara River were estimated using the average monthly flow distribution from Gordon River historical data set, as indicated in Table 7.8-2.

Table 7.8-2
Amagok Creek and Mara River - Estimated Monthly and Annual Runoff

	Gordon River		Amagok Creek Estimate		Mara River Estimate	
Month	Monthly flow distribution %	Runoff in mm	Average Monthly Discharge m^3/s	Runoff in dam^3	Average Monthly Discharge m^3/s	Runoff in dam^3
Nov	0	0	0	0	0	0
Dec	0	0	0	0	0	0
Jan	0	0	0	0	0	0
Feb	0	0	0	0	0	0
Mar	0	0	0	0	0	0
Apr	0	0	0	0	0	0
May	4	9	3.7	9,963	6.1	16,299
Jun	44	99	40.9	109,593	66.9	179,289
Jul	26	59	24.2	64,760	39.6	105,944
Aug	12	27	11.2	29,889	18.3	48,897
Sep	12	27	11.2	29,889	18.3	48,897
Oct	2	4	1.9	4,982	3.0	8,150
Total	100	225	-	249,075	-	407,475

Note: that 1 dam^3 (cubic decameter) equals 1,000 m^3, and that 1 mm depth of runoff from an area of 1 km^2 produces a volume of 1 dam^3.

7.8.3 Information Request 7.3

7.8.3.1 Issue Identification – Wetlands and Distributed Flow

The hydrological analysis, water quality, and effects assessments appear to be virtually silent on the role of wetlands habitats in water conveyance/supply or based on ecological value. The wetlands can likely be variously divided in arctic bogs, fens, marshes, swamps, and shallow open waters (e.g. based on the Canadian wetlands ecosystem classification system or a system better suited to arctic wetlands ecosystesm). In addition, various fens and bogs along the route could be classified as ombrogenous or geogenous depending on seasonal and annual water supply and fluctuations.

A better understanding of the extent and types of wetland in the LSA would provide an improved understanding of several emergent characteristics of relevance to the EIS, potentially including:

- Open-channel stream flow elevations and seasonal trends;
- Expectations associated with road-induced changes in surface flows and subsequent thermokarst formation potential;
- Water movements through road beds;
- Migration potential of any ML/ARD releases;
- Vegetation community status.

7.8.3.2 Concern

Failure to appreciate water flows through not just open channels flows but also contiguous wetlands might result in underestimation of stream height variation or erosional potential at road crossing sites.

7.8.3.3 Rationale

Adequate consideration of wetlands processes and distribution may help with planning around the type and specific configuration of stream crossings, especially in light of the very limited hydrographic data available at each proposed crossing.

7.8.3.4 Request

INAC requests that more discussion in the EIS be focused on wetlands in the LSA.

7.8.3.5 Response

Road fill material that will be used for the road bed will comprise diameters less than 900 mm. This size of material will accommodate adequate cross drainage for wetlands to maintain their hydrologic continuity where the road alignment cannot reasonably avoid establishing a road bed on wetland habitat. The FEIS will incorporate a detailed assessment of wetlands in the LSA.

7.8.4 Information Request 7.4

7.8.4.1 Issue Identification – Culverts and bridges

There is inadequate information on design parameters for culvert and bridge crossings.

7.8.4.2 Concern

Information should be provided to allow reviewers to assess the validity of the following information. A basis for estimation of the 1 in 25 year level should also be provided:

- Arch culverts and bridges will be designed to pass a 1 in 25 year flood event with additional 0.3m of freeboard to pass ice and snow debris during the freshet period.

7.8.4.3 Rationale

INAC requires this information to assess the suitability of various stream crossing options. Given the large number of stream crossings over the 211 km of road length, it will be important that the design features are clearly laid out, substantiated, and consider all relevant issues such as future changes in extreme and longer term flows.

7.8.4.4 Request

INAC requests additional information on (i) the conceptual design guidelines and rationale (*i.e.*, what design standard that was followed?), and (ii) how local site water elevation benchmarks will be established.

7.8.4.5 Response

The information in Volume I, Section 16.2 of the DEIS is supplemented by meteorological and hydrological information in the following sections:

- Appendix B-1 of the DEIS, *Meteorological and Climate Effects Assessment*;
- Appendix B-5 of the DEIS, *Meteorology Baseline Study 2001-2002*;
- Appendix C-1 of the DEIS, *Surface Water Quantity Effects Assessment*.
- Appendix A-3 of the DEIS, *Feasibility Study*.

The discussion in Sections 5.2.6 – 5.2.8 of Appendix A-3 of the DEIS describes how stream flows are estimated based on regression analysis of watershed areas versus Q where information is available. Velocities and water depths are then estimated using Manning's formula. In the absence of specific Territorial standards a design frequency of 1-in-25 years was chosen as a preliminary criterion.

The arch culverts are bottomless and their capacity exceeds that of round pipe culverts or arch pipe culverts of similar dimensions inserted in the streambeds. The arch culverts span the streams to preserve the fish habitat and the main design consideration is scour of the streambed if extreme flows are ultimately restricted by the arch span or bridge abutment, and high velocities develop. Counter-measures such as riprap upstream and downstream of the stream crossings as well as armouring of the streambed, if deemed appropriate, will be employed. Final design of

the culverts will ensure that the natural stream velocities do not change as a result of the culverts and bridges at design flows.

7.8.5 Information Request 7.5

7.8.5.1 Issue Identification – Fords

Fords and Stream Crossings.

7.8.5.2 Concern

INAC is concerned that during the spring fords may wash away due to their loose structure. Fords, which are essentially a combination of loose gravel and rock, are designed to accommodate some amount of runoff, but may become impassable with heavy runoff.

7.8.5.3 Rationale

The possibility of fords washing away should be discussed to ensure a complete assessment of the impacts of the project.

7.8.5.4 Request

The Proponent should provide evidence of researching the stability of fords during spring runoff.

7.8.5.5 Response

Only small low flow streams will be forded. Streams in this low relief, low precipitation region do not generally develop the velocity and volume to entrain the coarse material that will be used to construct the fords. It should be noted that the occurrence of major floods during the January to April operation period of the road is highly unlikely. Minor repairs may be necessary after extreme summer runoff events. Maintenance crews will repair any flood damage prior to the next winter operation period.

7.8.6 Information Request 7.6

7.8.6.1 Issue Identification – Surface Water quantity monitoring

Plans for surface water quantity monitoring/hydrographic data collection, beyond the port area, were not evident in the DEIS.

7.8.6.2 Concern

Plans for a surface water quantity monitoring program were not found in the DEIS. Without these it is not clear how the proponent will ensure that predictions with respect to surface water quality are accurate and how surface water quality will be ensured.

7.8.6.3 Rationale

Without these it is not clear how the proponent will ensure that predictions with respect to surface water quality are accurate and how surface water quality will be ensured.

7.8.6.4 Request

The Proponent should provide a detailed description of any surface water quantity monitoring plans.

7.8.6.5 Response

The surface water quantity monitoring program is outlined in Appendix C-1 of the DEIS, page 6-1. No impacts on the surface water quantity are anticipated from any road crossing. Any change in flow will be temporary and have limited to no effect on the flow regime. Due to the extraction of water from Un-named Creek during construction a hydrometric monitoring station will be installed in spring 2008 to monitor impacts of the water extraction. The station will be operated for the duration of the Project. This will provide a long-term record of local hydrology and will be used to monitor the changes in surface water quantity.

7.9 Issue – Surface Water Quality

7.9.1 Information Request 8.1

7.9.1.1 Issue Identification – Stream and wetland crossings

The Proponent has not presented sufficient information concerning the effects of the project on stream and wetland ecosystems.

7.9.1.2 Concern

Are there any data for the rate of natural flow (speed, direction) for all the streams? Is the data taken from a minimum of 25 years? Are there any data showing the estimated flow change when stream crossing are put into place. Are the stream crossings built to last the flow of water? What type of stream crossings are being used for the three large streams (catchment areas of > 100km$_2$)? When installing stream crossings, it may cause a constriction in the waterway which can obstruct flood flow and cause flow backups or washouts. Also water levels may rise causing ice dams?

Table 7.3-1 (Road Design Criteria) shows the width of the bridges at 6.0m. Where did this 6.0 m come from? Table 7.3-2 (Numbers of Crossings per Watershed Size) shows the watershed area range (km$_2$). What about showing flow, speed, width and direction! When referring to handling peak flows(*i.e.*, 1:25-year event) where did the numbers 1:25 come from?

7.9.1.3 Rationale

In order to fully understand the full effects of water quantity of the stream crossings, INAC requires a more detailed description.

7.9.1.4 Request

INAC requests references for these specific indications.

7.9.1.5 Response

Further information can be found in Appendix A-3, *Feasibility Report*, Section 5.2.6. Below is the paragraph addressing the velocity and depths of river/stream crossings for the road as reported by SNC Lavalin.

> *Average depths and velocities were estimated for all bridge crossings after determining approximate bridge widths based on field surveys. Channel gradients were measured from NTS 1:50,000 topographic maps. Roughness was estimated based on field observations. Based on the equations for the 1:25 year event at the bridge crossings, the average estimated stream depths were 0.47 ± 0.27 m, and the average stream velocities were 1.4 ± 0.58 m/s.*

Figures 7.9.1a to 7.9-1f present the direction of flow for each crossing and Table 7.9-1 outlines the available data on velocity of flows.

Hydrological data for this remote area is sparse. A description of the existing hydrological conditions in the region is presented in Section 5.2.6, Appendix A-3 of the DEIS along with methods and formulae that will be used to estimate streamflows.

In addition Appendices C-1 and C-2 of the DEIS contains data and descriptions of the 104 identified stream crossings. Construction methods and impacts are also discussed.

The 6 m bridge width is the criteria chosen by the design team and client to be sufficient for 2-way traffic on a resource access road.

Based on a 20-year road life, there is less than a 50% chance that the 1:25 year event will occur during road operations. The 300 mm freeboard will provide additional protection against larger floods.

7.9.2 Information Request 8.2

7.9.2.1 Issue Identification - Bank stability/permafrost conditions at bridge and culvert stream crossing

Descriptions of bank stability and permafrost conditions at bridge crossings are not provided.

7.9.2.2 Concern

Failures of frozen soils at river crossings are of particular importance in permafrost settings. Has the condition of the riverbanks been characterized with particular attention to potential failure modes associated with degrading permafrost or ice lensing/wedging in sedimentary bedrock formations?

7.9.2.3 Rationale

INAC is currently unable to fully assess the suitability of major river crossings proposed for this project.

Table 7.9-1
Flow Velocity, Discharge, Depth and Widths of Streams at Crossings of the Proposed Road Route

Original Site (km)	Mapped Site (km)	Flow Velocity (m/s)	Current Flow Conditions	Discharge (m^3/s)	Depth (m)	Width (m)
2.5	2.2	0.12	Low	0.139	0.4	2.9
3	2.8	0.2	Low	0.003	0.05	0.25
7.7	7.8	0.2	Low	0.006	0.2	0.15
11.9	14.1	0.25	-	0.128	0.15	3.4
21.2	22.9	1.1	-	9.056	0.58	14.9
31.8	30.4	0.15	-	0.019	0.05	2.5
31.9	33.4	0.39	-	0.047	0.1	1.2
32.9	33.7	-	low	0.426	-	-
33.9	33.8	0.25	-	0.205	0.1	8.2
35.2	34.8	0	low	0	-	-
40.3	40.6	0.5	low	0.01	0.1	0.2
41.6	42.3	0	low	0	-	-
42.9	43.3	0.25	-	0.041	0.15	1.1
56.8	56.9	0.19	Low	0.059	0.1	2.6
66.2	67.9	0.28	m	0.091	0.22	1.3
67.1	68.3	0.4	low	0.36	0.15	6
67.4	68.4	0.4	low	0.08	0.1	2
68.2	69.4	0.35	Low	0.025	0.1	0.7
70.4	70.1	0.33	m	0.198	-	-
74	74.1	0.7	low	0.077	0.1	1.1
75.1	74.9	0.214	m	0.032	0.25	0.6
82.1	80.4	0.35	low	0.49	0.35	4
83	83.7	0.2	m	0.02	0.05	1.2
100.9	100.3	0	low	na	-	-
101.2	103.3	0.3	low	0.074	0.35	0.7
104.4	103.3a	0.2	m	1.86	0.36	30
110.9	106.7	0.5	low	0.18	0.3	1.2
111.5	113.2	0.17	m	0.022	-	-
126.5	125.3	0.65	Low	32.5	0.5	100
132	134.6	0.38	low	2.73	-	-
157	155.7	0.154	m	0.008	0.09	0.64
158.3	158.2	0.66	Low	0.094	0.1	1.4
165	167.6	0	no flow	0	0	0
166.7	168	0.4	Low	0.028	0.2	0.35
167.7	168.3	0.21	m	0.068	0.1	1.8
170.2	169	0.45	low	0.108	-	-
178.3	177.2	0.48	m	6.33	-	-
180.4	181.4	0	m	0	-	-
183.4	183.6	0	low	0	-	-
186	186.5	0.1	low	0.003	0.05	6
189.2	189.6	0	m	0	-	-
189.8	-	0.3	low	0.03	-	-
193.4	192.4	0	m	0	-	-
193.5	193.8	0	m	0	-	-
193.7		0	m	0	-	-
198.8	198.2	1.05	Low	7.088	-	-
199.8		0.29	m	1.37	-	-
201.2	201.9	0	low	0	-	-
203.6	202.8	0.17	m	0.088	-	-
205	204.3	0	Low	0	-	-

Dashes (-) indicates no data available .

Note: 'Original Site' refers to the site by km from the 2001 Bathurst Inlet Port and Road Project Baseline Report Appendices; 'Mapped Site' site refers to the km markers presented on the most updated (May of 2008) Rescan mapping data.

7.9.2.4 Request

INAC requests that information be provided with respect to the stability of banks where bridge abutments or culvert installations are planned; *e.g.*, Mara River.

7.9.2.5 Response

A site investigation program is planned for summer 2008 to investigate the geotechnical conditions at the major river crossings. Our current plans are to found the abutments on sound bedrock outside of the wetted perimeter of the rivers. Riprap blankets will be placed upstream and downstream of the abutment locations to prevent bank erosion in the vicinity of the abutment foundations.

7.9.3 Information Request 8.3

7.9.3.1 Issue Identification – Construction site water management

There is missing information about the dewatering process at the construction sites.

7.9.3.2 Concern

It is stated that during construction, erosion will be minimized by de-watering construction sites as required. However, the proposed methodology for dewatering is not provided.

7.9.3.3 Rationale

INAC does not have enough information on the dewatering process to determine the significance of environmental effects, if any.

7.9.3.4 Request

The Proponent should provide a more detailed plan of the de-watering process of construction sites.

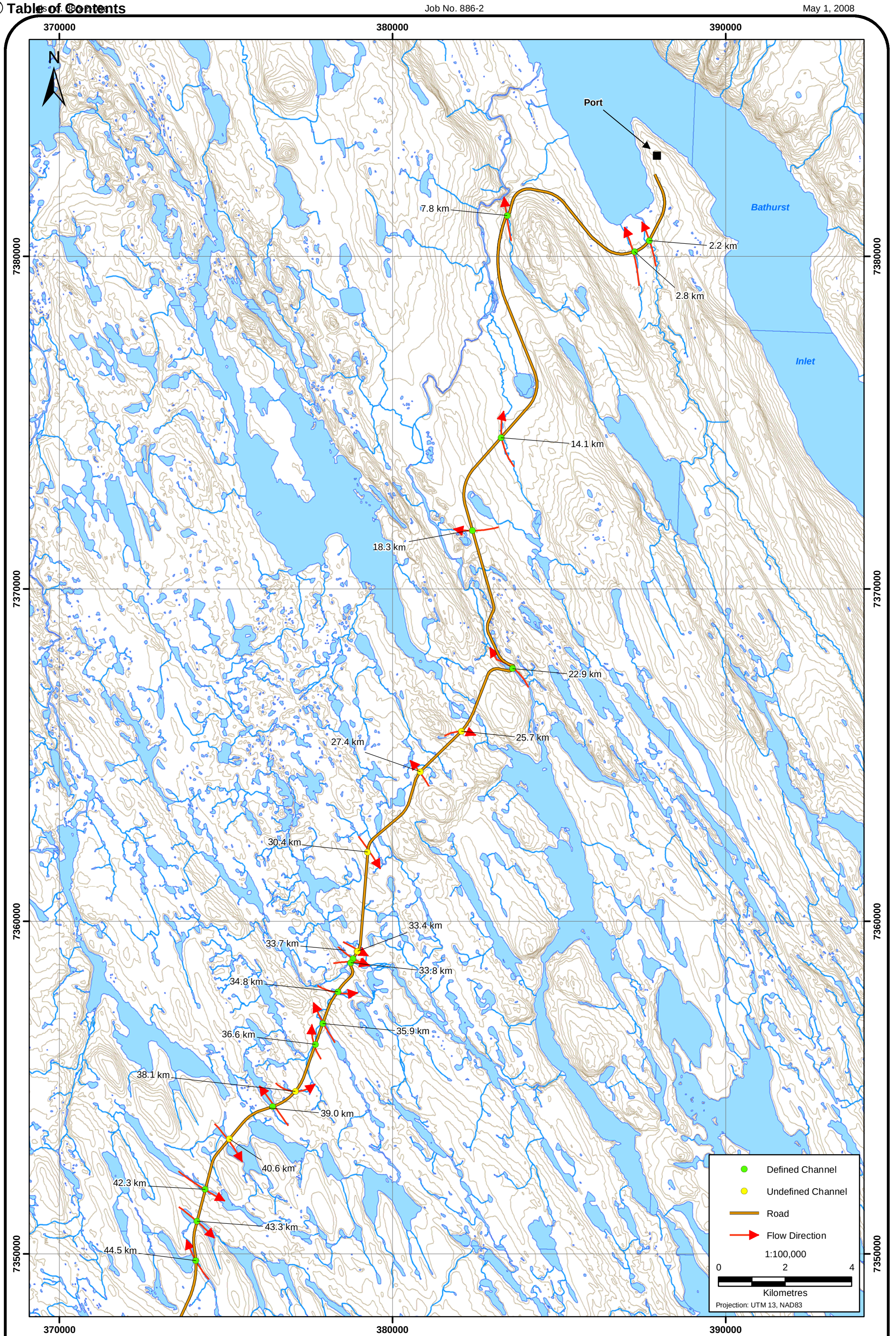
7.9.3.5 Response

Excavations anticipated at construction sites are minimal and shallow. All summer water crossing construction sites will if required have a sump. All surface water will be directed away from the work area. Silt fences will be installed in drainage ditches where erosion may occur and water from the work area will be discharged to natural drainage areas. Where necessary, settling ponds will be provided to capture sediments before water is discharged into natural water bodies.

7.9.4 Information Request 8.4

7.9.4.1 Issue Identification - Planning associated with potentially acid generating (PAG) materials

ML/ARD from quarry materials and granular material has the potential to influence especially surface water quality. The mitigative measure that will be employed should it be determined that bedrock or granular resources have the potential for acid rock drainage is not clear.

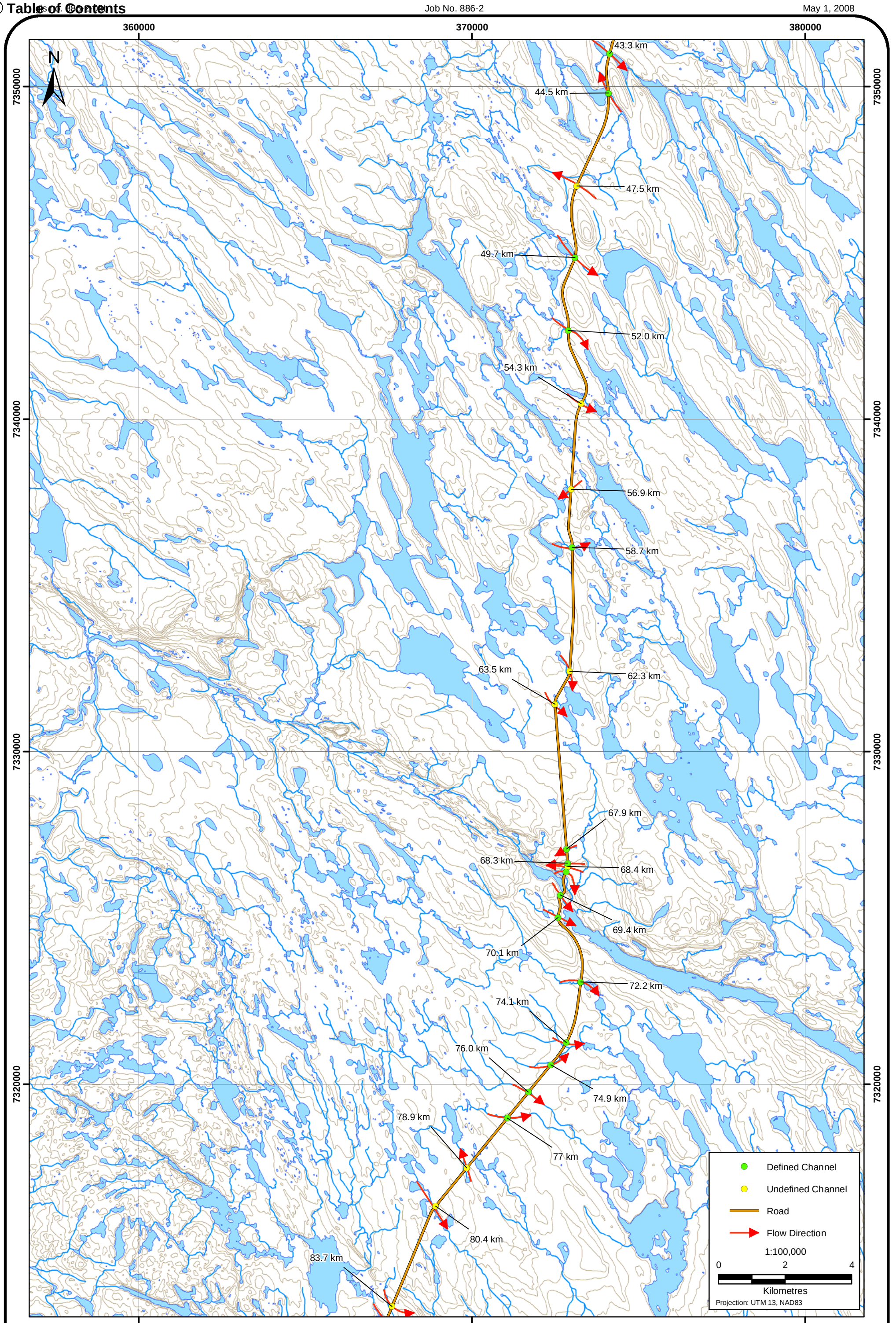


the Bathurst Inlet Port and Road Project

Flow Direction for Streams Crossing the Proposed Road Route

FIGURE 7.9-1a

Rescan™



the Bathurst Inlet Port and Road Project

Flow Direction for Streams Crossing the Proposed Road Route

FIGURE 7.9-1b

Rescan™

620000 630000 640000

7310000 7300000 7290000

N

84.2 km
84.2 km
84.2 km
84.2 km
85.0 km
90.3 km
91.4 km
92.3 km
94.1 km
97.2 km
98.8 km
100.3 km
103.3 km
103.3a km
106.7 km
113.2 km
113.8 km
115.2 km
117.4 km
119.4 km

Defined Channel
Undefined Channel
Road
Flow Direction
1:100,000
0 2 4
Kilometres
Projection: UTM 12, NAD83

the Bathurst Inlet Port and Road Project

Flow Direction for Streams Crossing the Proposed Road Route

FIGURE 7.9-1c

Rescan™

585000 590000 595000 600000 605000 610000 615000 620000

7285000 7280000 7275000 7270000

N

117.4 km
123.8 km
125.3 km
119.4 km
123.3 km
128.8 km
134.6 km
136.6 km
144.6 km
146.6 km
149.7 km
147.5 km
151.6 km
155.7 km

Defined Channel
Undefined Channel
Road
Flow Direction
1:100,000
0 2 4
Kilometres
Projection: UTM 12, NAD83

the Bathurst Inlet Port and Road Project

FIGURE 7.9-1d

Flow Direction for Streams Crossing the Proposed Road Route

Rescan™

560000 565000 570000 575000 580000 585000 590000 595000

7275000 7270000 7265000 7260000 7255000

N

146.6 km
149.7 km
147.5 km
151.6 km
155.7 km
158.2 km
159.5 km
159.7 km
160.7 km
169.6 km
169.1 km
168.3 km
168.0 km
167.6 km
170.8 km
169.4 km
177.2 km
173.1 km
189.6 km
183.6 km
181.4 km
186.5 km
182.8 km

Nose Lake

Defined Channel
Undefined Channel
Road
Flow Direction

1:100,000

0 2 4

Kilometres

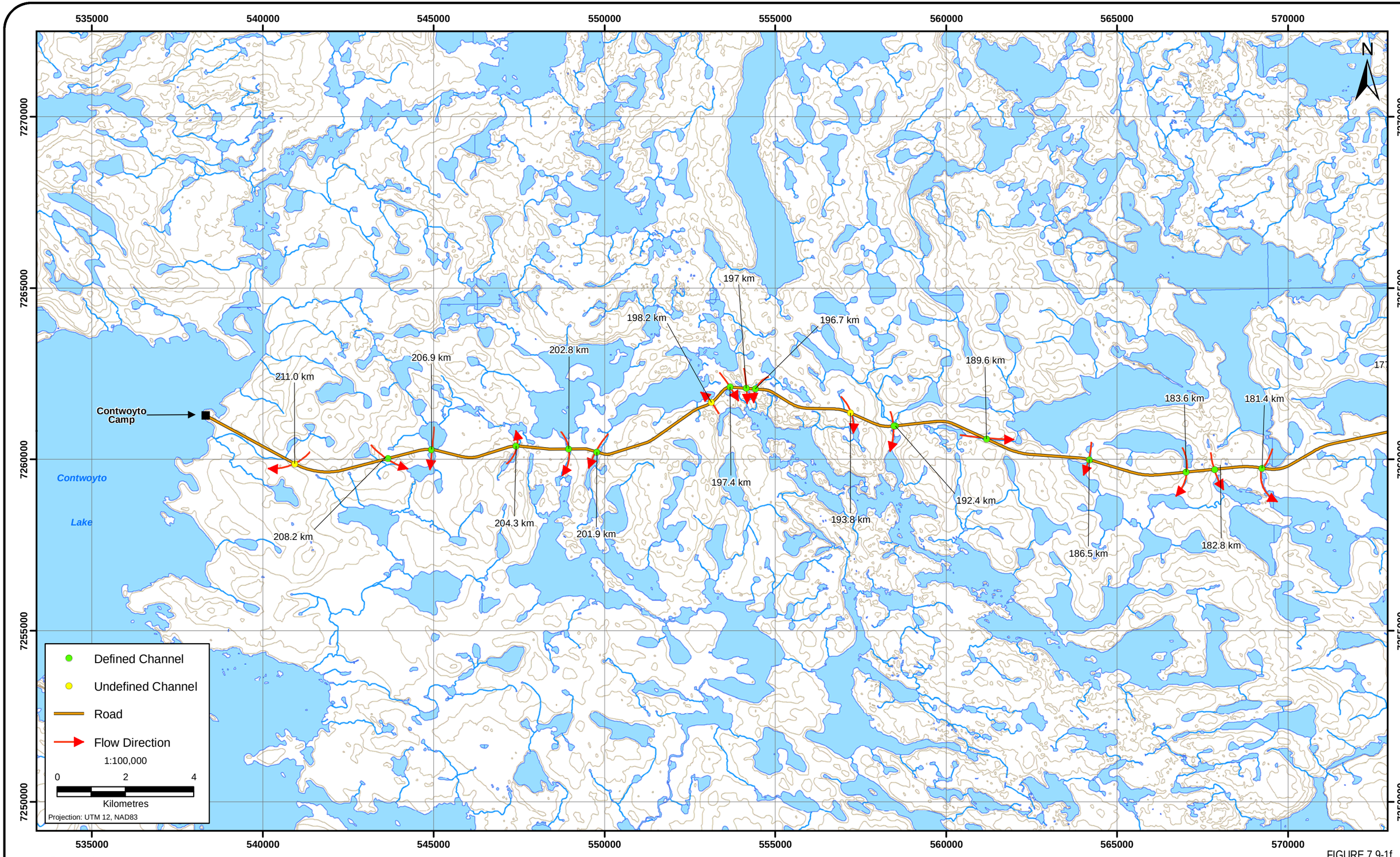
Projection: UTM 12, NAD83

the Bathurst Inlet Port and Road Project

FIGURE 7.9-1e

Flow Direction for Streams Crossing the Proposed Road Route

Rescan™



the Bathurst Inlet Port and Road Project

FIGURE 7.9-1f

Flow Direction for Streams Crossing the Proposed Road Route

Rescan™

7.9.4.2 Concern

Two mitigative measures are proposed. One is to blend acid generating rock with basic rock so that the acid run-off is neutralized. The second measure, described as a more satisfactory strategy, is to avoid using road-building materials that show acid generation potential. It is not clear if these are alternatives and if they are what rationale would be followed for the selection of the preferred strategy. If the strategy is to avoid the use of quarries or granular sources that have a high potential for acid rock drainage, the Proponent should respond to the following questions:

- Will additional quarry sources be identified or will the currently proposed sources (deemed to have a low potential for acid rock drainage) be expanded to obtain the required granular volumes?
- Are there any associated environmental considerations associated with increased haul distances that may be required if fewer quarry sites are utilized?
- If blending is proposed, where and how will the buffer material be incorporated within the road embankment and what material will be used as a buffer?

7.9.4.3 Rationale

Without information concerning the selection of mitigation measures and the rationale for the selection of these measures, it is difficult for INAC to determine if the impact assessment is appropriate.

7.9.4.4 Request

INAC requests that the Proponent clarify the mitigative measures that will be employed should it be determined that quarry or granular sources have the potential for acid rock drainage.

7.9.4.5 Response

Quarries with rock that has acid generation potential will be avoided.

The goal is to minimize new disturbances so additional quarry sources will be identified if the proposed sources (deemed to have a low potential for acid rock drainage) cannot be expanded to obtain the required road construction material volumes. Blending acid generating rock with basic rock will not be used as a mitigation measure.

The potential for ML/ARD will be mitigated by avoiding rock quarries where sulphide mineralization is evident. Preliminary investigations indicate that sulphide bearing rock occurs in shear zones between km 99-104 and at km 65.7 and at 194.5. Prior to development of quarries the area will be mapped and exploratory drilling carried out. Zones with shearing and sulphide mineralization will be blocked out and not form part of the quarry. If, after blasting, it becomes evident that a sulphide bearing zone was intercepted, limestone will be added to the material during or after placement to neutralize the affected fill and prevent or reduce acid drainage.

7.9.5 Information Request 8.5

7.9.5.1 Issue Identification - Existing water quality data

Missing data in DEIS regarding water quality in Contwoyto Lake.

7.9.5.2 Concern

INAC reviewers were not able to ascertain from the DEIS where the data 2001 and 2007, showing the water quality of each stream, was collected from. How was the average temperature for August of 12.7ºC arrived at for Contwoyto Lake? Was the average taken from a minimum of 25 years?

This is a relatively high summer-time temperature for a mid-arctic lotic system. There might be greater concern, therefore, about the localized or broader influence of sediment and nutrient inputs (*e.g.*, from treated sewage effluent) on bacterial and algal productivity and composition.

7.9.5.3 Rationale

It will be necessary to evaluate in more detail the proposed treatment type and performance levels of various wastewater treatment options for the camp at Contwoyto Lake.

The characteristics of the receiving environment will have some bearing on the effluent quality requirements.

7.9.5.4 Request

The Proponent should provide stream water quality data from 2001 and 2007, justification of gathering the temperature at Contwoyto Lake. They should also provide data on turbidity and water quality.

7.9.5.5 Response

All available stream water quality results for 2001 can be found in Section 2.1, Appendix C-6 of the DEIS, and for Contwoyto Lake in Section 2.2 of Appendix C-6. Stream water quality results for 2007 are presented in Appendix C-8 (Section 3.1.1).

After considering available options for discharge, the camp at Contwoyto will now discharge wastewater and camp effluent on the tundra; no discharge into Contwoyto Lake will occur. This small, 20-person camp will have an estimated water usage of 70 gallons per day per person (1,400 gallons per day discharge). Solids will be incinerated and wastewater will be disinfected by UV radiation before discharge to the tundra. Temperature was collected to characterize limnoligcal conditions of Contwoyto Lake.

7.10 Issue – Freshwater Life

7.10.1 Information Request 9.1

7.10.1.1 Issue Identification - Impact associated with increased fishing pressure

Increased exploitation pressure of fish and wildlife is expected near focal points of human activity, especially the Contwoyto Lake and Port Camp areas.

7.10.1.2 Concern

It is stated on p. 62-63 of Vol I of the DEIS that –

> *There are 104 stream crossings along the proposed road from Bathurst Inlet to Contwoyto Lake. These were sampled in 2001 and 2002 for fish habitat and fish community. The majority of active streams were wide and shallow, with low gradient and low discharge in the late summer. Glides were the dominant habitat type, with riffles and pools also present. Cascade habitat was rare. Few pools occurred due to the wide, shallow nature of the streams typical of the region.*
>
> *All potential lethal effects were classified as having **Negligible** residual significance for Arctic char, lake trout and whitefish because these species use the streams in the Project area mainly as migratory corridors. Streams may be used by some fish as spawning or rearing habitat, but the presence of these species outside of Contwoyto Lake was uncommon to rare. Impacts in Contwoyto Lake were deemed to be **Negligible** because of the size of the lake relative to the small footprint of the camp.*

The assignation of impact ratings to various fish populations in the DEIS did not account for direct mortality associated with exploitation.

7.10.1.3 Rationale

Increased access to an area is generally accompanied by increase access to fish and wildlife stocks. Without adequate anticipation or management, impacts may occur.

7.10.1.4 Request

The Final EIS should better address possible pressures on fish and wildlife populations associated with increased pressure by especially employees and contractors working on the BIPAR project.

7.10.1.5 Response

As outlined in Appendix C-4 of the DEIS, Section 5.3.2, page 5-7, the possibility of stress on fish populations through employee and contractor fishing activities is recognized, and this section further states that because "most waterbodies in the Project area support fish populations that are extremely sensitive to population decline due to overfishing (*e.g.,* lake trout)…all sport fishing will be strictly 'catch and release.'"

In regard to pressure on wildlife populations through employee and contractor hunting and trapping activities, Section 5.2.3.5, Appendix D-3 of the DEIS states that:

> *A no hunting policy will be in effect throughout the life of the Project. Management directives for this policy shall include:*
>
> - *prohibit hunting and trapping by all Project and contractor employees;*
> - *prohibit vehicle-based hunting or hunting from the road, and within a buffer area along the road (i.e., human safety);*

- *report any poaching or evidence of illegal hunting/trapping to government authorities;*
- *prohibit all Project and contractor employees from carrying personal firearms;*
- *enforce this policy by supervisors and regulatory authorities; and*
- *develop an effective whistleblower policy with the means to implement it.*

7.11 Issue – Terrestrial: Geology and Soils

7.11.1 Information Request 10.1

7.11.1.1 Issue Identification - Use of esker materials

The expectations for use of esker material for road construction are not clear from the DEIS.

7.11.1.2 Concern

Although it appears that the road embankment is to be constructed using crushed rock, it is unclear if the crushed rock will be exclusively sourced from bedrock quarries. The comment on non-availability of esker material in the winter months contradicts the proposed schedule that shows production and placement of granular material during the summer. It is also possible that granular material from Gravel-site G5 (esker) might be used as a buffer to offset the ARD potential in other zones (reference Appendix D-2 of the DEIS, Section 2.1, Bedrock Geology, Surface Material, and soils Effects Assessment, pg. 2-2).

7.11.1.3 Rationale

Without more information, INAC is unable to assess the full extent of impacts to unique landforms such as eskers which may be deemed Landforms and Soil VEC.

7.11.1.4 Request

The Proponent is requested to give an estimate of how much esker material is anticipated to be used compared to other materials, and to minimize the use of esker materials so that there is consistency between this proposed project aspect, the wildlife baseline assessment information, and proposed risk management measures.

7.11.1.5 Response

No esker material will be used for the road construction. Crushed rock for the road surface will be sourced from the rock quarries. Esker material will be used for road maintenance sanding, fine bedding, and concrete aggregate production. This is discussed in Appendix A-3, Section 5.2.9 of the DEIS. Page iii of Appendix A-2 of the DEIS states that sand and gravel required for winter operations will be stockpiled during the summer maintenance period so there is no conflict with the seasonal use/exploitation of the eskers. After the final design of the alignment, and avoidance of eskers where possible, the amount of esker material to be used will be provided.

7.11.2 Information Request 10.2

7.11.2.1 Issue Identification - Granular materials grain size analysis

Laboratory test results for the engineering properties of granular material from the eskers have not been provided.

7.11.2.2 Concern

Without further descriptions of this material, its suitability for the intended purposes cannot be assessed. Gradation results would help assess the fraction of the material that meets the requirements of the project and what percentage of reject material might be encountered.

7.11.2.3 Rationale

INAC is unable to fully assess the suitability of granular resources from eskers for use on this project.

7.11.2.4 Request

INAC requests that any information with respect to the engineering properties of the granular material from eskers be provided, in particular grain size distributions.

7.11.2.5 Response

At this early stage of project development and since use of esker material will be limited, no laboratory testing has been performed on this material. Visual descriptions in Appendix D-2 and Section 5.2.9, Appendix A-3 of the DEIS indicate that it is a coarse granular material consistent with its mode of formation. Samples will be collected in future phases of the Project but we are confident that after screening off the oversize, the material will be suitable for road sanding, bedding material, and concrete aggregate.

7.11.3 Information Request 10.3

7.11.3.1 Issue Identification - Ice core eskers

The potential for and measures to deal with massive ice that may be encountered in eskers is not described.

7.11.3.2 Concern

INAC is concerned that massive ice within eskers may be encountered and there exists a potential for run-away thermokarst in these areas of thick massive ice, should such features be disturbed.

7.11.3.3 Rationale

INAC is currently unable to assess the full extent of impacts to uncommon landforms such as eskers which are a Landforms and Soil VEC.

7.11.3.4 Request

INAC requests that the likelihood of massive ice be evaluated and mitigative measures be proposed should massive ice be encountered in granular borrow areas, or in areas immediately adjacent to disturbed areas.

7.11.3.5 Response

We consider the potential for encountering massive ice in eskers to be very low for the following reasons:

- Final road alignment will not cross high steep sided eskers hence road cuts through eskers will be avoided.
- We will not be exploiting the eskers as a source of road construction material. Its use will be limited to road maintenance sanding, fine bedding and concrete aggregate production. This would require relatively small amounts.
- We stipulate that a detailed geotechnical investigation of the proposed borrow area would be required before any esker is used. Such an investigation would reveal if the area contains or is prone to the propagation of massive ice which would only be possible in silt rich zones capable of developing capillary action close to a continuous supply of water.

Only the active zone of the esker will be exploited at a time when sufficient seasonal thaw would have occurred.

7.11.4 Information Request 10.4

7.11.4.1 Issue Identification - ML/ARD from quarried materials

Potential quarries sites were not available at the time samples were collected for ARD testing. Where possible, the potential for ARD has been determined by comparing rock types between quarry locations and bedrock outcrops which were sampled and tested for ARD.

7.11.4.2 Concern

The preliminary ARD screening process demonstrated that potentially acid generating bedrock may be present within the vicinity of the proposed road route. A more detailed ARD screening program is required for each of the proposed quarry sites and bedrock cuts. Of particular concern is the timing of the screening program with respect to construction start-up and what screening measures are planned during quarry development or are to be included in the Project Environmental Management Plan.

7.11.4.3 Rationale

Without confirmatory information concerning the site specific potential for ARD from the quarried rock or rock cuts, it is difficult for INAC to determine the potential for environmental impacts.

7.11.4.4 Request

The Proponent is requested provide the protocol and timing for a screening program to determine the potential for ARD at proposed quarry sites.

7.11.4.5 Response

The classification of the rock types at the proposed quarry sites has been carried out. A preliminary study (*Preliminary Bedrock Geology Characterization*, Appendix D-5 of the DEIS) on the rock types of the proposed quarry sites was carried out in 2001. At that time, the bedrock geology did not extend to include all of the potential quarry sites such that rock type information was provided only on those potential quarries occurring in the original bedrock mapping study area. The information on these quarries is provided in Table 3.1-3 of Appendix D-5 of the DEIS. The bedrock geology map was updated in 2007 to include all of the potential quarry sites. This map, showing the potential quarries (and gravel sources), is included in a map pocket in the back of the report.

Additional work on the quarries was carried out in 2007 to provide information on the potential quarry sites not assessed in 2001 and more information on the quarries previously assessed. This information is provided in Appendix D-6 of the DEIS, *Environmental Geochemistry of Surficial Samples from Proposed Rock Quarries, Granular Pits, Port Area and Airstrip*. The rock types for each quarry are presented in Table 3-1 of this report. A detailed description of the potential quarry sites is also included in Appendix A of this report.

The potential quarries have also been described in a third report prepared by SNC Lavalin, Appendix A-3 of the DEIS, *Feasibility Study*. The volume of material expected from each potential quarry was assessed (Table 5.2.9-1). The quarries are located on color air photo images in Appendix B of this report.

The additional work carried out in 2007 completed the geological characterization of the potential quarry sites.

Based on the geochemistry study carried out in 2007 and referenced in Appendix D-2 of the DEIS (Morin and Hutt, 2007) in which quarry sites were assessed for ARD potential, a management plan was developed that describes the screening program to determine the potential for ARD at the proposed quarry sites (Appendix D-2 of the DEIS). The goal is to avoid all sources of ML/ARD. To meet this goal, a geologist or engineer experienced in environmental drainage chemistry and ML/ARD will visually examine any substantial amount of rock or unconsolidated material that is disturbed and the related standing walls from which the material originated. This person will check for evidence of reactive material including:

- sulphide minerals such as pyrite;
- rusty secondary iron staining that may signify already reactive rock;
- other secondary mineral staining such as green staining that often reflects copper leaching; and

- carbonate minerals that can dissolve quickly in rainwater and could release metals into the environment and drainage waters.

Any rock with these signs will be collected and analyzed. As well, before disturbance, local water will be analyzed for baseline conditions. It will then be analyzed periodically to:

- monitor for changes from baseline conditions that may suggest some reactive material has not been detected; and
- allow for the characterization of the success of remediation efforts.

Measurements of pH and electrical conductivity of local water and seeps can indicate changes in chemistry. These tests can be frequently carried out in the field and are inexpensive.

7.11.5 Information Request 10.5

7.11.5.1 Issue Identification - Physical and chemical characteristics of potential quarry sites

Site specific characterization of bedrock at potential quarry sites was not carried out.

7.11.5.2 Concern

Potential quarry sites and road cuts were identified after field work and field mapping. Bedrock evaluation and rock type classification has been based on bedrock geology maps and the results of field-mapping in nearby outcrops. Quarries that did not occur on or near field-mapped outcrops were not assigned a rock type classification.

It would also be helpful if the boundaries for IOL and Crown Land be provided on drawings where quarry sources are provided or if this information was provided in a summary table with the requested information on physical and chemical properties.

7.11.5.3 Rationale

INAC is unable to fully assess the suitability of quarry sites for use on this project.

7.11.5.4 Request

The proponent is requested to provide the timing for additional geological mapping/investigations at proposed quarry sites to confirm or determine rock type classification.

7.11.5.5 Response

The classification of the rock types at the proposed quarry sites has been carried out. A preliminary study (*Preliminary Bedrock Geology Characterization*, Appendix D-5 of the DEIS) on the rock types of the proposed quarry sites was carried out in 2001. At that time, the bedrock geology did not extend to include all of the potential quarry sites such that rock type information was provided only on those potential quarries occurring in the original bedrock mapping study area. The information on these quarries is provided in Table 3.1-3 of Appendix D-5 of the DEIS. The bedrock geology map was updated in 2007 to include all of the potential quarry sites. This

map, showing the potential quarries (and gravel sources), is included in a map pocket in the back of the report.

Additional work on the quarries was carried out in 2007 to provide information on the potential quarry sites not assessed in 2001 and more information on the quarries previously assessed. This information is provided in Appendix D-6 of the DEIS, *Environmental Geochemistry of Surficial Samples from Proposed Rock Quarries, Granular Pits, Port Area and Airstrip*. The rock types for each quarry are presented in Table 3-1 of this report. A detailed description of the potential quarry sites is also included in Appendix A of this report.

The potential quarries have also been described in a third report prepared by SNC Lavalin, Appendix A-3 of the DEIS, *Feasibility Study*. The volume of material expected from each potential quarry was assessed (Table 5.2.9-1). The quarries are located on color air photo images in Appendix B of this report.

The additional work carried out in 2007 completed the geological characterization of the potential quarry sites.

The boundaries for Inuit Owned Lands (IOL) are provided in Figure 7.11-1. A summary table is also provided on the figure. Fourteen prospective quarries are on IOL.

7.11.6 Information Request 10.6

7.11.6.1 Issue Identification - Additional field sampling of surficial soils

Additional field sampling of surficial soils is required for detailed planning.

7.11.6.2 Concern

The comments provided in the report are for the general surficial geological conditions described for each material. Detailed planning will require additional field sampling in particular to determine adverse terrain types.

7.11.6.3 Rationale

INAC is unable to fully assess the suitability of the roadway alignment with respect to adverse soil conditions without the benefit of additional field sampling to confirm parent material types and limitations for road construction.

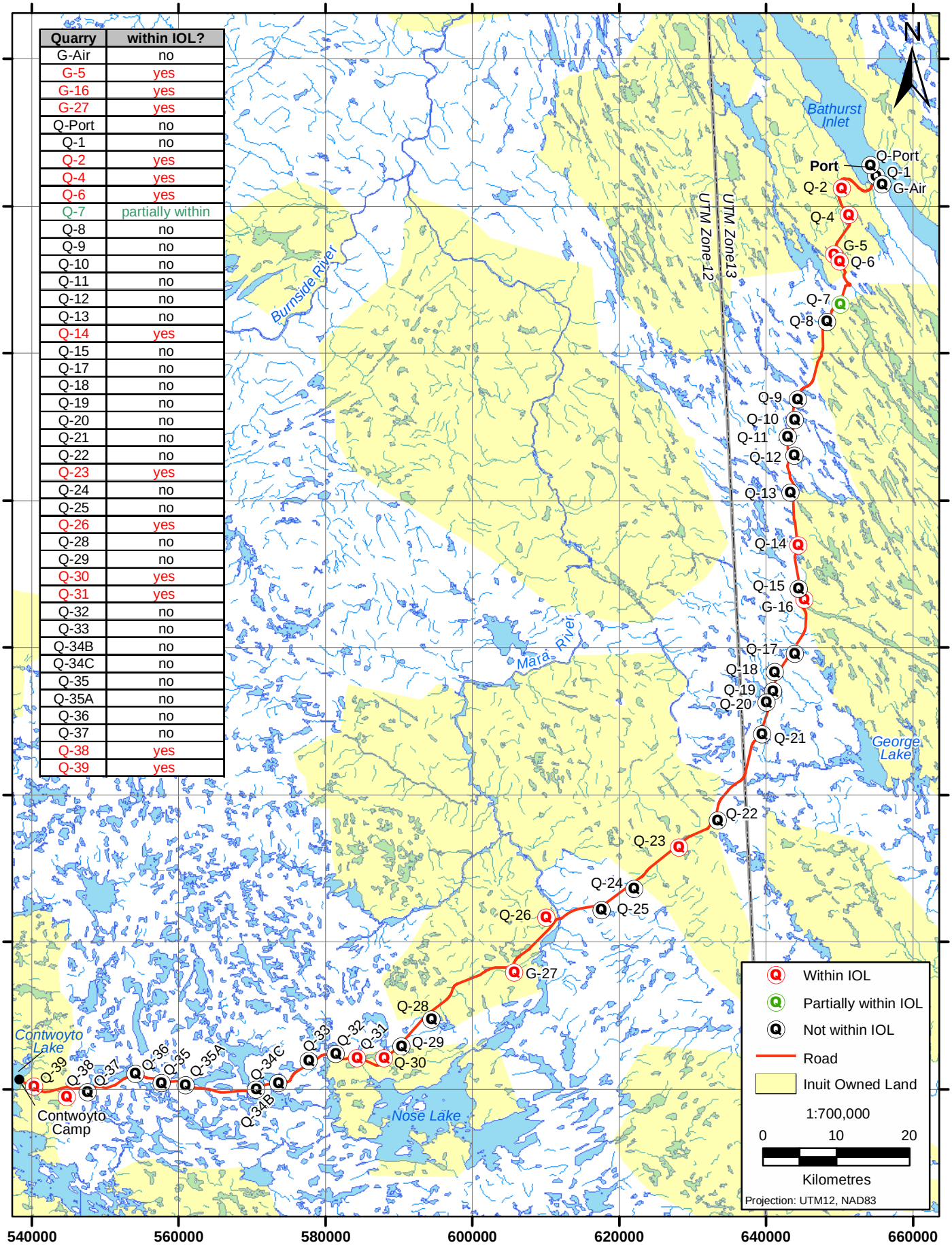
7.11.6.4 Request

INAC requests that the details and timing for any additional field sampling be provided.

7.11.6.5 Response

Terrain mapping on aerial photographs was carried out at a scale of 1:15,000. Nearly 4,500 terrain units or polygons were delineated along the route in a corridor 1 km in width. The average polygon size is 6.5 ha. This information was presented on a series of 29 maps at a scale of 1:10,000. An example is provided in Figure 7.11-2. Each map sheet covers approximately 7.3 km of road and the road is 211 km long. A total of 119 detailed plots were field checked.

Quarry	within IOL?
G-Air	no
G-5	yes
G-16	yes
G-27	yes
Q-Port	no
Q-1	no
Q-2	yes
Q-4	yes
Q-6	yes
Q-7	partially within
Q-8	no
Q-9	no
Q-10	no
Q-11	no
Q-12	no
Q-13	no
Q-14	yes
Q-15	no
Q-17	no
Q-18	no
Q-19	no
Q-20	no
Q-21	no
Q-22	no
Q-23	yes
Q-24	no
Q-25	no
Q-26	yes
Q-28	no
Q-29	no
Q-30	yes
Q-31	yes
Q-32	no
Q-33	no
Q-34B	no
Q-34C	no
Q-35	no
Q-35A	no
Q-36	no
Q-37	no
Q-38	yes
Q-39	yes



Prospective Quarry Sites along the Road and their Location with Respect to Inuit Owned Lands

FIGURE 7.11-1

THE BATHURST INLET PORT AND ROAD PROJECT

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This indicates that the terrain and soils mapping was inspected approximately every 1.8 km along the route. The assumption is that the air photo interpretation was carried out by an experienced mapper and then field-assessed by qualified professionals. This is a standard method. During the field program, soil pits were excavated to either bedrock or a depth of 75 cm. This gives a very clear indication of the surficial material at the site and this information is used to confirm the terrain mapping.

Each polygon on the terrain and soil maps includes detailed information as presented in a copy of the legend (Figure 7.11-3). Important information for roadbed conditions includes:

- The texture of the material and the slope. This information is important as it indicates areas subject to potential erosion and compaction, if denuded of vegetation.
- Drainage ratings, which are indicators of potential problem areas for road building.
- Water bodies and areas with organic soils. Organic soils are also difficult materials on which to construct roads.
- Eskers, which present challenges to road building because they may be narrow landforms with steep slopes consisting of loose material.
- Depressions (kettles) and escarpments.

Therefore, each polygon has information on each these for the area indicated on the maps. Further, polygons have been assigned additional terrain limitations for road building including: boulder fields, seasonally flooded, jelly-like materials, peat, steep slopes, high shrink-swell potential, wetness, failed topography, *etc*. These labels, in combination with the details on the texture, slope, and drainage, *etc*., will be very useful to those constructing the road. The descriptions in the report are general but the use of these maps in the field during road construction will be very helpful to those constructing the road. Based on the detailed mapping with the extra information that indicates potential challenges to road construction, no additional field work is required. A soil specialist or person with similar training should be on-site during construction, if carried out during the summer, to make recommendations when problems arise but the information presented on the maps should be sufficient.

7.11.7 Information Request 10.7

7.11.7.1 Issue Identification - Saline permafrost occurrences

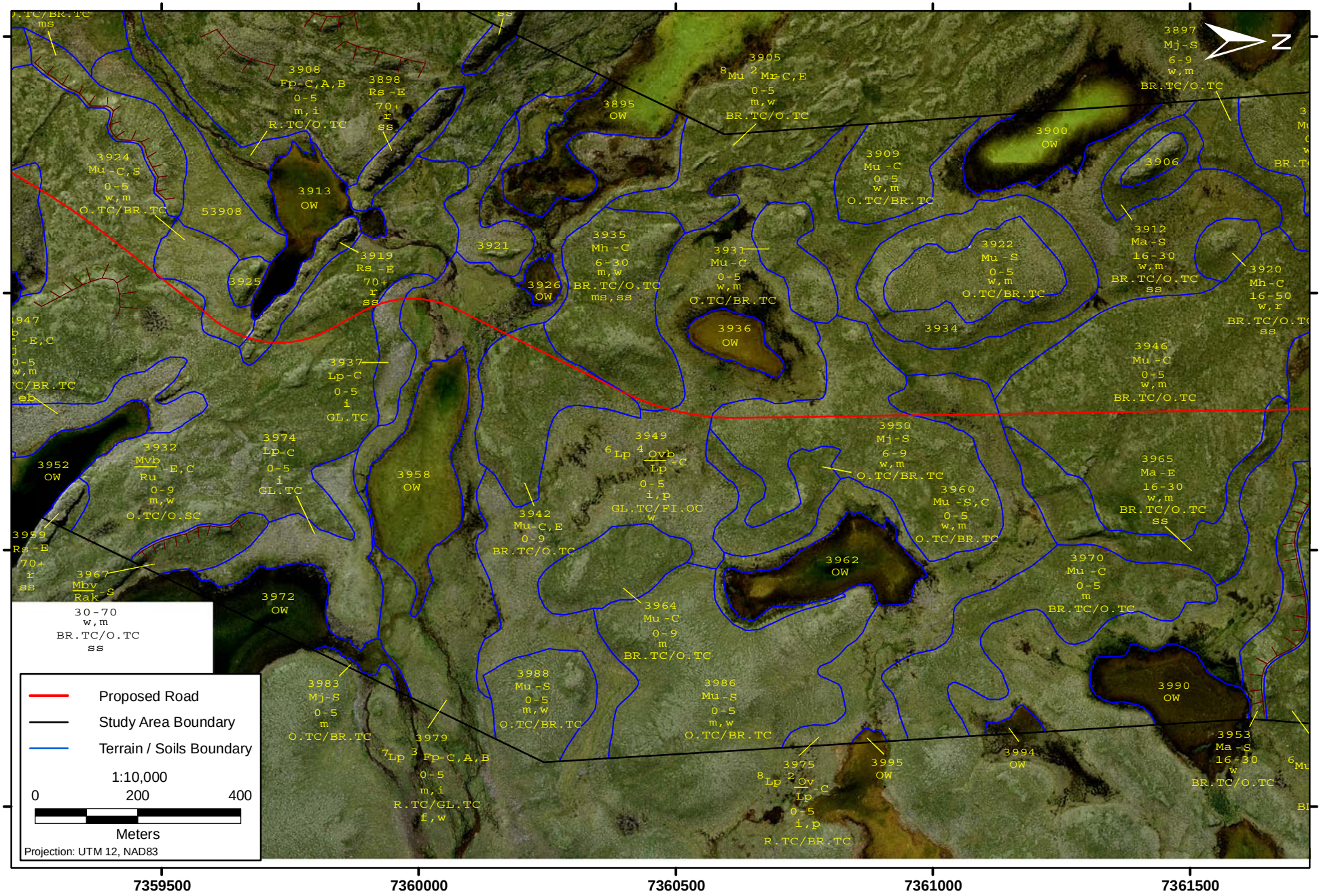
There is no mention of permafrost salinity.

7.11.7.2 Concern

Saline permafrost may impact the freezing point depression.

7.11.7.3 Rationale

Measured values would help INAC assess the expected performance of constructed works.



Example of Soils and Surficial Geology Along the Bathurst Inlet Port and Road (Mosaic 25: km 28+730 to km 36+425)

FIGURE 7.11-2

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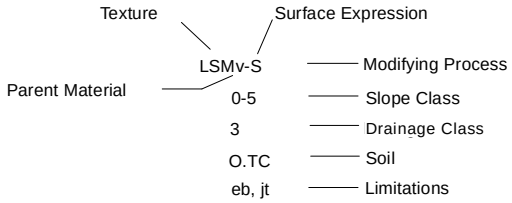
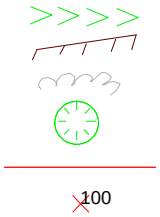
Terrain Unit Label



This symbol suggests the unit consists of moderately well drained, undulating loamy sand morainal materials; soilfluction is common; slopes vary from 0-5 %; Orthic Turbic Cryosols are typical soils; excessive boulders and "jelly-like" materials may pose limitations for road construction (depending upon location of road).

On - Site Symbols



Esker
Escarpment
Headwall Scarp (Large)
Depression (Kettle)
Proposed Road
Sample Sites

Dennis O'Leary

Dennis O'Leary

Della Clish, Jim Squarok, Colin Clish and Erin Anderson

Terry Lang

Dennis O'Leary, Terry Lang

Mapping and interpretation completed using 1:15,000 color aerial photography acquired during late July and early August, 2001; 160 detailed sites established along route as well as over 600 reconnaissance plots as part of the vegetation inventory program.

O'Leary, D. 2002. Surficial Geology and Soils Classification of the Bathurst Inlet Port and Road Corridor, Nunavut, 1:10,000 scale. Geowest Environmental Consultants Ltd., Edmonton AB.

Texture

S	Sand
LS	Loamy sand
SL	Sandy loam
LS	Loam
SI	Silt
SiL	Silt loam
SiCL	Silty clay loam
SiCL	Silty clay
C	Clay
g	Gravel

Parent Material

A	Anthropogenic
BF	Boulder field
C	Colluvium
D	Residual
F	Fluvial
FG	Glaciofluvial
L	Lacustrine
M	Moraine
OW	Open water
O	Organic
R	Rock
Tp	Tailing pond
W	Marine

Surface Expresion

a	Moderate slopes (16 - 50%)
b	Blanket (generally > 100cm)
c	Cone
d	Depression
j	Gentle slopes (2 - 15%)
k	Steep slopes (50 - 70%)
p	Plain (0 - 2% slopes)
s	Very steep slopes (> 70%)
t	Terrace
u	Undulating
v	Veneer (10 - 100 cm)
x	Lithic (< 10 cm thick)

Modifying Processes

A	Active
B	Braided
C	Cryturbation
E	Eroded
F	Slow mass movement
H	Kettled
L	Seepage
R	Rapid mass movement
S	Solifluction
"S	Initiation site

Slope Class (%)

0 - 5
6 - 9
10 - 15
16 - 30
30 - 50
50 - 70
70 +

Drainage

r	Rapid
w	Well
m	Moderately well
i	Imperfect
p	Poor
v	Very poor

Soil Types

O.SC	Orthic Static Cryosol
BR.SC	Brunisolic Static Cryosol
R.SC	Regosolic Static Cryosol
GL.SC	Gleyed Ststic Cryosol
O.TC	Orthic Turbic Cryosol
BR.TC	Brunisolic Turbic Cryosol
R.TC	Regosolic Turbic Cryosol
GL.TC	Gleyed Turbic Cryosol
FI.OC	Fibric Organic Cryosol
ME.OC	Mesic Organic Cryosol
TFI.OC	Terric Fibric Organic Cryosol
TME.OC	Terric Mesic Organic Cryosol
E.EB	Eluviated Eutric Brunisol

Limitations (to road construction)

bf	boulder field
eb	excessive boulders on surface
f	seasonally flooded
fb	highly fractured bedrock
jt	"jelly-like" materials
ms	moderate slopes (10 - 15%)
p	peat
s	seepage
ss	steep slopes (> 15%)
sw	high shrink-swell potential
w	wetness
z	failed topography

the BATHURST INLET PORT AND ROAD PROJECT

Legend for Soils and Surficial Geology Along the Bathurst Inlet Port and Road

FIGURE 7.11-3

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7.11.7.4 Request

INAC requests that information with respect to permafrost salinity be provided.

7.11.7.5 Response

In future site investigations cores of permafrost soils and rock will be obtained to assess the impacts on foundation design. The permafrost salinity will affect the percentage of unfrozen water in the permafrost zone and hence the pile bearing capacities and consolidation properties of the foundations. These will alter the parameters chosen for foundation design but not necessarily the chosen foundation approach.

7.11.8 Information Request 10.8

7.11.8.1 Issue Identification - Additional soils/geology issues

In addition to the five items discussed above, INAC's preliminary review of the BIPAR DEIS has raised a variety of other questions.

7.11.8.2 Request

INAC requests clarifications regarding the following additional points.

- Vol II, Appendix A-3, Section 4.4.1: Port Geotech – Could permafrost agrade into the wharf structure and causeway? If so, what is the implication to performance and operation?
- Vol II, Appendix A-3, Section 5: Road. It is stated that the bedrock for the first 70 km is predominately sedimentary. Page 5-11 states "gritstone, mudstone and shale". Experience with shallow sedimentary rock (shales for example) in the Igloolik area has shown that some outcrops are very ice rich. The shales have fractured along bedding planes and allowed water to enter forming ice lenses. Has the presence of ice-rich sedimentary bedrock been considered in the routing and road design?
- Vol II, Appendix A-3, Section 5.2.5: Geotech design of the embankment – DEIS states that a lower embankment height is better than a high one. The text further indicates that a lower embankment improves cross drainage.

7.11.8.3 Response

Minor aggradation of permafrost towards the soil/causeway interface is expected. This will be mitigated by the water around and in the interstitial pores of the rockfill causeway. Aggradation of the permafrost will reduce the effects of consolidation under the structure.

Outcrops will continue to be ice rich as surface water can still enter during milder weather and freeze during the winter. The road embankment will cause some compression and closing of near surface bedding planes and fractures under the road bed. Increased ice lensing will not occur unless there is a continuous source of water along with natural materials facilitating capillary action. This is very unlikely in the shallow bedrock areas. It will not be possible nor advantageous to avoid these areas. Any settlement due to thawing of ice in ice rich bedrock

areas will occur during the summer and will be repaired by the road maintenance crews before the next transportation period.

The statement of enhanced drainage conditions was made relative to previous road embankment on permafrost designs (usually of sand and gravel and up to 3 m in height). Refer to previous discussion in INAC IR 4.4.

7.12 Issue – Terrestrial: Ecosystems, Vegetation, Wildlife

7.12.1 Information Request 11.1

7.12.1.1 Issue Identification - Uncommon plants and communities

The main body of DEIS is dismissive of plants as VECs, stating –

"No rare or sensitive ecosystems or plants were identified within the RSA or port or road LSAs; they are all commonly distributed throughout the Arctic coast wherever the terrain is suitable."

This statement is inconsistent with the summary of the plant assessment, which states –

"Although there are locally uncommon species such as ferns, orchids, louseworts, legumes, and violets, in this study no species considered "rare" by international standards were encountered. In many cases, the project area occurs at the edges of the ranges of certain species, or in habitat that does not support them. This study produced a few range extensions, not unexpected, as the area is not botanically well known."

7.12.1.2 Request

The possibility of and merits of avoidance of disturbance to locally uncommon plant (and allied faunal) species should be considered in the project design.

7.12.1.3 Response

The possibility and merits of avoiding disturbance to all plant and ecosystem VECs (and allied faunal species) was considered in project design.

The proposed road alignment was chosen to satisfy criteria that included avoiding disturbing important habitat like wetlands to the maximum extent possible. This occurred before conducting baseline field work, and it was determined that the areas immediately adjacent to the proposed road alignment did not offer road alignment improvements. Thus, it was decided to keep the road alignment as proposed.

7.12.2 Information Request 11.2

7.12.2.1 Issue Identification - Spatial scale of wildlife assessments and associated project planning issues

The proposed project siting and timing do not adequately reflect the stated impact avoidance guidance.

7.12.2.2 Concern

Appendix D-7, and especially Figures 2.3-2 and 2.3-3 provide detailed locations of observed wildlife observations, raptor nests and carnivorous mammal denning sites. Since this information is only available at the LSA as opposed to RSA scale, it is not known whether minor or major route alternatives could result in reductions of potential project conflicts. Since the proposed route has not been substantively altered since prior to completion of the 2001-02 wildlife surveys, it raised the question about whether route selection has adequately considered minimizing risks to raptors, carnivores and/or other VECs.

According to the DEIS Project Description (Vol. I, p. 32) –

"A number of competing alternative route corridors were investigated based on construction, operating costs, terrain controls, and the following factors: … environmental controls, impacts and mitigative measures;… Potential effects on caribou were also considered in the route selection and road engineering study."

Since route selection seems to have been substantially established prior to availability of the wildlife baseline studies, it is difficult to see how wildlife and water quality effects minimization was considered.

7.12.2.3 Rationale

The overall DEIS, and in particular road routing and granular material source assessment should be far better linked to the recommendations arising from highly detailed biophysical assessment work completed to date.

7.12.2.4 Request

INAC requests that the appropriate impact avoidance and mitigation measures addressed in detailed DEIS appendix material be better used and referenced in defining the overall project scope, siting, and as captured in the main body of the DEIS. In particular, it appears that wildlife and habitat management recommendations arising from earlier assessments is not reflected in the currently documented project design.

7.12.2.5 Response

The environmental assessment presented in the BIPR DEIS was performed on the Project as defined by the feasibility study in progress at the time that related baseline studies were initiated. The feasibility study was completed for an alignment and port location that had been determined in response to previous transportation studies in the region that attempted to define transportation infrastructure that could facilitate mineral exploration and development in the northern portion of the Slave Geological Province (SGP). The BIPR project is the optimum configuration of required infrastructure that can serve the overall objectives of as large an area within the SGP as possible. It also follows a constructible alignment for a road that runs to a port site that can serve the sizes of vessels that would be called on to supply and remove bulk materials for the size of projects that are believed will be important elements in the near-term development scenario for the Kitikmeot Region of Nunavut. Also, the BIPR project configuration requires less terrain disturbance and fewer major water crossings than other alternatives considered previously in

varying degrees of detail. It is a situation in which environmental protection (alignment and constructability) complements the economic objectives of infrastructure to serve multiple clients on a sustainable basis.

7.13 Issue – Marine Environment

7.13.1 Information Request 12.1

7.13.1.1 Issue Identification – Marine Transport Methods

The BIPAR DEIS (Vol. I) addresses only two of many important aspects associated with the transportation of diesel fuel and other materials to and from the proposed port facility via large marine vessels (up to 50,000 tonne capacity, 213 m length and 12 m width): (i) general features of potential shipping routes via the eastern and western arctic; and (ii) recommendations for additional navigational aids for Bathurst Inlet. Figure 7.3-5 (Vessel Approach Route and Navigation Aids) makes it very clear that navigation through the Bathurst Inlet access route without incident for a large sea-going vessel will be far from trivial.

There is restricted passage especially in the vicinity of Entry Islands, Breakwater and Fishers Islands, Ekalulia/Shoe Islands, Red Islands, Quadyuk Islands, and near Kingaok, which will make safe navigation difficult even on clear, fair weather days. Freighters or tankers may be hauling large amounts of refined hydrocarbons, metal concentrates, and a wide variety of potentially hazardous materials.

7.13.1.2 Concern

There is a concern that the large number of avoidance/mitigation measures proposed by technical experts (DEIS Appendix E) for water and sediment quality, plankton, fish, seabirds, and marine mammals will be lost in the larger planning and implementation process. In addition, the spatial scale and depth of knowledge documented in Appendix E is not adequate relative to project issues and planning needs.

7.13.1.3 Rationale

The ability to transport large quantities of fuel and supplies via the marine environment is an integral part of the project rationale as well as acceptability from an environmental and socio-economic perspective. Since no detailed EIS has been completed of proposed marine activities to date, no reasonable set of decisions can be provided on the project acceptability.

7.13.1.4 Request

INAC requests additional information on the following:

- types of marine vessels proposed;
- whether tankers will be single- or double-hulled;
- anticipated needs for tug support (port selection criteria include adequate turning/wharfage area for “tugless” operation; however, this may not alleviate the need

for tugs for other purposes. Interested parties should evaluate tanker traffic safety and environmental requirements for Prince William Sound);

- anticipated needs for use of a harbour pilot and vessel to assume control of ship operations within constricted waters and near the community and port;
- expectations regarding safe and environmentally sustainable operational window with regard to wind and sea state, visibility, sea ice, presence of marine mammals, presence of other vessels (including small boats);
- grounding and spill avoidance measures;
- spill response measures;
- availability of oil spill response infrastructure and capacity;
- presence of viable shellfish beds along the Bathurst Inlet portion of the route, the future use of which could be encumbered or lost as a result of accidental or chronic spills and contaminant inputs);
- baseline data on PAH (as petroleum hydrocarbon constituents) and metal levels in representative shellfish (clam, other) samples;
- presence of important marine mammal or fish foraging grounds within Bathurst Inlet;
- mapping of sensitive shoreline habitat, including estuaries and staging areas for migrations of aquatic species such as anadromous stocks of arctic char;
- needs for financial securities against future marine accidents.

7.13.1.5 Response

The types of vessels proposed are category Type B to CAC 2 Ice Class, depending on the requirement. These are Arctic Class ships as prescribed by the Arctic Shipping Pollution Regulations and meet the standards made under the authority of the Canadian Shipping Act. Canadian carriers will meet Canadian standards and foreign flag vessels will comply with international standards and applicable Canadian requirements. A Category 2 or CAC2 ship is a ship which is designed and constructed:

- for the purposes of unrestricted navigation in Canadian Arctic waters,
- ice management within its structural capability; and
- is fitted with a stress measuring system to monitor the ramming process.

For large ships it is not anticipated that tugs will be required, however, tugs will be required for smaller barges that deliver to local communities and deliver freight from Hay River.

The location of the dock will allow for both starboard and port approach and berthing. The starboard approach will be direct from seaward without any turning. The starboard side berth will make it more difficult to depart because the vessel will have to clear the berth and make a relatively sharp turn to port to set a course to the north and out of Bathurst Inlet (Figure 7.13-1). It is not planned to have any tug assistance at the port and it is expected that prevailing wind and

ice conditions will dictate which approach will be favoured. Local weather reporting (wind speed, direction, wave height, ice conditions) will be necessary to assist incoming vessels.

Sea ice on this proposed route is reported to freeze fast to the shoreline and become immobile each winter except for the eastern portion of Barrow Strait (consolidates in 80% of winters) and Lancaster Sound (consolidates in 40% of winters). Sea ice in Baffin Bay remains mobile all winter. The average date (recorded) of *in situ* melting of sea ice in Bathurst Inlet is July 6 with the earliest being June 27 and the latest being August 8. By the fourth week of July open water is present for the majority of the shipping route.

Freeze-up begins in most channels in early October. Sea ice growth is rapid through the months of October and November with most channels along the proposed route, being frozen to the shoreline (consolidated) by late November. The earliest and latest consolidation dates are October 22 and November 20 respectively. With the above ice conditions it is estimated that the shipping season in Bathurst Inlet will be approximately 100 days. It is estimated that there will be an average of 8 vessel visits to the port site per year, with the size and type of vessel(s) proposed.

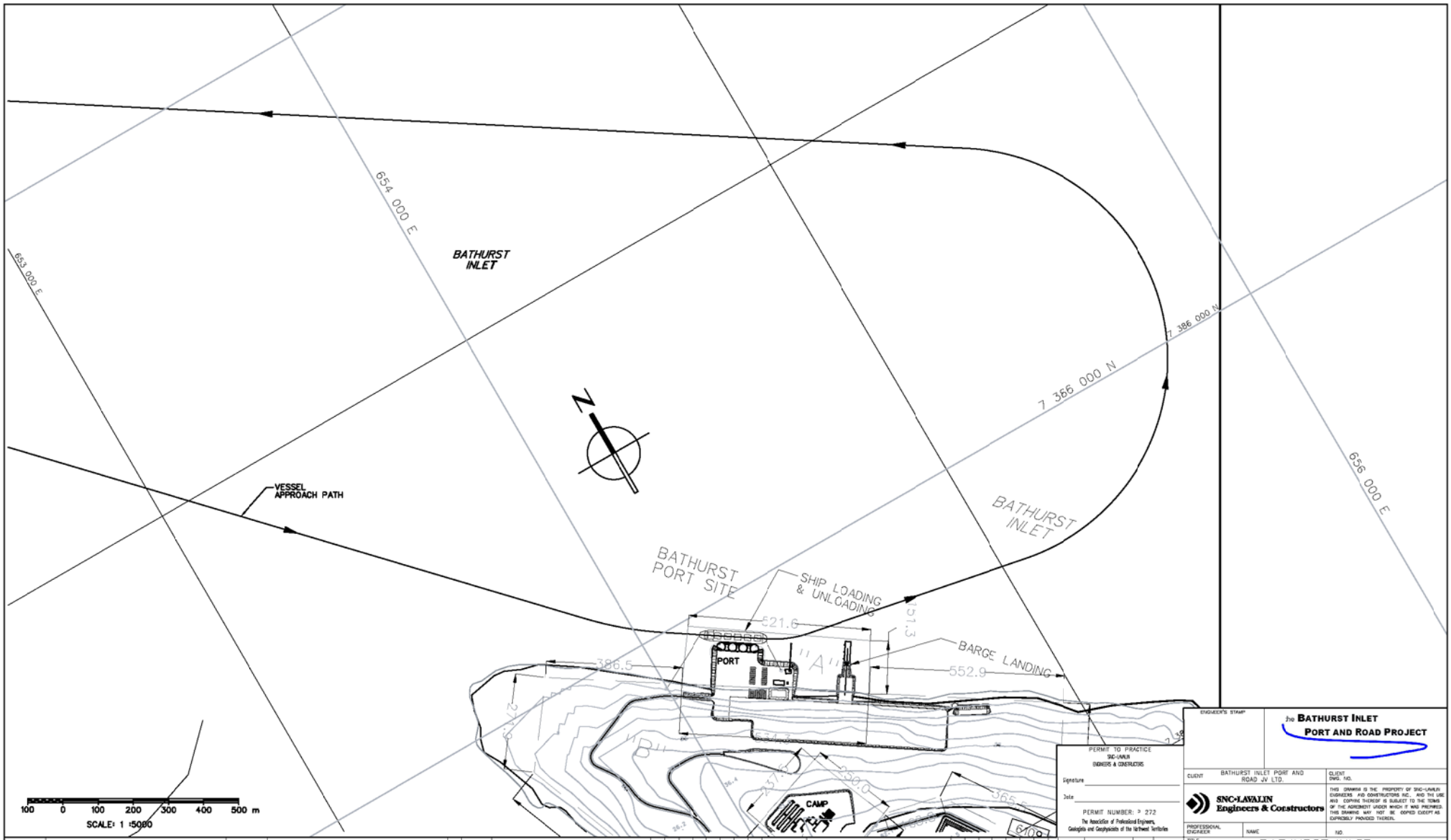
As grounding and spill avoidance measures it is recommended that a system of navigational aids be installed to augment navigation safety (Appendix A-3 of the DEIS, Section 4.0) and that where practical, emergency anchorages be defined along the route. It is also recommended that current velocities be measured in the narrower sections of the channel, and in those sections where the ship may be subject to cross current influence. Current velocities will be measured in 2008.

The regulatory authority responsible for approval of aids to navigation in Canadian waters is the Department of Fisheries and Oceans (DFO), and specifically the Canadian Coast Guard (CCG) subgroup of DFO. While this Ministry is mandated to provide aids to navigation in Canadian waters, it is feasible that BIPR provide the required aids to navigation, in which case they would be classed as private aids to navigation, and be the responsibility of BIPR.

The proposed aids are for the most part simple systems of omni-directional light beacons which allow conventional bearing and (radar range) distance position fixing augmented by the installation of range marks for the critical route sections:

- north of Breakwater Islands
- south of Red Islands and
- south of Quadyuk
- ·to mark the centerline of the transit along these sections of the route.

Strategies for spill response measures are provided in the DEIS (Section 4.0 of Appendix G-4). If required, additional detail could be provided on the specific equipment types to be used for port spills. This is usually not done at the EA stage, since common practice is to provide that level of detail at the post approval stage.



DATE: 2008/06/05 - 11:47am
PATH: J:\334306 - Bathurst Inlet\41 - Civil Engineering\41DK - Sketches-Drawings\334306-FIGURE 7.13-1.dwg

DWG. NO.	REFERENCES	DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	ENG. MNG.	AREA MNG.	CLIENT	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	ENG. MNG.	AREA MNG.	CLIENT

PERMIT TO PRACTICE
SNC-LAVALIN ENGINEERS & CONTRACTORS
Signature
Date
PERMIT NUMBER: P 272
The Association of Professional Engineers, Geologists and Geophysicists of the Northwest Territories

ENGINEER'S STAMP

for BATHURST INLET PORT AND ROAD PROJECT

CLIENT: BATHURST INLET PORT AND ROAD JV LTD.

CLIENT DWG. NO.

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PROFESSIONAL ENGINEER | NAME | NO.

TITLE

BATHURST INLET
Figure 7.13-1
VESSEL APPROACH ARRANGEMENT

DESIGNED			
DRAWN			
CHECKED			
APPROVED LEAD DISC.			
APPROVED ENG. MNG.			
APPROVED AREA MNG.			
APPROVED CIVIL COORD.			
APPROVED AREA MNG.			
SCALE	NAME (PRINT)	INIT.	DATE

PROJECT NO.	AREA	DISC.	DOL	DRAWING NUMBER	LOC.	REVISION NUMBER
334306						

Format "Tabloid" Sheet Size

Viable shellfish beds at the port site will be surveyed in 2008. Representative shellfish samples will be collected at this time to establish baseline data on PAH and metal concentrations in shellfish.

Available maps indicating fish habitat use are shown in Figure 7.13-2, "Known Fish Habitat Locations along the Bathurst Inlet Port Shipping Lane." This map indicates that neither Arctic char nor Arctic cod are known to be in Bathurst Inlet.

Marine insurance will be required for all shipments destined for the Bathurst Port the cost of which will be carried by the purchaser or the owner of the goods and will include loss of goods or damage. The shipping company will be responsible for other marine accidents and environmental clean up.

7.13.2 Information Request 12.2

7.13.2.1 Issue Identification - Probability of marine oil spills

The methodology used to estimate probabilities of a marine oil spill are not considered to be useful for the BIPR project, owing to an expected departure between marine, climatic and operational conditions of the Bathurst Inlet area from the expected range of conditions at other global temperate and tropical sites.

7.13.2.2 Concern

The MMS database primarily reflects deep-sea, large tanker traffic moving in largely unconfined waters except when leaving or entering port over a very small portion of the overall transportation route. In addition, the MMS would not be generalizable to waters with sea ice and strong limitations to visibility by ice fog. Furthermore, it is not clear that the MMS database captures all release types of interest, including release of hydrocarbons in bilge water discharge, limited leakage at transfer points, and other types.

Most ports require escort of ships by a harbour pilot, and occur in waters for which regulatory oversight of ship movement and illicit or accidental contaminant releases is more easily derected and deterred. Such is not the case for the proposed BIPAR marine transportation route. Another issue is that the MMS database might be biased relative to the current proposal, given that movement of larger tankers through such constrained access areas enroute to port would not be favoured for port location. It needs to be considered that the Bathurst Inlet portion of the route is at the atypical end of the spectrum of current use fueling ports based on ease of coastal marine access.

Finally, INAC would argue against use of a median or average spill incidence as a conservative estimate of impact potential for the BIPAR project; rather a reasonable, relevant upper-bounds estimate should be used.

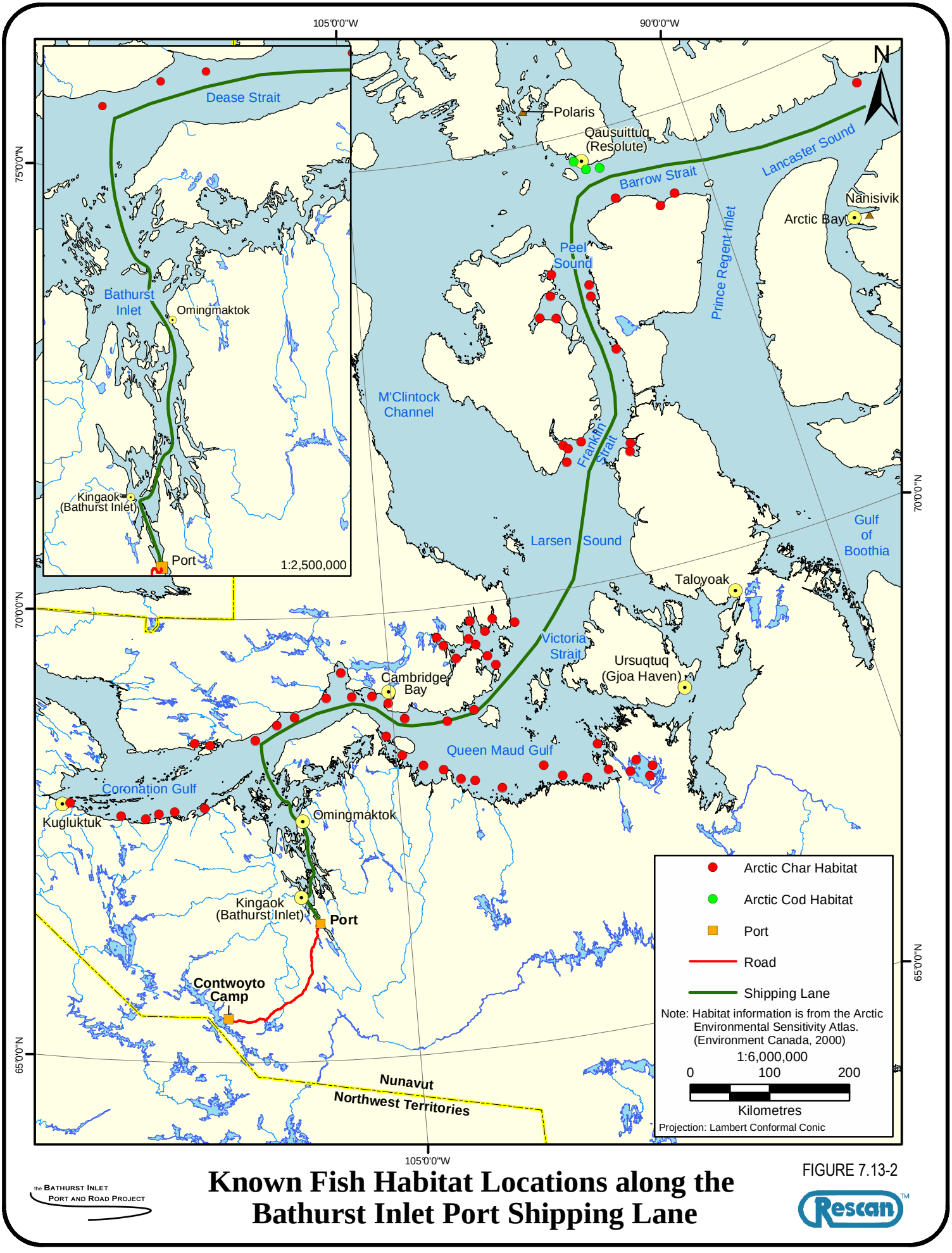

FIGURE 7.13-2

Known Fish Habitat Locations along the Bathurst Inlet Port Shipping Lane

the Bathurst Inlet Port and Road Project

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7.13.2.3 Rationale

Expectations regarding fuel release are a very important aspect of the decision process. It will be important to obtain feedback from several different objective sources before INAC can make a rationale decision about the actual potential risks.

7.13.2.4 Request

INAC questions the applicability of the U.S. Mineral Managements Service (MMS) marine oil spills database to the BIPR project, and recommends against reliance on the low stated probabilities of release as the primary impact avoidance/risk management measure. Furthermore, INAC seeks a strongly supported prediction of hydrocarbon releases from all major reservoir types and transit points.

7.13.2.5 Response

The database that was used for comparison has limitations, as noted, but is likely the best that is available for the purpose.

7.13.3 Information Request 12.3

7.13.3.1 Issue Identification - marine facilities – sediment dredging/excavation

The design currently proposed by the Proponent requires excavation and disturbance of very soft seafloor sediment for the wharf and Causeway that will likely release a large quantity of fine-grained sediments into the water.

7.13.3.2 Concern

Geotechnical investigations conducted by the Proponent determined that the seabed at the wharf location is about 20 m thick, consisting of soft clay. The Proponent considered three wharf foundation types; pre-built concrete cells, reinforced concrete drilled piers and steel sheet pile cells (SSPC). The Proponent justifies the selection of the SSPC based on successful performance in Arctic locations. INAC agrees that a SSPC may be appropriate, however, is concerned that the excavation of soft clay seabed material for backfilling with rock is expected to release large quantities of sediments into the water. The same concern exists for the construction of the causeway that may or may not require the excavation of seabed sediments. Information on the transportation, disposal and closure of the landfill area along the road at the Port Facility is limited as well as environmental control measures to prevent the release of sediment for the landfill location to the water.

7.13.3.3 Rationale

Without further information concerning mitigation measures, INAC is unable to evaluate whether the impacts to the environment under the current design scheme are sufficiently addressed.

7.13.3.4 Request

INAC requests that the Proponent propose mitigation measures that will address the release of sediment into the water.

7.13.3.5 Response

Containment booms and silt curtains will be installed around the offshore work area before the subsea sediments are disturbed. Where onshore erosion may occur in any drainage system on the construction sites, sumps and ditch checks will be installed as well as silt fences. The sumps and silt fences will trap the silt and the ditch check will reduce the flow and reduce erosion thereby limiting any release of silt into water.

7.14 Issue – Transboundary Effects

7.14.1 Information Request 13.1

7.14.1.1 Issue Identification - Transboundary Effects- missing information

7.14.1.2 Concern

The transboundary effects analysis presented in the DEIS is limited to the following:

1. listing which effects presented in the broader assessment may extend across boundaries,
2. stating what rating the broader impacts received, and
3. in some cases, stating a rating for the transboundary effects. No or very limited analysis is provided to justify these statements and a description of the broader effects is only occasionally provided. The entire Appendix is limited to five pages in length. Descriptions of the nature of impacts that will occur across boundaries are generally not included. Information needs with respect to transboundary socio-economic effects is detailed in section 18 of this document.

7.14.1.3 Rationale

In order to adequately assess transboundary effects, a more detailed analysis should be conducted. The effects should be characterized and detailed information on how the analysis was conducted and how conclusions were reached should be provided.

7.14.1.4 Request

The transboudary effects of the proposed project should be further characterized, including a discussion of the nature, magnitude and geographical extent and how these were determined.

7.14.1.5 Response

Trans-boundary effects are the consequences of Project development on jurisdictions outside Nunavut (municipal, provincial, or national).

With respect to marine mammals the nature of the potential transboundary effects is as follows:

- alteration of movement patterns and distributions resulting from disturbance caused by vessel noise on the shipping route in Canadian waters outside of Nunavut; and
- increased potential for exposure to contaminants, possibly leading to disturbance, injury, or mortality, resulting from a large, accidental spill on the shipping route in Canadian waters outside of Nunavut.

The magnitudes of the impacts on marine mammals in Nunavut are given in Table 4.1-1 of Appendix E-5, "Bathurst Inlet Port and Road Project Marine Mammals Effects Assessment". Impacts on the shipping route outside of Nunavut would be no greater than those in Nunavut, and probably would be less because the route would be offshore, away from any bays or other coastal features that could result in concentrations of marine mammals. The magnitude of the impacts are assessed as negligible or low for each potential impact after taking mitigation measures into account. The geographical extent of the impacts assessed, in addition to being trans-boundary, as local for collisions and landscape (<5 km or, for masking in bowhead whales, <10 km) for noise and oil spills. The terms "negligible", "low", "local", and "landscape" are defined in Table 6.4-1 of Appendix A-5, "Bathurst Inlet Port and Road Effects Assessment Methodology."

The assessment for marine mammals was made using knowledge of the species, knowledge of the literature on impacts on marine mammals, and professional judgment. Reference to the published literature is included in Section 4 of Appendix E-5, "Bathurst Inlet Port and Road Project Marine Mammals Effects Assessment". Visual observations from the project vessels will be made both to mitigate impacts and to assess the degree of disturbance to marine mammals, if any. In our opinion, the use of threshold values or the measurement of other indicators that are used to assess disturbance of marine mammals (*e.g.*, breathing rates, dive times, detailed distribution as determined by aerial surveys) are not warranted given the low magnitudes, short durations, reversibility, and low probability of occurrence of the predicted effects.

The BIPR Project considered Socio-economic trans-boundary effects when conducting the cumulative effects assessment (Appendix G-5). The reason for this being that the trans-boundary effects of the BIPR Project are minimal and are of no disturbance to the external and internal areas of the project. According to Appendix G-3 of the DEIS, "potential trans-boundary effects on the Valued Social and Economic Components (VSEC) for the Project are minimal and **Positive**. In addition to bringing job opportunities in Nunavut, the Project will also contribute to GDP growth in the Northwest Territories and all of Canada."

The Valued Social and Economic Components (VSEC) are defined by the Nunavut Impact Review Board as "the socio-economic attributes or components identified as a result of a social Scoping exercise as having scientific, social, cultural or economic value." The identification of VSEC's was determined by the SEIA Project Team from a scoping exercise based on information and input received during the Nunavut community consultation program, from published reports and experience of the analysts in Nunavut. Relevant VSEC's are listed in Table 7.14-1, in no particular order of importance:

Table 7.14-1
Valued Social and Economic Components (VSECs)

VSEC	Rationale for Concern	Geographic Area/Extent
Community Health and Well-being	To ensure the health and safety of their homes and to ensure that community cohesion will not be disrupted by the BIPR Project.	SEIA area of influence
Environmental Conservation	The preservation and sustainable use of all biophysical elements; specifically wildlife and water.	SEIA area of influence
Education and Training Opportunities	Increased investment within region which would equate into expanded education and skilled labour training.	SEIA area of influence
Wage Employment Opportunities and Economic Development	To experience the direct benefits of job creation from the development of the BIPR project.	SEIA area of influence
Traditional Economic Activity and Pursuits	Continued and promoted participation within the traditional/subsistence economy.	SEIA area of influence
Cultural Sustainability	The preservation of the Inuit traditional way of life.	SEIA area of influence

Trans-boundary issues for the BIPR are minimal. There are no risks to NWT communities for water quality and minimal for air quality. Potential trans-boundary effects of the Project may include potential effects on migratory barren-ground caribou herds. First Nations and Métis in the Northwest Territories harvest Bathurst herd caribou that range into the Project area.

Four wildlife groups were identified as potentially having trans-boundary effects: Caribou, grizzly bear, wolves, and migratory birds. These species groups were identified due to their ranges and the potential for these species to cross ecological or geographic boundaries. Hence, effects from the BIPR project on these species may impact users of these species in other provinces or territories. Due to the high levels of uncertainty in addressing these concerns, the effects assessment for trans-boundary effects was kept very general. For caribou, the effects assessment provided **Low** magnitude based on reduced habitat, potential disruption of movement, potential for disturbance, and potential reduction in reproduction. A conservative rating of **Low** was also applied due to the level of uncertainty in the geographic extent of these effects. For grizzly bears, the effects were rated as Low within the project area. Unlike Caribou, which cross boundaries on a yearly basis, grizzly bears within the project area may disperse across boundaries, when they are young and so may reduce the level of connectivity over this larger area. This effect was rated as **Negligible**. For wolves and migratory birds, the effects ratings within the project are were rated as negligible, yielding a **Negligible** trans-boundary effect as well.

The original trans-boundary assessment for climate and air quality identified two potential effects: The global distribution of CO_2 emitted by the project that will contribute to climate change and the transport of persistent air contaminants (mostly particulate matter) to jurisdictions outside of Nunavut. Geographical extents assigned to these two potential effects were explained in detail in the original assessment as was the assignment of magnitude ratings for these two effects. CO_2 emitted by the Project will disperse throughout the global atmosphere due to its long lifetime in the atmosphere. Climate effects for the Project were rated **Moderate** because GHG emissions from the Project emissions would only constitute approximately 1% of total emissions for the Northwest Territories and Nunavut; GHG emissions from the Project would be negligible compared to national or global emissions. Therefore, emissions from the Project will not have a measurable effect on the trend of increasing concentrations of GHGs in the global atmosphere and as a result, have **Negligible** potential to cause trans-boundary effects. For persistent air contaminants the modeling results showed that the ambient concentrations of air contaminants declined rapidly with distance from the sources as a result of atmospheric dispersion. Therefore, although some air contaminants will be transported across the boundaries of Nunavut, concentrations will be negligible and are very unlikely to be measurable in jurisdictions outside of Nunavut. Therefore, potential trans-boundary effects were considered to be **Negligible**.

7.15 Issue – Accidents and Malfunctions

7.15.1 Information Request 14.1

7.15.1.1 Issue Identification - Accidents and Malfunctions- missing information

The DEIS does not contain an adequate assessment of the potential environmental impacts of accidents and malfunctions.

7.15.1.2 Concern

The assessment of the potential effects of accidents and malfunctions contained in the DEIS is limited to listing what the proponent has identified as “major environmental and safety risks” and for each of these, listing the plan that will describe prevention, mitigation and response. It should be noted that these plans are not contained in the DEIS.

7.15.1.3 Rationale

The environmental impacts of potential accidents and malfunctions should be considered potential impacts of the project, and as such, should be assessed comprehensively.

7.15.1.4 Response

The BIPR JV recognizes the environmental sensitivity of the area in which the development is proposed and the potential impacts that can be caused by accidents or malfunctions during the construction and operation of the Project. It is our intent to prepare a project-specific Emergency Response Plan once the contact personnel, phone numbers, chain of communications, reporting protocols etc. are known. All of the JV Partners, Engineers and Consultants have generic Emergency Response Plans as part of their Corporate Health Safety Environmental and Security Systems. The project specific plans are usually compiled by modifying the generic procedures to

suit the project and can result in significantly thick documents which are implemented just prior to field mobilization. We are hereby attaching, as examples, the following excerpts from the 2008 Tibbitt to Contwoyto Winter Road Emergency Response/Spill Contingency Plan which cover the main types of accidents or emergency situations which threaten a project of this nature:

Fuel Spills: Spill Response Strategies

General

The potential exists for spills of both petroleum products and/or various chemicals being transported for use at the receiving site. A spill may be in the form of a liquid as in petroleum products, or in the form of a solid. A dry chemical spill may transform into a liquid chemical spill if it is allowed to gain access to a water body (lake or stream) prior to being contained and successfully cleaned up.

Spills may occur on land, snow, ice or in the water or to a combination of one or more depending on the conditions at the time of spill. Various proven practical methods of containment and recovery are well documented for use in northern climates and are summarized in the following documentation. Additional technical information is available from Environment Canada – Environmental Emergencies Section.

The first initial action is to prevent any direct health risk to responding personnel. Persons not directly associated with the clean-up operations are to be directed to leave the immediate area. The area should be isolated and limited to traffic as directed by the response team personnel.

Containment

The type and size of the containment method chosen will depend on the following factors:

- **Size of spill** - Berms surrounding large spills that cover extensive areas are difficult and time consuming to build. Earth and snow berms may be more easily put into place than sand bag containment. It is also important to build the berm as close to the source as possible to minimize any spreading.
- **Terrain** - Steep or varied terrain can make an effective response difficult, particularly with heavy equipment. Spills will travel faster on steep inclines and require faster response times. Larger, flat areas will require longer berms to contain a spill, however spills travel much slower allowing additional time frames for the construction of barriers.
- **Soil types** - Loose, coarse or dry soils will allow liquid spills to be absorbed and require additional work to remove contaminated materials. Frozen soils create a natural barrier that aid in clean up. The tundra vegetation also allows void space, which quickly takes up spills. Trenches or berms can be difficult to construct without the use of heavy machinery.
- **Proximity to water** - It is important that every precaution be taken to ensure that spills do not enter a waterway. If there is any possibility of contamination, a stream or river should be protected by diversion of the spill from the watercourse.

- **Weather** - Weather can play an important role in spill response operation, particularly if the ground is frozen (or beginning to thaw). The presence of water (either from rainfall or spring melt) can increase the clean-up requirements. Water will also increase the tendency for the spill to spread and pose a hindrance to the effective clean up. Soluble chemicals are also a concern when water is present as contamination can spread rapidly.
- **Location** - the location that the spill occurs will greatly influence the type of containment measures and the ability to successfully clean up the spill.
- **Daylight** - during the Winter Road season daylight is at a minimum. This greatly reduces the ability to assess the spill and provide an adequate response. Insufficient light requires that additional sources be available to affect the cleanup.
- **Temperature** - Air temperatures of the arctic, with the extremes during the winter, demand attention by response personnel to ensure the safety of the response team. Although the extreme cold can be beneficial to the containment of a spill on land, it can also be detrimental in the efficiency and response time to control and contain the spill.

Spills on Land

There is potential for spills to occur on land at numerous locations along the winter haul road and include transfer points along the route, the Dome Lake, Lockhart Lake and Lac de Gras Winter Road camps and numerous designated portage (over land) locations along the route.

Spills on land should be contained as close to the source as possible with every effort (taking into account the safety of everyone involved) should be made to ensure that a spill does not reach water. Petroleum products spilling onto frozen snow covered ground may be contained by the construction of snow dykes. For fast initial containment of smaller spills the dykes can be built manually with shovels. Larger spills may require the use of heavy equipment such as graders and bulldozers.

Lining with a polyethylene plastic liner, plastic tarpaulin or similar synthetic material may ensure the impermeability of dykes. Alternatively, water may be sprayed or poured over the dykes and allowed to freeze to further enhance the barrier to the spilled material. This method assumes that water is available or may be accessed from the spill site. Synthetically lined dykes are more effective and longer lasting than just snow or snow and ice-lined dykes.

Containment dykes may also be constructed from sand or gravel from available quarry sites if and where accessible. Again, for smaller spills, the dykes can be fashioned manually with shovels where for larger spills, trucks or other heavy equipment (front-end loaders) will normally be required to transport and handle sand and gravel.

Trenching or ditching can be used as a method for containing and/or intercepting the flow of liquid spills on land. During the predominantly frozen conditions associated with the Winter Road, some ice, snow, loose sand, gravel and surface layers of organic material may be scraped or dug away to create local low lying areas. This can be effective in re-directing flow or allowing simple containment prior to pumping or absorbing the spilled material.

Generally, the spillage of solid materials on land is self-contained due to its nature. Some precaution with regard to wind-blown dispersion may be required with lighter materials (lime). In these cases, a layer of snow placed on top of the spilled material will suffice until removal to appropriate disposal is arranged.

Spills on Snow

Containment on snow is readily achieved and is very effective due to its absorbent quality. Liquid spills (petroleum) will become immobile within the snow pack and easily removed for transport and recovery or disposal. The snow can be used to its advantage in the construction of snow dykes/dams. Whenever possible, the snow pack should be left in place to avoid contaminating the underlying substrate.

Spills on Ice

Spills that occur on ice, from either direct spillage or migration to the ice, are greatly affected by the strength of the ice. If the spill does not penetrate the ice, and the ice is safe to work on, then the methods of containment are similar to that on land. Where the spill has penetrated the ice, the situation should be handled similar to that on open water. If, as in petroleum spills, the material floats, then every effort should focus on the recovery of the material using pumping/suction methods, and absorbents.

Recovery

Spilled liquid petroleum products contained within a dyked or trenched area should be recovered by pumping into a standby tanker, portable storage tank or drums. Pump and suction hoses should be screened to prevent snow, ice or debris from clogging the line or pump.

Any remaining material may be absorbed by use of a variety of natural and commercially available products. Synthetic products such as 3M Brand, Conweb and others are easier to use and more efficient than natural products.

The availability of shovels, rakes and pitchforks are invaluable in any spill clean up and recovery operation. The use of heavy equipment for larger spill situations such as front-end loaders and haul trucks, make the removal of material easier. It also ensures that all materials, including absorbent sand, snow etc. have been removed from the site.

In-situ combustion may be used as a final means of disposal after every effort has been made to remove the spilled fuel/oil etc. Approval for burning of petroleum products must be obtained from the DIAND Inspector prior to combustion. Burning should never be carried out on land where combustible organics are present and the oil has migrated into the soil. Removal is the method of choice in this case.

The most efficient means of igniting diesel oil for in-situ combustion is with a large size portable propane torch. Other highly flammable products such as gasoline or alcohol, or combustible products, such as wood may also be used to promote ignition of the spilled product. Spilled oil should be ignited where it has pooled naturally or been contained by dykes, trenches or depressions. Oil, which has collected in slots in river ice, may also be disposed of by in-situ

combustion if sufficient holes are drilled in the ice. Once holes are drilled, the oil, which collects in the holes, may be ignited.

Disposal

Recovered products, contaminated materials (snow and surface soils), and waste absorbents must be disposed of appropriately. The Material Management Plan details procedures for ultimate disposal. In cleaning up a spill site, the following practices are employed to facilitate proper disposal:

Recovered Petroleum Products

Petroleum products such as oil and fuels that have been recovered by pumping into portable tanks, drums or a standby tanker are relocated to the nearest Winter Road support camp as soon as practicable after clean-up of a spill. Recovered products are prepared for off-site recycling/disposal by camp personnel through transfer (as necessary) to proper containers that are labelled for transport. Waste materials are transported off-site to registered waste handling facilities towards the end of each operating season.

Contaminated Snow

Relatively large volumes of contaminated snow are commonly associated with a spill. Dedicated snow dump locations are established on an annual basis to accept this material. Snow dumps are used as a means to consolidate materials for central management. Contaminated snow dump containers are located at each of the Winter Road maintenance camps. This snow will be treated in an appropriate manner during the summer season of each year.

Contaminated Soils

In cases where spilled materials have impacted underlying soils, clean up may require the removal of contaminated surface soils. The decision to remove surface soil is made on a site and spill specific basis as often soil removal can, in some locations, pose more risk and environmental damage than allowing small residual amounts of contaminated materials to remain. The decision to remove impacted soils is made by the Spill Operations Commander in consultation with the Incident Commander. As is the case with contaminated snow, excavated soils are, in general, relocated to the closest Winter Road camp for consolidated management.

Waste Absorbents

Waste Absorbents generated through normal camp operations and as a result of spills are stored in drums at the Winter Road camps for subsequent incineration or off-site disposal at a registered waste handling facility. Relocate waste absorbents from a spill site to the closest Winter Road camp in appropriate containers.

Fire/Explosions

Fire Fighting Theory

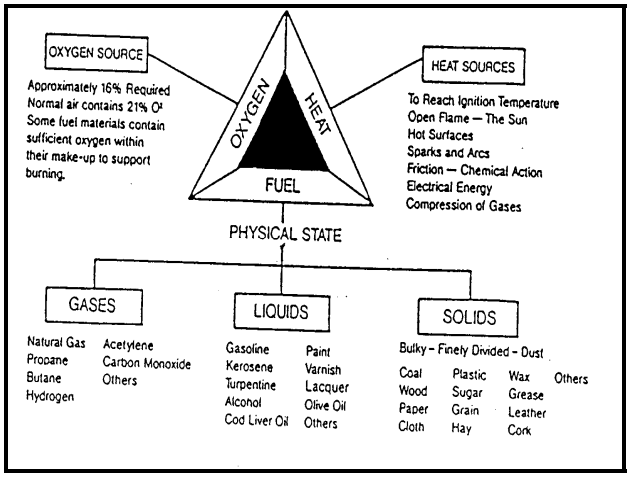
The Fire Tetrahedron

Fire is a process that has been traditionally likened to a triangle, with the three sides representing the three factors necessary for combustion:

- Fuel
- Oxygen
- Heat

When fuel, oxygen, and heat are present in the proper proportions, a fire will result. Conversely, if one of these components is removed, the fire will be extinguished.

The Fire Triangle

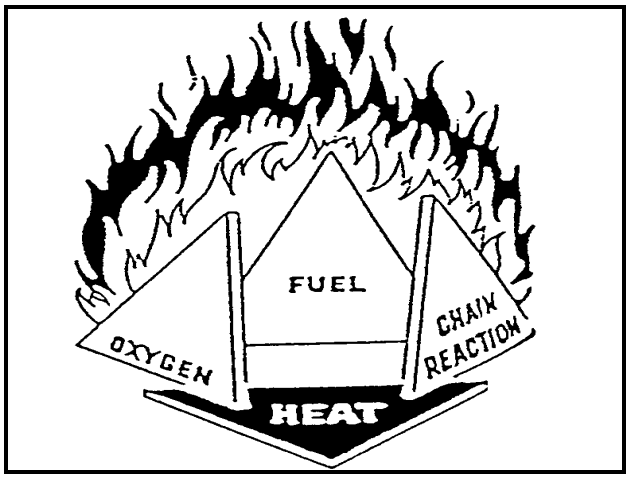


In addition to the three factors required for fire to sustain itself and continue burning, a fourth factor is required:

- Chemical reaction

This fourth factor has resulted in the fire triangle becoming the fire tetrahedron or pyramid, with the chemical (chain) reaction being the base of the pyramid.

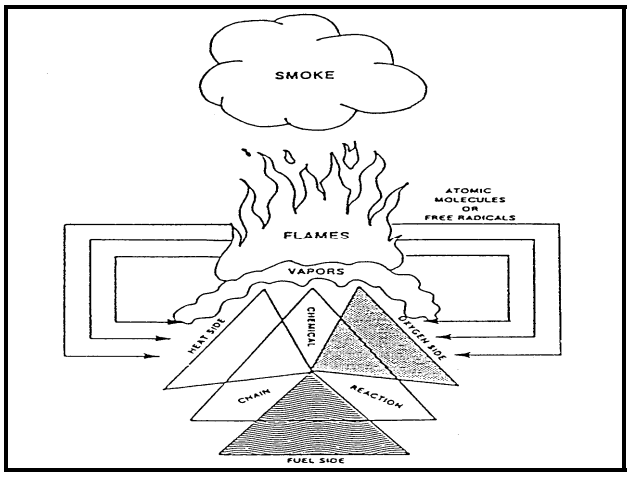
The Fire Tetrahedron



During a fire, complex molecules are broken down into simpler compounds. As the temperature increases and additional oxygen is drawn into the fire, the simple compounds are further broken down and burned. This will raise the temperature even higher, draw in more oxygen, and cause further breakdown.

Fire is therefore, a chemical chain reaction, which will continue until one of the four factors is removed.

The Chemical Chain Reaction Process



Fuels

All materials may exist in three forms:

- Solid
- Liquid
- Vapor (or gas)

However, only vapors burn!!!!

Most hydrocarbon liquid fuels are lighter than water. This means that their specific gravity is less than 1.0.

Most hydrocarbon liquid fuels will mix with another hydrocarbon. Some (such as methanol) will even mix with water. Liquids that mix are said to be miscible with one another. Liquids that will not mix with one another are said to be immiscible.

All solid and liquid material must first be converted to vapor before combustion will take place.

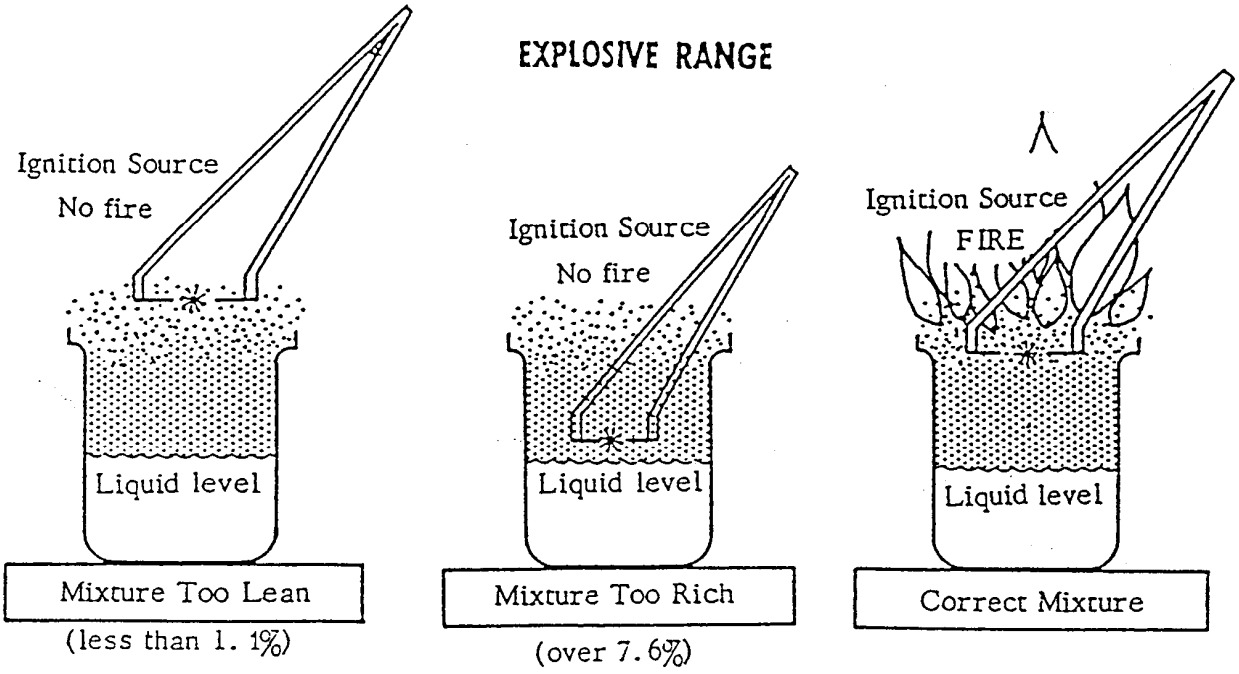
Solids and liquids can be converted to vapor by applying heat. Liquids may also be converted to vapor by mechanical means, such as shaking, stirring, etc.

The amount of heat, or mechanical action required to form vapor varies widely from substance to substance.

All fuels have a vapor density. A vapor density greater than 1.0 means the vapor is heavier than air, and will therefore settle in a low-lying area. A vapor density less than 1.0 means that the vapor is lighter than air, and will rise into the atmosphere. Fuels with a vapor density greater than 1.0 are the more hazardous, as their vapors will collect in low-lying areas and present an explosion hazard.

Fuel vapors must be mixed with the right amount of oxygen before combustion can occur. The range of vapor/oxygen mix over which a vapor will ignite is called the explosive range.

Explosive Range (or Flammability Limits) of Gasoline



Heat

Once vapor has formed, it must be heated to a certain temperature in the presence of oxygen before combustion will occur.

Gasoline, for example, produces enough vapor to flash at –43° C.

The following terms are used to describe the combustion stages:

- **Flashpoint** – The temperature at which a material gives off sufficient vapor to flash **momentarily** when ignited by a spark or flame.
- **Fire (burning) point** – The temperature at which a material gives off sufficient vapor to maintain combustion, when ignited by a spark or flame.
- **Auto-Ignition temperature** – The minimum temperature at which a material ignites spontaneously. The ignition is independent from an external ignition source (such as a spark or flame).

Some examples of flash points and ignition temperatures are:

Liquid	Flash Point °C	Auto-Ignition Temperature °C
Gasoline	-43	280
Kerosene	43	210
Light Motor Oil	190	315

Generally

The lighter the fuel, the lower the flash point, the heavier the fuel, the higher the flash point. Solid combustibles have virtually the same flash point and auto-ignition temperature.

Source of Heat

There are at least six sources of heat that may cause ignition of vapors:

- The sun
- Open flames
- Electricity
- Chemical reaction
- Friction
- Gas compression

The Sun - The sun is the ultimate source of all heat. The sun's radiation can heat surfaces or vapors, and if the oxygen is available, combustion will occur.

Open Flames - If vapour and oxygen are present in the right mixture near an open flame, combustion will occur.

Electricity - Most industrial fires are ignited by an electrical heat source. There are four types of electricity that may produce heat sufficient to ignite combustibles or flammable liquids:

- Electrical sparking – a sudden one-time discharge of electricity. Sparking will not normally ignite combustible materials but it can ignite flammable vapors.
- Electrical arcing – refers to electrical energy "jumping" between two points.
- Electrical resistance – all conductors have a characteristic to the flow of electricity. The electrical energy lost to resistance is transformed to heat and / or light. (Light bulbs, electrical heaters, and stoves all use electrical resistance to function.)
- Static sparking – may occur when two substances that were joined together are separated. Unless the two substances are grounded or bonded together to prevent a static spar, ignition of flammable liquid vapors may occur.

Chemical Reaction (Spontaneous Combustion) - Any two (or more) chemicals, when mixed together, may react.

Some chemical reactions require an input of heat to occur, but many chemical reactions occur at any temperature, and give off heat.

The heat given off in a chemical reaction may cause some vapor to form, or it may heat up vapors already present in the vicinity.

The combination of heat, vapor, and oxygen (from the reaction, or in the atmosphere) can cause combustion. This combustion due to chemical reaction in the absence of any visible external heat source is called spontaneous combustion.

Friction - Any two surfaces, when rubbed against each other, produce heat due to friction. If there is vapor in the vicinity, and oxygen in the atmosphere, then the heat caused by friction could raise the temperature of the vapors to the fire point, and cause a fire.

Compression of a Gas - Any time a gas is compressed, heat is given off. If the heat due to compression raised the gas temperature to its fire point and oxygen is present, combustion will occur.

Oxygen - Oxygen (O_2) is the third requirement for fire (along with heat and fuel). Oxygen plays an essential role in the chemical reaction of fire. Oxygen is added to the fuel in a chemical reaction that is called oxidation.

Most fuels require a minimum 15% oxygen concentration in order to burn. Since the oxygen comprises 21% of the atmosphere, oxygen is normally present in sufficient quantity to allow for the combustion of most fuels.

Rusting is slow oxidation, a slow "fire" that gives off very little heat.

However, many materials oxidize at a much faster rate, and produce a lot of heat, in the process we call "fire".

Extinguishing Fire by Breaking the Tetrahedron

A fire may be extinguished by removing, separating, or excluding one of the four-tetrahedron factors. Different extinguishing materials will remove different factors.

For example:

Extinguishing Agent	Action
Water	removes heat
Foam	removes heat
	separates (liquid) fuel from oxygen (prevents vaporization of liquid fuel)
Dry chemical	interrupts the chemical reaction
Sand	separates fuel from oxygen (displaces oxygen)
CO2	separates fuel from oxygen (displaces oxygen)
Halon	interrupts the chemical reaction

Classification Of Fire

Since fires may involve many different types of fuels, and since each fuel type produces a different sort of fire, fires have been grouped into classes:

- **Class A Fires** – ordinary combustibles
- **Class B Fires** – flammable liquids, greases, and gases
- **Class C Fires** – energized electrical equipment
- **Class D Fires** – metals
- **Class K Fires** – kitchen greases and oils

Class A Fires – Ordinary Combustibles

Class A fires involve wood, paper, rubber, dust, plastic, etc. Class A fires are the most common type of fire in North America.

Water is the best agent to extinguish Class fires, due to its great cooling capacity. Dry chemical, CO_2, and Halon may be used to extinguish Class A fires, but these agents lack the cooling capacity of water, and may not cool the burning material adequately. Therefore, the material may re-ignite after the initial extinguishment.

Class B Fires – Flammable Liquids, Greases, and Gases

Class B fires are often violent and may easily spread over wide areas unless dealt with promptly.

Foam is one of the best agents to use on a Class B fire. Foam has some cooling capacity but its prime purpose is to spread a vapor barrier over the surface of the flammable liquid. This prevents vapor from rising into the flame. Since it is only the vapors that actually burn, the fire goes out due to lack of vapor fuel. Dry chemical, CO_2 and Halon may be used to extinguish Class B fires, but these agents will not prevent the further release of vapors.

Water should not be used to extinguish a Class B fire, unless in a very fine mist by well-trained personnel.

Class C Fires – Energized Electrical Equipment

Class C fires usually begin as a result of faulty electrical equipment or wiring. Once the electricity is shut off, we are let with a Class A, B, or D fire, which can then be extinguished normally.

When the electrical power cannot be shut off, CO_2, certain dry chemicals with the C rating, or Halon may be used. Great care should be taken, as the ignition source (electricity) is present, and none of the agents offer a great deal of cooling capacity.

Water must never be used on live electrical equipment due to the electrocution hazard.

Class D Fires – Metals

One does not often think of metals as being flammable, but they are, and metal fires are among the hottest and most dangerous fires. Magnesium, potassium, sodium, titanium, and zirconium are the most common types of metals involved in a metal fire.

Metal fires are usually extinguished by first smothering the fire (excluding the oxygen). Metal fires require special extinguishing agents, often specific for each individual metal. The selection of the agent is critical, as burning metal may explode violently if exposed to the wrong agent.

Any extinguishing agent containing moisture must never be used on a metal fire, as moisture will cause an immediate explosion.

There is no one agent that is effective against all burning metals. Each metal must be analyzed and a specific agent chosen for the particular metal.

Class K – Kitchen Greases and Oils

Fires involving cooking media (grease, fats, and oils) in commercial cooking appliances are unlike most other fires because these oils have a wide range of auto-ignition temperatures.

Auto-ignition occurs when the oils reach high temperatures, typically above 400°F. Once the oil is burning; the entire mass of oil must be cooled below its auto-ignition temperature to be extinguished.

In the mid 1960's, fire protection engineers discovered that by applying sodium bicarbonate dry chemical or potassium bicarbonate dry chemical to burning cooking oil, a unique phenomenon called "saponification" occurred. The free fatty acids from the saturated fats, combined with

alkaline dry chemical, form soapy foam on the surface of the oil. This foam acts much like traditional fire fighting foams to hold in the vapors and steam, and extinguish the fire. ABC (multi-purpose type) dry chemicals will not produce the saponification effect because the base chemical (ammonium phosphate) is acidic in nature.

Recent tests show that, compared to sodium bicarbonate dry chemical agents, wet chemical agents using liquid solutions containing an alkaline mixture (typically potassium acetate, potassium citrate, potassium carbonate or a combination of these chemicals) are generally more effective in extinguishing grease fires. The combination of a fine mist spray from an extinguisher using an alkaline mixture and the saponification characteristics of the agent itself holds in the vapors.

Dry Chemical Fire Extinguishers

Although it used to be thought that dry chemical agents "smothered" the fire (separated the fuel from the oxygen) it is now thought that the individual dry chemical particles interfere with and stop the chain reaction.

Dry chemical agents are extremely fine powders that are specially treated to be water repellent. Dry chemical agents are capable of being "fluidized", that is they are free-flowing enough to be pumped through hoses or piping when propelled by (gas) pressure.

Most dry chemical agents are corrosive to certain metals in the presence of moisture. This corrosion need not be of great concern however, if the excess powder is promptly removed. Vacuuming, wiping, or washing can easily remove most agents. The exception is monoammonium phosphate powder that will require scraping, if adhered to hot metal surfaces.

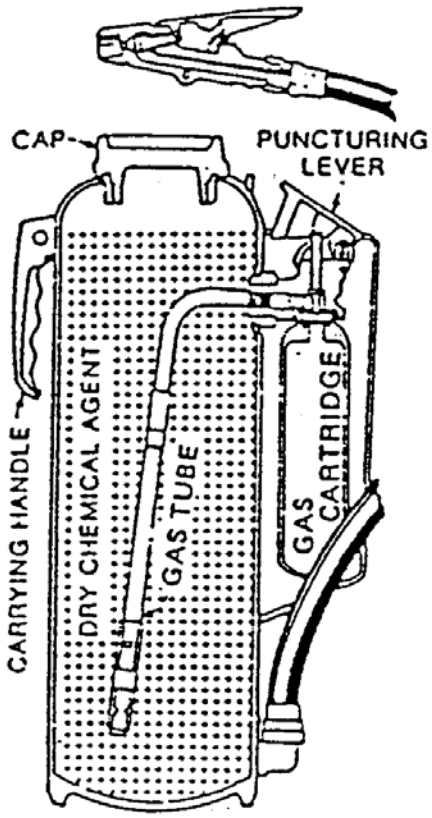
Generally speaking, all dry chemical agents are non-toxic, although like any fine powder they can cause local respiratory tract irritation if inhaled in large amounts.

20-lb. Fire Extinguishers

The extinguishers that are available on the SECURECheck trucks have the multipurpose dry chemical agent called monoammonium phosphate ($NH_4H_2PO_4$). This agent is better known as Foray. It is a yellow powder and is suitable for Class A, B, and C fires.

When used on Class A fires, the agent melts and forms a molten residue that adheres to the heated surface and prevents oxygen from contacting the fuel. Pound for pound, monoammonium phosphate is 8 times more effective than water on Class A fires.

20-lb. Cartridge Operated Fire Extinguisher



Attacking A Fire

A fire, regardless of its size, location, or time, demands immediate action. Training is required for personnel to be prepared for a fire emergency and to know what immediate action should be taken if a fire occurs.

Controlling a Fire

Controlling fire means limiting its size and intensity, to keep it from getting any hotter. Once a fire is under control, it is much easier to attack and extinguish. Controlling is often achieved by removing or wetting down adjacent combustible material to prevent it from catching fire. The critical issue is to confine the fire within an area that can be handled with the available equipment.

Speed is of the utmost importance when fire fighting. The longer a fire is allowed to burn, the hotter it becomes. If you can keep a fire from spreading (or "get it under control,") you are preventing it from getting hotter. Getting control of a fire may be accomplished by moving combustibles away from the fire scene, but this is not always possible. The next best thing is to keep the surrounding combustible material from getting hot enough to catch fire. Remember that a flame or spark is not always required to start a fire. Material may burn simply because it is too

close to an existing fire, or it is against a metal wall that is being heated by a fire, or it may be heated by hot gases escaping from a fire. If you do not address these problems, you may well wind up fighting two or three fires instead of just one.

Water (or snow) is the best agent to use to keep things cool.

Basic Steps for Attacking a Fire

The three basic steps in fire fighting are:

- Locate the fire.
- Get the fire under control.
- Extinguish the fire.

The fire fighter must quickly determine the following:

- The location (and the centre) of the fire.
- What is burning?
- The extent of the fire.
- What combustibles are in the immediate vicinity?
- What are the hazards to the fire fighter's safety while fighting fire?
- The best method of extinguishment.
- The best technique to prevent the spread of the fire.
- The best technique to extinguish the fire.

The first responder to a fire must first determine the exact location of the fire, and if possible, the centre of the fire. Locating the fire and the fire centre is often easy, but it may be hampered by smoke. Therefore, always approach the fire from the windward side, where the heat and smoke will be minimal.

Having located the fire, the fire fighter must then determine exactly what is burning, and the class of the fire (A, B, C, or D). This will verify that the available fire fighting equipment will be effective, and will possibly alert the fire fighter of potential safety hazards.

The next step is to determine the extent (size) of the fire. If it is a small fire, he may decide to attack it immediately with a portable extinguisher – remember speed is of the essence. However, if the fire cannot be put out with the extinguisher then it may spread out over a larger area.

The best tactic for the first response is to have one fire fighter with the 150-lb. extinguisher to approach the fire. Extinguish the fire using wide sweeps covering the base of the fire. If the equipment is extremely hot, give short bursts of dry chemical every few seconds to keep the fire extinguished. Dry chemical is an extinguishing agent, but not a suppression agent, meaning that the chemical will not keep the vapors from re-igniting if the temperature is high enough. Monitor

the equipment closely for re-flash until the equipment has sufficiently cooled. The 20-lb. extinguishers are to provide personal safety for the fire fighters.

Once the fire has been controlled, overhaul should be conducted as soon as possible to check for extension and hidden fires. Other overhaul considerations include disconnecting the battery, securing airbags (Supplemental Restrain System (SRS) or Side-Impact Protection System (SIPS), and cooling fuel tanks and any intact sealed components.

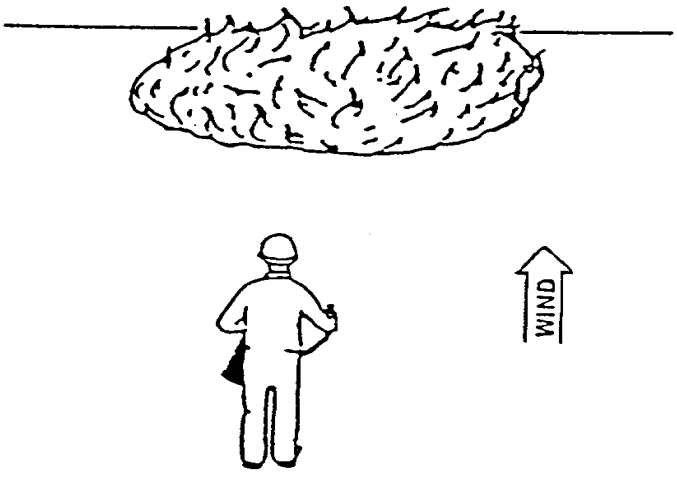
Remember that partially used extinguishers must be treated as empty. A partially used extinguisher must be bled down of any remaining pressure and recharged immediately after usage. Only after recharging, may the extinguisher be returned to its normal location.

Charging the 20-lb. Extinguisher

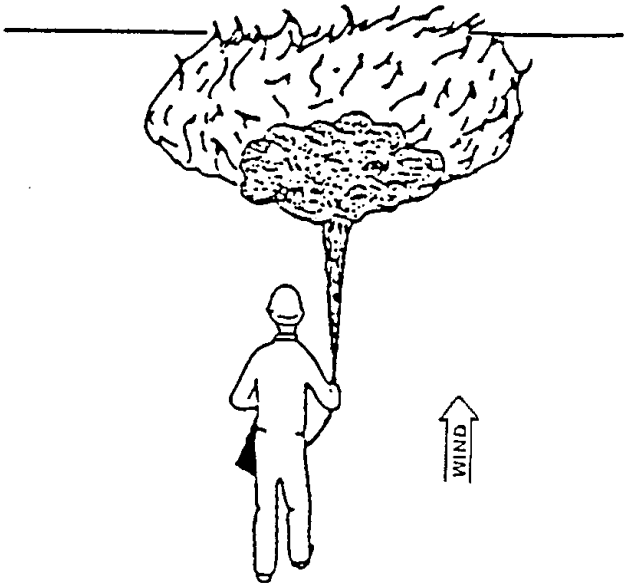
1. Grasp the by the carrying handle with your left hand.
2. Remove the extinguisher hose from its holder, and pull the hose free from behind the puncture lever with your right hand.
3. Place the nozzle solidly under the thumb of your left hand (while still holding the carrying handle).
4. Bend down on one knee and tip the top of the extinguisher away from your head and face.
5. Using your right hand push the puncture lever down firmly, and verify that the indicator pin pops into the up position.
6. Take the nozzle into your right hand, point it in a safe direction and give a short burst of chemical to verify that the extinguisher is functioning properly.
7. Stand, carrying the extinguisher hip high and approach the fire in a safe, upwind direction.

Flammable Liquid Spill Fires

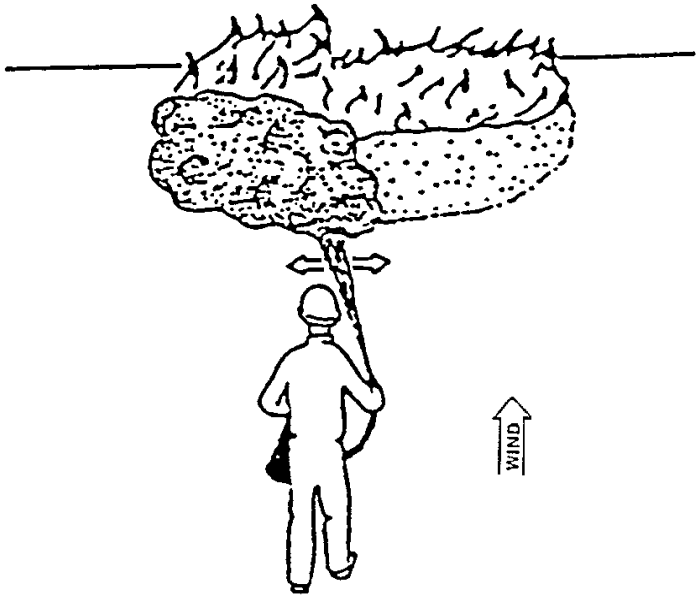
1. Approach to about 8 feet from the fire.



2. Hold the nozzle down at a 45° angle and aim the nozzle towards the near edge (base) of the flames.

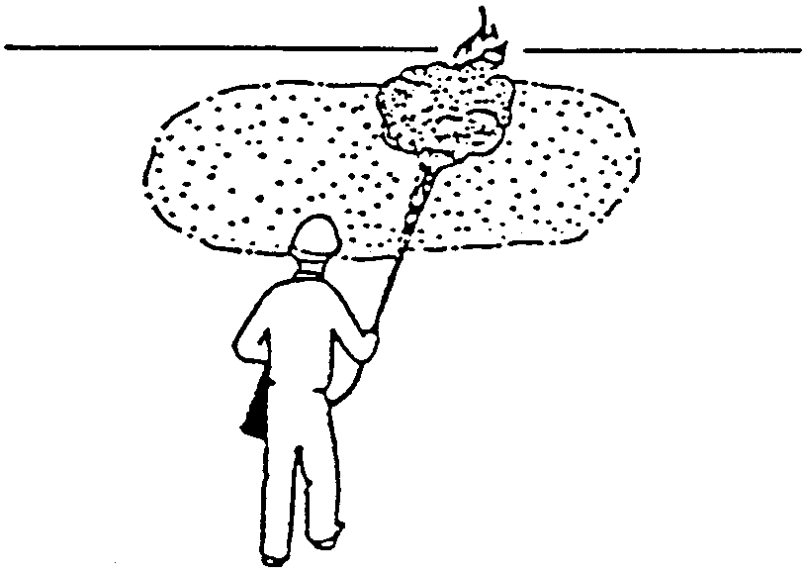


3. Squeeze the nozzle handle and adjust the stream 6 inches short of the edge of the flames.
4. After the nozzle is completely open, start a side-to-side sweeping action across the full width of the fire. Keep your right arm slightly bent to give a level sweeping pattern.
5. Make sure that each sweep is slightly wider than the width of the fire.



6. Advance forward only as fast as the extinguishing action of the dry chemical will permit. Do not outrun your protection.

7. Advance cautiously. Do not raise the stream. Keep it aimed at the base of the fire in a sweeping action.
8. Stop your advance at the base of the (now extinguished) fuel spill area. Do not become involved in the fire. Maintain the sweeping action, pushing the flames back until only a small fire exists at the far edge of the spill.
9. Extinguish the small fire remaining at the back edge of the spill by aiming the stream directly at the base of the flame. Do not raise the nozzle to "chase" the fireball.



10. Once the fire is out, back off a few steps and maintain a watch for at least three minutes. Never turn your back on a recently extinguished fire.

Discharged Extinguishers

Notify the shift supervisor as soon as possible in order to have discharged extinguishers replaced.

Medical Emergencies

Scope of this Information

This information provides a brief review of the Red Cross Standard First Aid training materials. Each first responder is trained to either the Standard First Aid certificate level or the Advanced First Aid certificate level. All actions performed must be within the limitations of the certificate held for each specific individual.

Emergency Action Principles

There are six emergency action principles to follow in order:

1. Survey the scene.
2. Check the casualty for unresponsiveness. If the person does not respond, call EMS.

3. Do a primary survey and care for life-threatening problems.
4. Do a secondary survey, when appropriate, and care for additional problems.
5. Keep monitoring the casualty's condition for life-threatening problems while waiting for EMS to arrive.
6. Help the casualty rest in the most comfortable position and give reassurance.

These steps help keep you, the casualty, and other bystanders safe and increase the casualty's chance of survival.

Frost Bite

Signs and Symptoms

Depending on the circumstances and how long the casualty is exposed to the cold, frostbite may occur by itself or along with hypothermia, which is the cooling of the whole body rather than the freezing of a specific part. The following are the signs and symptoms of frostbite:

- Lack of feeling in the affected area.
- Skin that appears waxy.
- Skin that is cold to the touch.
- Skin that is discolored (flushed, white, yellow, and blue).

First Aid

If the casualty shows signs of both frostbite and hypothermia, give first aid first for the hypothermia because it can lead to death if the person is not warmed immediately. Even in this case do not ignore frostbite, which, if serious, can require the amputation of the affected part. Follow the emergency action principles first, and then give the following specific care for frostbite:

1. Cover the affected area.
2. Handle the area gently and never rub it because this causes further damage.
3. Warm the area gently by immersing the affected part in water warmed to 40.5 °C. If possible, use a thermometer to check the water; if not possible, consider the water too warm if it is uncomfortable to your touch.
4. Keep the frostbitten part in the water until it looks red and feels warm.
5. Bandage the area with a dry, sterile dressing. If fingers or toes are frostbitten, place cotton or gauze between them. Avoid breaking any blisters.
6. Get the casualty to a doctor as soon as possible. Do not thaw the frozen part if there is a possibility of re-freezing.

Hypothermia

Signs and Symptoms

- Shivering (may be absent in later stages).
- Numbness.
- Lack of co-ordination.
- Confused or unusual behavior.
- Body temperature below 35 °C.

First Aid

Begin with the emergency action principles, and then give this additional first aid for hypothermia:

1. Remove any wet clothing and dry the casualty.
2. Warm the casualty by wrapping him or her in blankets or putting on dry clothing and moving him or her to a warm place. Do not warm the casualty too quickly by immersing him or her in warm water. Rapid re-warming can cause heart problems. Be very gentle in handling the casualty.
3. If available, put hot water bottles, heating pads (if the casualty is dry), or other heat sources on the body, keeping a blanket, towel, or clothing between the heat source and the skin to avoid burns.
4. If the casualty is alert, give warm liquids to drink.

In cases of severe hypothermia, the casualty may be unconscious. Breathing may have slowed or stopped. The pulse may be slow and irregular. Take up to 45 seconds to check the pulse. The body may feel stiff. Monitor the ABC's until EMS arrives, and give rescue breathing if necessary. Be prepared to start CPR.

Head, Neck, Or Spinal Injuries

Suspect head, neck, or back injuries in casualties who have experienced a violent force, such as in a motor vehicle crash, a fall, or a diving or sports injury. In such cases minimize movement of the head and neck when opening the airway. Use the jaw thrust method instead of the head-tilt/chin-lift.

Signs and Symptoms of Head and Spine Injuries

- Changes in level of consciousness.
- Severe pain or pressure in the head, neck, or back.
- Tingling or loss of feeling in the fingers and toes.
- Loss of movement of any body part.
- Unusual lumps on the head or spine.

- Blood in the ears or nose.
- Heavy bleeding of the head, neck, or back.
- Convulsions.
- Impaired breathing or vision.
- Nausea or vomiting.
- Persistent headache.
- Loss of balance.
- Bruising of the head, especially around the eyes and behind the ears.

These signs and symptoms alone do not always mean a serious head or spine injury, but always call EMS when you suspect a serious head or spine injury.

First Aid for Head and Spine Injuries

Follow the emergency action principles whenever you suspect a head or spine injury:

1. Survey the scene to ensure no danger.
2. Check the casualty for unresponsiveness. If the person does not respond, call EMS.
3. Do a primary survey and care for life-threatening problems (ABC's). Call EMS for help if necessary.
4. Do a secondary survey, if needed, and care for other problems.
5. Keep monitoring the ABC's until EMS arrives.
6. Help the casualty rest in the most comfortable position and give reassurance.

Head and spine injuries can become life threatening. Give the following specific first aid while waiting for EMS help to arrive:

1. Keep the head and spine as still as possible.
2. Maintain an open airway.
3. Monitor consciousness and breathing.
4. Control external bleeding.
5. Maintain normal body temperature.

Rescue and Emergency Moves

Usually in emergencies, you give first aid in the same place you find the casualty. Moving a casualty needlessly can lead to further injury. However, in some cases, the situation is dangerous, and the casualty must be moved or rescued before you can give first aid.

Moving Casualties

Never move a casualty unless there is immediate danger such as fire, poisonous fumes, risk of drowning, risk of explosion, a collapsing structure, or uncontrollable traffic hazards.

Always follow these guidelines when moving a casualty:

- Only attempt to move a person you are sure you can comfortably handle.
- Bend your body at the knees and hips.
- Lift with your legs, not your back.
- Walk carefully using short steps.
- When possible, move forward rather than backward.
- Always look where you are going.
- Support the casualty's head and spine. Immobilize the head, neck, and back if you suspect a neck or back injury. A casualty who is unconscious should be treated as if he or she has neck or back injuries.
- Avoid bending or twisting a casualty with possible head or spine injury.

Log Roll

Move a casualty with a suspected neck or back injury only if it is absolutely necessary. You need a spine board (a flat, non-metal board the same length as the casualty) and at least two other rescuers to assist. One rescuer acts as leader and instructs the others:

1. All rescuers kneel on the same side of the casualty.
2. One rescuer at the head supports the head and neck, while one at the feet supports the feet. Other rescuers pass their hands over the casualty at the chest, hips, and knees.
3. At the leader's signal, the rescuers roll the casualty toward them onto his or her side. The head and neck are kept aligned with the rest of the body.
4. The spine board is placed behind the casualty. On the leader's signal, the rescuers roll the casualty back onto the board as one unit.
5. To secure the casualty immobile on the board, wrap a series of bandages around the casualty and board, including at the forehead, chest, waist, legs, and ankles.

The rescuers can now carry the casualty on the board away from the danger scene.

7.16 Issue – Cumulative Effects

7.16.1 Information Request 15.1

7.16.1.1 Issue Identification - Cumulative Effects- outdated information

It is not clear that the cumulative effects assessment reflects the current development scenario in the Kitikmeot Region.

7.16.1.2 Concern

The cumulative effects of the BIPR project will be highly dependant on predicted resource development activity in the project area. As this activity can be highly dynamic in nature, it should be confirmed that the December 2007 assessment accurately portrays the current scenario.

7.16.1.3 Rationale

Ensuring that the cumulative effects scenario that is considered is as accurate and current as possible will enable a better assessment of the cumulative effects of the proposed project.

7.16.1.4 Request

INAC requests that the proponent confirm whether the cumulative effects assessment reflects the current development scenario in the Kitikmeot Region and provide an updated assessment if warranted.

7.16.1.5 Response

Some of the mining projects mentioned in the cumulative effects assessment are in various stages of feasibility assessment and a definitive answer as to whether or not they will ever go into production is not possible at this stage. What is certain is that the existence of the BIPR would make exploitation of the potential resources more feasible. The development of base metal projects requires a transportation route to get the raw product or concentrates to smelters or refining facilities. There are obviously no guarantees at this stage but the proponent is confident that the provision of a viable transportation route would enhance the feasibility of these projects.

The proponent understands the dynamic nature of the development scenarios in the Kitikmeot Region. Once the proponent has been given directions from NIRB on the FEIS, the cumulative effects assessment will be revised based on the most recent information available at that time for all potential projects in the region. The Jericho Project will be taken off the list of exiting developments since the mine is now closed.

7.17 Issue – Sustainability Analysis

7.17.1 Information Request 16.1

7.17.1.1 Issue Identification - Sustainability Analysis- missing information

The proponent has not demonstrated how they have incorporated sustainable development principles throughout all phases of the project.

7.17.1.2 Concern

The DEIS does not contain specific information about how sustainable development principles have been applied, including an analysis of the capacity of renewable resources affected by the project. The proponent's analysis is limited to stating that "The Project has been developed to facilitate economic development in accordance with sustainable development principles…" and that "the environmental assessment process has been designed to ensure that the Project does not

affect the availability of renewable and non-renewable resources in the Project area…" These are statements rather than analysis. Specific measures that have been taken to incorporate sustainable development should be documented and discussed for all phases of the project. Information needs with respect to the assessment of sustainability from a socio-economic perspective is detailed in section 18 of this document.

7.17.1.3 Rationale

INAC cannot assess how the principles of sustainable development have been implemented by the proponent. A sustainability analysis is required as per NIRB's 10 minimum EIS requirements for a part V review.

7.17.1.4 Request

The application of the sustainable development principles should be specifically documented and referenced for all phases of the project.

7.17.1.5 Response

The BIPR Project Team has adopted the definitions of sustainable development provided by NIRB and INAC. As stated in Appendix A-5 of the DEIS, Section 1.2.1 (page 1-1), the BIPR Project has:

> *been developed to facilitate economic development in accordance with sustainable development principles and the Kitikmeot Corporation Policy Statement. The environmental assessment process has been designed to ensure that the Project does not affect the availability of renewable and non-renewable resources in the Project area, and to evaluate and mitigate for potential effects to ecosystems and biodiversity.*

The effects assessments on both the biophysical and human environment demonstrate a comprehensive understanding of sustainable development. Table 7.17-1 illustrates how the sustainable development principles of the INAC are incorporated into the DEIS.

In addition to the sustainable development principles of INAC, the NIRB interprets progress toward Sustainable Development as meeting the following goals:

1. Preservation of ecosystem integrity
2. Respect for intergenerational equity; and
3. Attainment of durable social and economic benefits.

Preservation of Ecosystem Integrity & Respect for Intergenerational Equity:

The BIPR project will take a proactive approach to protecting and preserving the ecosystem. It is important to note that although any biophysical changes on the environment are expected to be minimal, continuous monitoring of aquatic, marine and terrestrial wildlife and vegetation is suggested. As the communities in the region rely on subsistence hunting and gathering for the

Table 7.17-1
INAC Sustainable Development Principles as they Apply to the BIPR Impact Assessment Process

Sustainable Development Principle (INAC)	Effects Assessment
Human Environment – Construction and Operations	
Full consideration of economic viability, social implications, and cultural and environmental values in decision making and policy and program development.	Social implications, and cultural and environmental values have been addressed through the comprehensive Environmental Impact Statement process, including a full, stand-alone Social and Economic Impact Assessment study. Potential effects identified through these processes have been identified and mitigation measures will be applied to eliminate or reduce identified effects. Economic viability is ongoing through a parallel economic feasibility process, which to date has confirmed that, under circumstances identified within the Study, the Project can be developed in a manner that benefits the people of Kitikmeot Region and Nunavut.
Open, inclusive, and accountable decision making.	The Bathurst Inlet Port and Road Project is a 50/50 joint venture between Nuna Logistics Limited (majority owned by the Kitikmeot Corporation) and Kitikmeot Corporation (wholly owned by the Kitikmeot Inuit Association). The Project is contained entirely within Nunavut. Although the Project is expected to be financed and developed as a Public Private Partnership, ownership is expected to be Inuit. The Kitikmeot Inuit Association (KIA) is the political body responsible for administering Nunavut Land Claim Agreement within the Kitikmeot Region. Decisions concerning the Project are being made by public representatives. Input has been obtained from members of the affected public through inclusive community consultation in accordance with the NIRB Guidelines. As a private/public project, decision makers within the Kitikmeot Inuit Association and the Government of Nunavut are entirely accountable for all Project decisions. The EIS review and approval process, overseen by NIRB, will ensure that decisions are based on technically sound information and inclusive of community and government agency input.
Honouring treaty and fiduciary obligations as well as land claim, self-government, and international agreements.	As stated above, the Bathurst Inlet Port and Road Project is a 50/50 joint venture between Nuna Logistics and Kitikmeot Corporation (wholly owned by the Kitikmeot Inuit Association). The Project is contained entirely within Nunavut. Although the project is expected to be financed and developed as a Public Private Partnership, ownership is expected to be Inuit. The Kitikmeot Inuit Association (KIA) is the political body responsible for administering Nunavut Land Claim Agreement within the Kitikmeot Region. The KIA and the

(continued)

Table 7.17-1
INAC Sustainable Development Principles as they Apply to the BIPR Impact Assessment Process (continued)

Sustainable Development Principle (INAC)	Effects Assessment
	people of the Kitikmeot Region have expressed strong support for the BIPR Project and political and financial support has been received from the Government of Nunavut and from the federal government through Indian and Northern Affairs Canada. Community consultation was conducted in an open and transparent manner by the Project Developer, in accordance with the Guidelines provided by the Nunavut Impact Review Board in compliance with policies and regulations of the Nunavut Government. Potential effects of the Project on First Nations and Métis communities in the Northwest Territories have been identified and are being addressed. Community consultation was initiated and will continue throughout the remaining stages of Project Development. Territorial and federal government agencies have been involved in the development of the EIS process and will continue to be involved throughout the review and approval process.
Engagement of interested local communities and organizations when planning and implementing federal programs.	This principle was implemented through the extensive community consultation process. This consultation included notification of consultation events, such as notices of open house meetings throughout the six Nunavut and nine Northwest Territories communities using both print and radio media. In addition to the community consultation activities, stakeholder interviews and questionnaires were conducted in the communities of Cambridge Bay and Kugluktuk in 2002. The interviews were designed and conducted to assess general awareness of the Project and to elicit information and interviewee views on a variety of Project-related topics including: education/skills upgrading, cultural considerations, employment opportunities, business opportunities, and lessons learned from past development projects. Scoping meetings were also held in Cambridge Bay and Kugluktuk. A presentation was given at the meeting with the purpose of providing information on the proposed project including design, the engineering and feasibility study, and the environmental, socio-economic, and archaeology studies.
Respect for diverse cultures and traditional values, as well as the land and its diversity as the foundation of healthy communities.	This principle has been demonstrated throughout the entire BIPR Project and will continue throughout later stages of Project development. Measures that have been incorporated in response to local cultural and social characteristics include a work rotation of 2 weeks in and 2 weeks out, which provides wage economy opportunities yet encourages local Inuit workers to return to the land on a regular basis without threatening the skill level of Inuit who participate in traditional pursuits such as hunting and gathering.

(continued)

Table 7.17-1
INAC Sustainable Development Principles as they Apply to the BIPR Impact Assessment Process (continued)

Sustainable Development Principle (INAC)	Effects Assessment
	Also, to build collective understanding and respect among all parties in the workplace, a Cultural Awareness Program will be implemented to preserve Inuit culture and tradition and to provide a social environment in which Nunavummiut people are able to participate in the formal wage economy while maintaining their traditional heritage and lifestyle. Elders, hunters and trappers will be hired at the camps as mentors and teachers to help preserve language and increase traditional knowledge as well as teach youth traditional skills.

Fair and equitable opportunities for First Nations, Inuit, Métis and northern peoples to share the benefits, risks, and drawbacks of development.	Sharing benefits has been well documented in the DEIS. Benefits include:
	• Active participation and encouragement through an ongoing and interactive community consultation program in Nunavut (community consultation in NWT will resume in 2008).
	• Employment opportunities – local hiring, sustainable employment, participation agreements.
	• Training – transferability, lack of existing skills, efficiency/effectiveness of training programs, location of training, community preparedness, pre-employment/literacy training.
	• Business opportunities – opportunities for local contracts, long-term opportunities, preparedness.
	• A Social and Economic Management Plan (SEMP) that addresses areas where the Project was indicated to have potential negative effects and where efforts on behalf of the Proponent may be required to manage the implementation of mitigation measures. Commitments are listed below:
	  • Zero tolerance for alcohol and drugs - to provide a safe, drug- and alcohol-free camp and workplace to all employees; this will be implemented with a ‘zero tolerance policy’ and a ‘"code of conduct.’
	  • Communicable diseases management - providing medical services for all employees within Project camps.

(continued)

Table 7.17-1
INAC Sustainable Development Principles as they Apply to the BIPR Impact Assessment Process (continued)

Sustainable Development Principle (INAC)	Effects Assessment
	• Counselling for Workers - this will be integrated in the health services program; counselling will be provided for drug and alcohol issues, family issues, work performance, stress management, and general health and wellness. • Traffic safety - appropriate road signs will be provided along the road and speed limits will be enforced. • Community health program - to advocate counselling when off-site. • Traditional/Cultural Activities Program - to re-confirm its support and respect for traditional activities and forms of economic activities. • Education and Development Program - to provide educational opportunities to employees. • Economic opportunities - to provide access to mining areas and mineral resources near the Project to increase their financial feasibility and potential development. Drawbacks and risks are minimal for the Inuit of the Kitikmeot Region. Risks of Project development will be borne primarily by the private sector developer, although the benefits of ownership will remain with the Kitikmeot Corporation. Drawbacks are considered to include environmental and social/cultural effects. As demonstrated in the DEIS, environmental impacts are anticipated to be extremely low, if any. Social and cultural effects, including the potential for outmigration of trained/skilled workers; potential for community social issues such as crime, alcoholism, *etc*., will be minimized first by distance of communities to the work sites, and second, through controls on travel by non-Inuit workers into local communities and community social programs to provide support for any problems that do occur. Overall, the potential drawbacks of the BIPR project are considered to be far outweighed by the benefits.
Decisions based on the best available scientific, traditional, and local knowledge.	Decisions made regarding the route alignment of the road, design features (such as stream crossings), timing and logistics of construction, *etc*., have all been made in consideration of input received through detailed scientific and engineering studies, supplemented where available with traditional knowledge, and community input obtained through community

(continued)

Table 7.17-1
INAC Sustainable Development Principles as they Apply to the BIPR Impact Assessment Process (completed)

Sustainable Development Principle (INAC)	Effects Assessment
	consultation and community leader interviews. All community interests and concerns have been addressed by the BIPR Project Team to date and made available to the public in the DEIS.
Efficient use of natural resources and minimization of pollution in INAC's internal operations.	This principle is the overarching purpose for conducting the DEIS of the BIPR Project. Impacts to natural resources as a result of Project execution and operation, including the potential for pollution, have been minimized through avoidance by way of design and mitigation as outlined in detail throughout the DEIS.

much of their dietary needs, any contamination of the water or potential food sources can have serious effects on human health and well-being in the region. As outlined in the DEIS, direct and indirect effects caused by the changes to the biophysical environment as a result of the BIPR will be negligible upon the implementation of mitigation measures. As all local communities are at least 40 km from either the port or road, negative impacts to community health and well-being due to changes in the biophysical environment will be minimal within the area of influence. The BIPR project will contribute to the creation of a self-sustaining and self sufficient community due to its commitment to resource management/conservation. The BIPR Project will:

- Have no direct or indirect interaction on the water supply of any Kitikmeot community.
- Ensure that the effects on ice required for seal hunting and caribou migration will be insignificant as shipping occurs during the summer months.
- Not utilize icebreakers to extend the shipping season for vessels serving the Project. As a result, shipping will not affect caribou migration or seal hunting.
- Ensure sufficient controls, such as the implementation of the Water Management Plan and the Environmental Management Plan, in place during construction to prevent: the erosion/sedimentation caused by surface runoff, contaminants to runoff into local surface water resources and /or to steep into groundwater, the potential for flooding and the potential to impact permafrost.
- Not directly impact the land use patterns of Nunavummiut. This includes hunting, fishing, trapping and travel activities within the area of influence.
- Construction at the port during the summer months is not expected to impact fishing and hunting game such as waterfowl and ground squirrels.
- Not disrupt the land use patterns of the Inuit within the area of influence by attracting non-Inuit BIPR workers into areas that are traditionally used by local communities.
- Ensure that construction activities will not disrupt caribou migration or calving.

Durable Social and Economic Benefits:

The Project will have a direct effect on the creation of an economically viable community whilst maintaining a durable social fabric. The Project will contribute to a self sustaining and self sufficient community by:

- Creating 260 employment positions during construction with a payroll of approximately $40 million with a target of providing 30% of these jobs to Inuit workers.
- Creating 57 full time employment positions during operation with a target of providing 50% of these jobs going to Inuit workers at the commencement of operations and as many as 75% of these jobs after 10 years of operation.
- There is a strong spin-off effect for job creation for providing goods and services to the project. It is estimated that 150 jobs will be created in the transportation sector alone.
- The prospect for establishing new mining projects in the Slave Geological Province is high.

- Meeting the goal of assisting in the creation of self-sustaining and self-sufficient communities by providing additional employment opportunities within the Kitikmeot Region.
- Creating an alternative way for local businesses to receive goods more efficiently and at a lower cost than cargo which is currently flown into isolated communities or transported overland from Yellowknife via the existing winter road network to mines and exploration sites.
- Resulting in a direct reduction in the cost of living to communities within the area of influence by providing and alternative way to access cheaper fuel and dry cargo by way of the port project site.
- Not threaten the skill level of Inuit who participate in traditional pursuits such as hunting and gathering.
- Supporting traditional forms of economic activity through the favourable work rotation of two weeks in and two weeks out as Inuit will be encouraged to return to the land on a regular basis.
- Implementing the Cultural Awareness Program to build collective understanding and respect among all parties in the workplace for Inuit culture and tradition and to provide a social environment in which Nunavummiut people are able to participate in the formal wage economy while maintaining their traditional heritage and lifestyle.
- Creating an opportunity to increase education and skilled labour training.
- Programs include: using traditional language in the workplace, serving country food, celebrating Inuit events, encourage developing Inuit art and crafts within the work camps.

The BIPR project will not only contribute to a sustainable and self sufficient community through economic growth, but through various commitments to resource management and resource conservation, respect for Inuit culture and traditional values and the participation and engagement of local communities, elders and organizations.

7.18 Issue – General

7.18.1 Issue Identification - The Proponent has not used the same scale for Mapping

7.18.1.1 Concern

The scale of maps within the DEIS are very inconsistent

7.18.1.2 Rationale

It is difficult to interpret maps when they are different scales and very inconsistent.

7.18.1.3 Request

The Proponent should make sure that all maps should be 1:50,000/1:250,000.

7.18.1.4 Response

Due to the size of the Project area and the number of disciplines being studied it is not possible to restrict map scales to 1:50,000 or 1:250,000 for all the maps. The maps range in scales from 1 to 7.5 million for an overview of the road and shipping route to 1 to 600 for detailed maps of the port area.

Where possible we have endeavoured to keep the scale consistent within each discipline (*i.e.*, all quarry sites maps completed at 1:5000).

If the large-scale maps (*i.e.*, quarry sites, port site) were done at smaller scales such as 1:50,000 or 1:250,000 the information would not be visible. Similarly, if overview maps were done at one of these scales it would require many letter-size or tabloid-size maps to cover the area.

All maps have the scale that they are created at in the legend along with a scale bar. In addition, insets have been added to many large-scale maps so that the reader will know where that map is with respect to the larger Project area.

7.18.2 Issue Identification - The Proponent has not distinguished between Crown Land and Inuit Owned Land on all maps of the Road nor do they indicate quarry locations

7.18.2.1 Concern

It is difficult to determine which quarries are on Crown Land and which are on IOL. It would be beneficial to have a layer added indicating which is IOL or crown lands. This feature will help provide information pertaining to quarry royalties, lease cost, *etc*.

7.18.2.2 Rationale

INAC cannot fully assess the impacts of the quarries without knowing what land they are sitting on.

7.18.2.3 Request

INAC is requesting the proper delineation of IOL and Crown Land on all maps in the entire DEIS and its appending documents. Quarry locations need to be clearly indicated on all the maps referencing roads.

7.18.2.4 Response

The boundaries for Inuit Owned Lands (IOL) are provided in Figure 7.11-1. A summary table is also provided on the figure indicating whether or not each of the quarries is on IOL. Fourteen prospective quarries are on IOL.

7.19 Issue – Socio-economics

7.19.1 Information Request 18.1

7.19.1.1 Issue Identification - The DEIS does not clearly outline how public consultations have influenced the design of the Project

7.19.1.2 Concern

The BIPR team has conducted numerous meetings, interviews and presentations over time with various communities within the area of influence. Section 4 of Appendix 2 attached to A-2 (Project Description) requires that the Proponent identify how consultation has affected project design prior to the issuance of the EIS Guidelines. Section 4.5.2 of the Final 2004 Guidelines also states this requirement. The referenced documents in the Table of Concordance, Section 11 of the DEIS and Appendix A-4, describe the nature of community consultation methodology as well as the feedback from various communities but the referenced documents do not clearly indicate how the feedback from the community engagements was incorporated into the design of the project.

It appears that previous community interests and concerns were taken into consideration in the initial design, for example the Project Description indicated the Draft West Kitikmeot Regional Land Use Plan by the Nunavut Planning Commission 1997 was used in the selection of the route. As well, there seems to be an employee rotational change from three weeks in/one week out to two week in/two weeks out, presumably at least partially because of community concerns for community wellness etc. as indicated in community interviews. However, these and various other community interests are not clearly identified as being incorporated into the current design as revealed in DEIS Section 11 and A-4.

It is noted that the project description was prepared in 2003 after community engagement in 2001/2002. The project feasibility study was prepared in September 2007 after community engagement again in 2006/2007. Accordingly, there should be ample opportunity within the feasibility study and the DEIS to indicate where engagement has affected project design. Additional references in the Table of Concordance would help capture the efforts the Proponent has already undertaken and how they were transformed into action by way of inclusion in project design.

7.19.1.3 Rationale

This information is required in order for INAC to assess the comprehensiveness of the consultation efforts. Many community members may view this information as necessary components to meaningful engagement and in some respects, is what many people view as "consultation." This section may be a key section of the EIS that is reviewed by community members.

7.19.1.4 Request

INAC recommends that the Proponent clearly outline how public consultation has influenced the design of the BIPR Project.

7.19.1.5 Response

The major components of the Project have not changed since the original feasibility study. The only changes were smaller facilities at the port and Contwoyto Lake and the elimination of the Izok - Lupin road and the Contwoyto Lake barge portion of the Project.

There were several Project decisions based on community issues that came out of the community consultation including:

- No ice breaking to extend the shipping season, due to concerns about caribou migration over the ocean ice between Victoria Island and the mainland.
- Adoption of several recommendations from the then draft Kitikmeot Land Use Plan:
  - Locating the road back from waterbodies.
  - Employee/contractor hunting and fishing.
- Using the ice road to move equipment/supplies/vehicles/boats to Bathurst Inlet from Yellowknife on the winter road for summer barging to Cambridge Bay and other communities during the following summer. This would provide earlier deliveries into the Kitikmeot communities than is presently the case with the NT barge network.

The community consultations in 2007 were largely designed to address the socio-economic issues/studies.

7.19.2 Information Request 18.2

7.19.2.1 Issue Identification - Section 5.5 of the DEIS "Community Support Analysis" does not include the full range of socio-economic groups engaged and requires a reassessment of conclusions based on this information

7.19.2.2 Concern

Section 4.4 of the Guidelines indicates that the Proponent should provide an analysis of the support for and opposition to the project, including the groups that stand to benefit and lose from the Project and including a description of how the Proponent has sought input from a broad range of socio-economic groups. Section 5.5 of the DEIS and Appendix A-3 outlined in Section 4.4 of the Guidelines do not clearly address the requirements in Section 4.4 of the Guidelines as pertains to community support.

Section 5.5 of the DEIS states that responses from the communities included local organisations such as elders, youth groups, Inuit leaders, hunters and trappers associations, government officials and RCMP officers and that they were generally positive given factors which will affect lower costs of living. This section also states that an assessment on a community by community basis was not possible as this was not the way the SEIA process was conducted (impacts on VSECs and VECs in Nunavut and NWT were assessed).

The description within this section is limited and somewhat confusing. It is recommended that the Proponent reassess this section and clarify if each of those socio-economic groups were

engaged in their entirety or if individual members from each group were engaged. Additional references in the Table of Concordance might be helpful so that the reader can clearly identify support for the project. By viewing the sign-up sheets from various engagement activities, various socio-economic groups seemed to be left out of this description including educational groups/teachers, mining business/executives, tourism lodges, members of Inuit communities (not just leaders), *etc*. The overall conclusion of positive support based on longer term stable employment and lower fuel costs requires further information regarding how this conclusion was derived at, including references within the DEIS where this sort of overall assessment has taken place. The various studies that have taken place regarding consultation processes might be referenced.

7.19.2.3 Rationale

This information is required in order for INAC to assess the comprehensiveness and adequacy of the consultation efforts.

7.19.2.4 Request

INAC recommends that the Proponent include all of the socio-economic groups engaged in DEIS Section 5.5 and that it re-examine its assessment of community support, referencing in the Table of Concordance applicable support within the DEIS documents.

7.19.2.5 Response

To date, the socioeconomic groups from Nunavut and Northwest Territories engaged in social and economic impact assessment process for the purpose of this DEIS are the following:

- Elders
- Youth Groups
- Inuit Leaders
- Hunters and Trappers Organizations
- Government Officials
- RCMP Officers

Affected parties which have attended community or stakeholder meetings in 2007 are listed below:

Nunavut

- Community Members of Bathurst Inlet
- Community Members of Cambridge Bay
- Community Members of Kugluktuk
- Community Members of Taloyoak
- Community Members of Gjoa Haven

- Inuit Development Corporation
- Nunavut Power
- Hunters' and Trappers' Organizations
- Nunavut Tunngavik Incorporated
- Kitikmeot Meats
- Kitikmeot Inuit Association
- Member of Legislative Assembly (MLA) West Kitikmeot Region

Northwest Territories

- Community Members of Lutsel'ke
- Community Members of Yellowknife
- Environment Canada
- Alexco Recourses
- EBA Engineering
- DIAVIK
- CBC
- North Arrow Minerals
- DIAND
- MAC
- Chamber of Mines
- Tlicho Logistics

In light of the concerns express and inherent challenges in assessing community support (Section 4.4 of the NIRB Guidelines), the following factors should be considered pertaining to the 2007 Community Consultation Program:

- Consultation efforts are documented in Volume II Appendix 1 Section 3.4: *Nunavut Community Consultation Summary Report for the Bathurst Inlet Port and Road* (Page 336). Community, public and stakeholder meetings were successful in meeting the program's objectives of providing increased awareness of the BIPR Project; providing updated project-related information to communities; determining informational needs and addressing questions and concerns related to the project; gathering new community input and expectations of the project; developing a more comprehensive understanding of traditional lifestyle in relation of assessing potential social and economic impacts and finally, collecting current and accurate information as an aid in the developing a social baseline for the DEIS. Conclusions regarding support for the project are more difficult to derive. Our suggestions are provided first for Nunavut, and then for the Northwest Territories:

- *Nunavut:* Consultation initiatives in Nunavut have enabled the early identification of potential conflicts and opportunities, and to fully understand and address stakeholder perspectives, concerns and questions related to the Project. The consultation program provided the BIPR Project team with a good understanding of interests and concerns about the BIPR Project as expressed by attendees. However, these results may not be representative of the entire population of the area of influence. Due to the relatively small populations of the communities, and the number of community members that attended the consultation events, it is difficult to draw conclusions as to whether the opinions of the attendees are reflective of the community, including whether the Project is broadly supported or not supported. That said, based on the participants that did provide consistent positive and supportive opinions, there is overwhelming support for the Project.
- *Northwest Territories:* Consultation efforts to date in the Northwest Territories have proved challenging due to limited feedback from the communities. The communities of the Tlicho, Akaitcho and Sahtu were invited to Yellowknife for an information session during the day and an open house on the evening of May 14, 2007. Yellowknife was chosen for the meeting because of its central location and the services it offers. The BIPR Project was to pay for the transportation, accommodation and meals for two representatives from each community to come to Yellowknife for these sessions. Unfortunately, the information session was cancelled due to lack of response for attendance, but the evening open house took place. The letters of invitation informed community leadership of the meeting times and locations, and asked that each First Nation attend an information session and public meeting in Yellowknife. BIPR offered to cover the expenses of community representatives attending the meetings. Unfortunately, despite BIPR Project efforts to engage the First Nations and Métis communities, very few First Nations persons attended the open house. Consultation sessions with the First Nations and Métis in the Northwest Territories will be rescheduled. As a result, no conclusions can be drawn as to the degree of community support within the Northwest Territories.

In conclusion, based on the results to date of the Community Consultation for Nunavut, the SEIA Project Team is of the opinion that Nunavummiut community generally support the project. It is anticipated that all communities within the area of influence for Nunavut will benefit from increased employment during the construction and operations period, ongoing education and training opportunities, indirect business opportunities and increased living standards due to reduction in costs and fuel and supplies.

Based on correspondence received from First Nations and Métis communities of the Northwest Territories to date, overall conclusions on community support cannot be drawn. Both the Tlicho and Akaitcho have indicated that they require more time for internal discussions with leadership before making any contact with the BIPR Project team for community consultations. The North Slave Métis have also not expressed support or lack of support and are expecting additional consultation to occur.

7.19.3 Information Request 18.3

7.19.3.1 Issue Identification - The DEIS does not include copies of all materials presented at consultation meetings and other relevant materials

7.19.3.2 Concern

Section 4.12 of the 2004 EIS Guidelines requires that the Proponent provide in an appendix copies of all materials presented at consultation meetings and other relevant materials. Understanding the information presented at meetings is important to understand the nature of the engagement process and whether all key aspects of the project have been discussed with communities, including the public's use of the road, anticipated closure plans etc. Clarifying the nature of the information which has been distributed is especially important given the notations by Jemma Scoble in her 2006 report of consultation activities (Appendix F-8 p. 39 & 40) of a) the discrepancy in the nature of project related messages or "mixed messages" in Cambridge Bay and Kugluktuk and b) the importance of improving the mechanism for the dissemination of project information and the handling of interests and concerns. While efforts were made to engage communities during 2007 prior to the completion of the feasibility study, it is unknown if the material presented in Nunavut and NWT in 2007 was substantially consistent with the material contained in this EIS.

It can be noted that Section 1.3 of Appendix F-8 (Review of Socio-economic Impacts, Cambridge Bay and Kugluktuk, by Jemma Scoble dated March 2006) indicates that there are transcripts of hearings and presentations available as well as correspondence from stakeholders. The inclusion of all materials presented at consultation meetings and all correspondence from stakeholders outlining issues of concern and interest, including any responses that were provided to the communities, would be valuable information in the assessment of this project.

7.19.3.3 Rationale

This information is required in order for INAC to assess the comprehensiveness and meaningfulness of the consultation efforts. This is particularly important as the Feasibility Study was produced in September 2007 after most, if not all, of the initial consultations were concluded (or consultation invitations had been distributed). Ensuring that the Feasibility study approximates the information presented at community consultations is important to understanding community expectations and facilitating the EIS review of this project.

7.19.3.4 Request

INAC recommends that the Proponent include all materials presented at community meetings as well as any correspondence regarding interests and concerns from community members.

7.19.3.5 Response

For the purpose of this Information Request, Appendix 7.19-1 provides all consultation material and relevant correspondence addressing community interests and concerns for the Bathurst Inlet Port and Road Project. The following is included within Appendix 7.19-1:

- A complete list of persons attending all community and stakeholder meetings in 2007;
- Relevant correspondence letters, faxes and/or emails received by the BIPR SEIA team which highlight community interests and concerns;
- Audio visual material including posters and power point presentations;
- Meeting notes recorded by the SEIA project team; and
- The questionnaire package utilized during community visits and meetings.

7.19.4 Information Request 18.4

7.19.4.1 Issue Identification - A list of organisations consulted has not been provided in the DEIS

7.19.4.2 Concern

Section 4.12 of the EIS Guidelines requires that the Proponent prepare a list of the organisations consulted, including the time, place and purpose of the consultation and the contact information for the organisation. A-4 and associated appendices provide lists of names but do not always identify their affiliated organisation. Section 1.1.3 of A-4 indicates that stakeholders were notified of the meeting by email and telephone, at least the stakeholders of Cambridge Bay. Accordingly lists of organisations contacted for engagement should be easily obtainable.

7.19.4.3 Rationale

This information is required in order for INAC to assess the comprehensiveness of the consultation efforts.

7.19.4.4 Request

INAC recommends that the Proponent provide a complete list of the organisations invited to "stakeholder meetings" and those who attended. An indication as to why those stakeholders were invited in particular would be helpful in this assessment process.

7.19.4.5 Response

The SEIA team considers *stakeholders* to be persons, groups or communities that have an investment, share, or interest in the BIPR Project. A complete list of all invitees for consultation initiatives in Nunavut and Norwest Territories is presented. The following lists and corresponding discussions are presented by Territory and form of consultation (stakeholder, community) for the 2007 program.

Nunavut – Community Meetings

Community consultation consisted of public meeting and elders luncheons. The purpose of the public meetings was to providing updated project information to the communities and provide a forum for community members to raise issues, concerns and questions related to the proposed project. Appendix A-4 of the DEIS, sub-appendix 1: *Nunavut Community Consultation Summary Report for the Bathurst Inlet Port and Road* (Pages 534-535) states that public

notification of the meetings took place several weeks prior to the scheduled meeting. The following methods for notifying the public were used:

- newspaper announcements;
- radio announcements;
- posters faxed to community businesses, agencies and organizations;
- posters affixed to bulletin boards in public places with high visibility;
- emails to organizations and stakeholder group; and
- telephone calls to organizations and stakeholder groups.

Table 7.19-1 illustrates the communities and local organizations that were invited to public meetings and elders luncheons and the rational for their participation:

Table 7.19-1
Communities and Local Organizations Invited to Public and Elders Meetings in 2007

Date	Name of Organization	Rationale for Stakeholder Involvement
Nunavut		
	Community Members of Bathurst Inlet Community Members of Cambridge Bay Community Members of Kugluktuk Community Members of Gjoa Haven Community Members of Taloyoak	These communities were identified in the Nunavut Impact Review Board Guidelines as communities that *should* be consulted.

See Appendix 7.19-1.

Nunavut – Stakeholder Meeting

In Nunavut, potential stakeholders were identified in accordance with the guidelines established by the NIRB (Guide 6B, A Proponents Guide to Conducting Public Consultation for the Nunavut Impact Review Board Environmental Assessment Process August 2006l Section 6 Page 5-6). Potential stakeholders were contacted for a meeting by email and telephone. Newspaper announcements and posters for the public meetings also informed the general public that stakeholders meetings were scheduled.

Appendix A-4 of the DEIS, sub-appendix 1, (page 535) states that stakeholders meeting were arranged to obtain stakeholder input and address stakeholder concerns/questions regarding the proposed project. Table 7.19-2 presents the stakeholders that were invited to stakeholder meetings and the rational for their participation:

Table 7.19-2
Specific Public Entities Invited to BIPR Stakeholder Meetings

Date	Name	Rationale for Stakeholder Involvement
Nunavut		
	Inuit Development Corporation Nunavut Power Hunters and Trappers Association Nunavut Tunngavik Incorporated Kitikmeot Meats Kitikmeot Inuit Association Member of Legislative Assembly (MLA) West Kitikmeot Region	The 2007 Consultation Program's stakeholders meetings had predominantly a socio-economic focus, aimed at obtaining information to assist in the identification of Valued Socio-economic Components. Stakeholders were also selected according to the following criteria: • Position/role in the community; • Experience/expertise; • Availability; • Willingness to participate; • Individual expressed interest in participating or requested; to attend; • Referral from another stakeholder; and • Stakeholder or stakeholder group request. Invitees were provided with the opportunity to extend the invitation to other stakeholders or to inform the meeting organizer of individuals he/she believed should attend prior to the meeting. Inclusiveness has been and continues to be a guiding principle in consultation activities for the Bathurst Inlet Port and Road Project. Any person wishing to attend the 2007 stakeholders' meetings was encouraged to do so and their input was welcomed.

See Appendix 7.19-1.

Northwest Territories – Community and Stakeholder Meetings

To date, community meetings and/or visits to communities in the Northwest Territories has not transpired. Territorial Governments and individual First Nations were however contacted in attempts to establish concrete meeting dates. Table 7.19-3 shows the communities that were contacted that the rationale for their involvement.

To date, there has only been one stakeholder meeting for the 2007 Northwest Territories Consultation Program. For five days prior to the meeting, a radio announcement was aired three times a day in English and the local languages (May 2007). Advertisements were also published in local and regional newspapers the week before the meeting was to take place (May 2007). Interpreters who could speak the local language and English were in attendance at all meetings and were available to assist meeting attendees.

Table 7.19-3
Communities Invited to BIPR Meetings by Letter/Fax

Date	Name of Organization	Rationale for Stakeholder Involvement
Northwest Territories		
June 25, 2007 and October 10, 2007	Tlicho Territorial Government	These communities were identified in the Nunavut Impact Review Board Guidelines as communities that *should* be consulted.
October 10, 2007	Yellowknives Dene First Nation (N'dilo)	
October 10, 2007	Yellowknives Dene First Nation (Dettah)	
June 25, 2007	Akaitcho Territorial Government (AGT)	
May 9, 2007	Sahtu First Nation	
June 25 2007	North Slave Métis Association (NSMA)	
October 10,2007	Lutsel Ke Dene First Nation	

Table 7.19-4 illustrates entities who attended to the stakeholder meeting on May 14, 2007. There were no stakeholders personally invited to any meets. The approach adopted was to target any interested persons, groups or organizations that have an investment in the project. Therefore, there is no rational required to explain why each entity was invited.

Table 7.19-4
General Public Entities Invited to BIPR Stakeholder Meetings

Date	Name
Northwest Territories	
May 14, 2007	Environment Canada
	Alexco Recourses
	EBA Engineering
	Yellowknife Community Members
	Diavik Diamond Mines
	CBC
	North Arrow Minerals
	DIAND
	MAC
	Chamber of Mines
	Tlicho Logistics
	Lutsel'ke Community Members

7.19.5 Information Request 18.5

7.19.5.1 Issue Identification - The Proponent's analysis of how the proposed BIPR Project will contribute to sustainable development, particularly in Nunavut is inadequate

7.19.5.2 Concern

The Proponent deals with the proposed BIPR Project's contribution to "Sustainable Development", as defined on pg. 3 of the EIS Guidelines, in a cursory and incomplete fashion. Its assessment of the Project's contribution to the sustainability of cultures and communities in Nunavut is notably inadequate. "Sustainability" issues are explicitly dealt with only twice in the DEIS, and in both cases the treatment is brief. This analysis claims, in relation to the construction and operations phases of the Project, that it "will meet the regional and territorial economic development goal of assisting in the creation of self-sustaining and self-sufficient communities by providing additional employment opportunities within the Kitikmeot region." However, it gives few details on how exactly the Project will assist in creating "self-sustaining" communities. In general, the Proponent fails to effectively demonstrate that the Project will contribute to a key goal identified by NIRB as being crucial to sustainable development: "the attainment of durable social and economic benefits, particularly in Nunavut."

7.19.5.3 Rationale

Without a more detailed analysis from the Proponent, INAC will be unable to adequately assess the proposed BIPR Project's contribution to the sustainability of cultures and communities in Nunavut.

7.19.5.4 Request

INAC recommends that the Proponent be required to develop a more substantial analysis of how the BIPR project will contribute to the creation of self-sustaining and self-sufficient communities. In undertaking this analysis, the Proponent should take into account the key goals associated with Sustainable Development that NIRB has highlighted in its EIS Guidelines.

7.19.5.5 Response

Please refer to INAC IR #16.1.

7.19.6 Information Request 18.6

7.19.6.1 Issue Identification - It is unclear which tourism-related groups were included as stakeholders within the consultations

7.19.6.2 Concern

Many communities within the area of influence have identified growth in the tourism industry as a goal for local economic development initiatives. The DEIS does not address the extent to which tourism-related industries were included in the consultation process.

7.19.6.3 Rationale

In order for INAC to assess the comprehensiveness of the consultation efforts this information is required.

7.19.6.4 Request

INAC recommends that Bathurst Inlet Port and Road Joint Venture Ltd. provide a comprehensive listing of all groups / organizations included within the stakeholder consultations and a summary specific to the tourism industry on the nature of the concerns raised with respect to the project's potential effects on tourism.

7.19.6.5 Response

The Bathurst Inlet Port and Road Project's community consultation activities have sought community and stakeholder views, concerns and input as they relate to the proposed project and to the lives of residents in communities in Nunavut. Tourism is an important and growing sector of the economy in the territory and with many Nunavummiut participating in the industry it is an important area for consideration of potential project-related impacts. In an effort to obtain input from those participating in this and other sectors, interviews, community and stakeholder meetings and focus groups were conducted as part of the project's consultation program. Opportunities to comment or express viewpoints on potential impacts to tourism were provided.

The following groups/organizations were among those included in stakeholder consultations:

- Bathurst Inlet Lodge/Bathurst Arctic Services;
- Kitikmeot Inuit Association;
- Kugluktuk Heritage Centre;
- Arctic Island Lodge;
- Coppermine Inn;
- Bathurst Port and Road Committee;
- Department of Economic Development and Transportation;
- Hunters and Trappers Organization;
- Kitikmeot Economic Development Commission;
- Visitor Centre;
- Arctic Closet;
- Housing Association (Kugluktuk, Cambridge Bay);
- Government of Nunavut;
- High School (Cambridge Bay, Kugluktuk);
- Elementary School Cambridge Bay, Kugluktuk);
- Kitikmeot Corporation;

- Department of Health and Social Services;
- Nunavut Arctic College (Kugluktuk, Cambridge Bay);
- Community Wellness Centre;
- Nunavut Tunngavik Incorporated;
- Nunavut Power;
- NIRB;
- Department of Education;
- Kitikmeot Food;
- Kitikmeot Supplies;
- Ladies Group Cambridge Bay;
- Department of Sustainable Development;
- Chamber of Commerce;
- Hamlet Office: Council & staff;
- Fire Department;
- Arctic Coast Enterprises;
- Local Taxi operators;
- Nunavut Housing Corporation;
- Department of Indian and Northern Affairs;
- RCMP detachment;
- Community Government and Transportation;
- Department of Human Resources;
- Residential School Survivors Group; and
- Kitikmeot School Operations.

The following tourism-related comments and issues were raised during stakeholder consultations; these comments focused primarily on potential impacts to Bathurst Inlet Lodge:

1. Port and road's potential to enhance the tourism industry – development attracts visitors, promotes Nunavut and improves infrastructure.
2. Bathurst Inlet's pristine beauty and traditional way of life – key factors in its attractiveness to tourists - is threatened by the proposed port. Example of a comment from community member in Cambridge Bay: "Bathurst Inlet is one of the last places in the area for tourism – if this is the last place to save for tourism"
3. Development at Bathurst Inlet could attract new residents and adversely impact ecotourism

4. Development at Bathurst Inlet could enable former residents and relatives to move back to the community by providing infrastructure - tourism-related employment opportunities may result.
5. The proposed road and airstrip could assist in tourism-related travel to and in/around Bathurst Inlet.
6. If the port encourages people to reside at Bathurst Inlet it could destroy the lodge.
7. Development (mining and infrastructure) may impact wildlife and nature – key components of the touristic appeal of the Kitikmeot region.
8. The Proponent hasn't adequately discussed opportunities for benefits to the Bathurst Inlet Lodge.

In order to explore concerns related to the project's potential impact on tourism, project team members sought feedback from participants during the following consultation activities: community meetings, elders' luncheons, discussions with the community of Bathurst Inlet, stakeholders meetings, interviews, questionnaires and focus group discussions. Perceptions were mixed, ranging from concerns for potential impacts to the pristine environment at Bathurst Inlet to anticipated benefits associated with infrastructure development in the region and the project's potential for enhancing conditions for the growth of tourism in the region. The main tourism-related concerns came from interviews in 2006 and 2008 with Boyd Warner, Principal Operator of Bathurst Arctic Services. Boyd cited the potential for the project to destroy the Bathurst Inlet Lodge by attracting more Nunavummiut to the area and by impacting the pristine, natural appeal of Bathurst Inlet. He also expressed the view that potential opportunities for tourism-related benefits associated with the project exist but these have yet to be explored. The Bathurst Inlet Lodge is of the view that there are risks associated with the development of the port and road at Bathurst Inlet that may have serious and adverse impacts on ecotourism in the area and on the Lodge itself. Business owners from the communities of Kugluktuk and Cambridge Bay, who attended stakeholder meetings and/or participated in interviews, mentioned potential business opportunities that may result from the project, and the expectation of benefits associated with increased revenue to the Kitikmeot.

As outlined in Appendix A-4 of the DEIS, to date, consultation efforts in the Northwest Territories have included an open house style meeting in Yellowknife on May 14, 2007. The meeting was made advertised to the general public via radio announcements and notices published in local and regional newspapers. This meeting was poorly attended, despite specific invitations to the communities, and the offer to cover travel costs for community representatives. From the attendance, it would seem that there were no attendees with specific/stated interests in tourism. The BIPR consultation process is ongoing, and additional opportunities for groups to participate in the Project will be provided in subsequent stages as the Project proceeds. Issues raised respecting tourism will be addressed in Project design and any subsequent documents.

7.19.7 Information Request 18.7

7.19.7.1 Issue Identification - The current DEIS does not consider the tourism industry in the NWT communities included in the area of influence

7.19.7.2 Concern

That the current baseline report is incomplete because the tourism industry in the NWT is not adequately addressed.

7.19.7.3 Rationale

Without an understanding of the extent to which the tourism industry is currently operating in the NWT, the potential implications of the proposed project on the tourism industry cannot be determined.

7.19.7.4 Request

INAC recommends that baseline conditions for the tourism industry in the NWT be included in the DEIS. INAC also recommends that the comprehensiveness of the impacts assessment portion of the DEIS be re-evaluated in the context of this information.

7.19.7.5 Response

Tourism in the Northwest Territories

Investing in the tourism industry is a priority for the Northwest Territories. The Department of Industry, Tourism and Investment's goal for 2010 is to have increased annual spending in the tourism sector to $145 million. To meet the objectives set out in the 2004 Strategic Plan, five areas have been targeted for investment: marketing, product development, infrastructure, human resource training and research and planning (Tourism 2010: A Tourism Plan for the Northwest Territories. NWT Department of Industry). The Strategic Plan is based on principles such as: respect for aboriginal rights, culture and traditions; and equity in terms of support for communities with the NWT. It is aimed at diversifying of tourism opportunities, augmenting the number of skilled workers within the industry, creating new tourism ventures and products, and increasing the number of tourists annually to the territory.

Tourism in the Northwest Territories is comprised of a variety of services, assets and opportunities. Among those cited in the Strategic Plan are: fishing operations, outdoor adventure, big game outfitters, ecotourism, aboriginal cultures, diverse and expansive wilderness, wildlife and waterways, parks, campgrounds, and visitor centres, and significant workforce potential among NWT's youth.

Challenges to tourism in the Northwest Territories include factors such as high costs associated with air travel, labour shortage resulting from high paying opportunities in the non-renewable resources sector, limited number of destination attractions and tours, and competition from other tourism markets. The sector is also subject to impacts from the increased cost of air travel and general economic conditions.

Visitors come to the Northwest Territories for a variety of reasons. Fishing, general touring, outdoor adventure, hunting, business and Aurora Tours are the most popular attractions. Over the past ten years Aurora viewing has been the number one tourist draw in the NWT – with the largest number of visitors coming from Japan and Europe. Competition from tourist destinations such as Alaska with direct flights to Asia and Europe can explain a recent trend towards declining numbers of Aurora visitors.

Tourism activities in the Northwest Territories are plentiful and demonstrate the huge potential the sector to make even more a significant contribution to the Territory's economy. NWT Tourism lists the following areas contributing to the industry's success and development:

Water Activities

The NWT offers a wide range of water activities such as kayaking, rafting and canoeing. There is an abundance of destination lakes (Great Bear, Great Slave), rivers (Coppermine, Horton, MacKenzie, Slave, South Nahanni, Yellowknife and Thelon) and guided trips within the territory.

Fishing

The NWT offers ice fishing (Yellowdog Lodge, Blachford Lake Lodge) and fly fishing (Kasba Lake Lodge, Trout Rock Lodge) through a number of fishing outfitters (Yellowknife outdoor adventures, Mackay Lake Lodge, Great Bear lake Outfitters, and Barbara Ann Charters).

Hunting

The NWT is a popular destination for world class hunting due to the variety of species and regions to hunt. Among the animals hunted in the Territory are:

- Muskox;
- Mountain and barrenground Caribou;
- Moose;
- Wolverine;
- Bison;
- Black bear; and
- Walrus.

Outfitters in the NWT include: Arctic Safaris, Warburton Bay Lodge, Great Bear Lake Outfitters, and Perterson's Point Lake Lodge.

Northern Lights

Aurora operators in the NWT offer Aurora viewing and other winter packages such as dogsled rides and an Aboriginal cultural village. Among the businesses contributing to this segment of the industry are: Yellowknife Outdoor Adventures, Canadian Ex Aurora Tours, Aurora Village and Taiga Tour Company.

Birding

Over 200 bird species breed and stage in the NWT. Among these are: bald eagle, bufflehead, Canada goose, Gray Jay, Great Horned owl loons, Osprey, Snowy owl, Tundra swan, white pelican and whooping crane. Some businesses in NWT providing birding vacations include: Watta Lake Lodge, Taiga Tour Company, and Blachford Lake Lodge.,

Wildlife

Lands in the north of the NWT are managed by the government of NWT and have the dual purposes of providing protection for threatened species and protecting wildlife for aboriginal hunters and trappers. Among the tourist destination wildlife sanctuaries are Thelon Game Sanctuary, Peel River Preserve, MacKenzie Bison Sanctuary and the Norah Willis Mitchener Wildlife Preserve. There is a large variety of animals viewing such as caribou, grizzly, muskox, whales, and bison.

Parks

There are two world heritage sites in the NWT: Nahanni National Park Reserve – with river canyons that attract canoeists and rafters, and Wood Buffalo National Park – home to the plains bisons. Tuktut Nogait National Park (hiking and calving grounds of the Bluenose caribou herd), and Aulavik National Park (iceberg viewing, bird watching) are also significant tourist destinations and testament to the abundance resources in the Territory.

Additional activities include: aboriginal, cultural and traditional tours and lodges, historic sites , boat cruises, golfing, hiking and aerial tours.

Tourism in the Communities within the scope of the Project:

Yellowknife

Yellowknife is home to many of the NWT's tourist services such as Raven Tours, The Northern Frontier Visitor Centre and The Prince of Wales Northern Heritage Centre. Yellowknife offers many tourist activities including Aurora viewing, boating, wildlife viewing, fishing and outdoor adventures.

Deline

Deline is a tourist destination for anglers and hunters. Key components of the tourism industry in Deline are Grey Goose Lodge, local guided tours of Great Bear Lake, Deline fisheries, Franklin's Fort, Ehdacho and Sahoyue parks. Great Bear Lake is famous for Lake trout and Arctic Grayling and flyfishing trips. Great Bear Lake Outfitting provides fishing and big games packages, naturalist and cultural excursions, and boating and canoeing.

Holman

Holman (Ulukaktok) is well known for its dancers and drummers, its art and specifically for the Holman Art Prints. In terms of businesses, community has an 8-room hotel, The Arctic Char Inn, which opened in 1961, a famous art gallery - The Holman Print Shop, the Olokhaktomiuk Hunter and Trappers Committee and the Paulatuk Community Corporation. Activities and

attractions in Holman include: hunting and fishing, wildlife viewing (caribou, muskox, polar bear, wolves and arctic fox) and historic/nature sites such as a stone trap on Johanson Bay.

Whati

The community of Whati has one fishing lodge, a restaurant and a hotel. The main tourist activity is spport fishing and there is an annual fishing derby on Lac La Matre. The community celebrates the end of winter at the annual Spring Carnival with games, dances and sports.

Behchoko

Behchoko is the closest community to Chan Lake Territorial Park at the northern end of the Mackenzie Bison Sanctuary. The closest visitor's centre is the Northern Frontier Regional Visitors Centre in Yellowknife. The Happy Daze celebration occurs annually and involves traditional games, log splitting contests, drum dances, and a youth carnival.

Rae Lakes

The community of Rae Lakes has a hotel, restaurant and one lodge/outfitters.

Lutselk'e

Residents of the community of Lutselk'e are involved in small tourism ventures, hunting, trapping and fishing.

Wekweeti

The community of Wekweeti engage mostly in hunting, fishing and trapping. There is some involvement in tourism and it offers a place of traditional lifestyles and values in the heart of traditional Dogrib hunting territory. There is one restaurant and one lodge/outfitters.

7.19.8 Information Request 18.8

7.19.8.1 Issue Identification - The DEIS does not provide an analysis of the potential impacts to local and regional transportation patterns resulting from the project

7.19.8.2 Concern

The DEIS and supporting documents do not clearly state the changes to the existing transportation patterns on either the barge service or traffic patterns on the Tibbitt to Contwoyto Winter Road that will result from the project or present an analysis of potential impacts to existing transportation systems and patterns. For example, will removal of the majority of fuel and some operating supplies from the bulk cargo of the existing barge service raise the rates for supplies shipped by the existing barge service?

7.19.8.3 Rationale

Section 5.3 of the DEIS acknowledges difficulties with the Tibbitt - Contwoyto Winter Road and benefits provided by the project; however an analysis of transportation pattern shifts is not presented. Tables 3.4-1 and 3.5-1 in the Abridged Feasibility Study appear to indicate that all

diesel fuel and operating supplies currently being delivered by existing barge and winter road infrastructure will be delivered through the project. Section 3.5 states that only 10% of operating supplies to Nunavut communities will be delivered through the project with the remainder being transported on the existing barge system.

7.19.8.4 Request

INAC recommends that Bathurst Inlet Port and Road Joint Venture Ltd. provide an analysis of the potential impacts to local and regional transportation pattern shifts resulting from the project.

7.19.8.5 Response

In addition to the references cited by the Intervener, the following sections of the DEIS addresses this issue:

- Volume I of the DEIS, Section 35.2.3.3 – Projected Operational Periods and Road Traffic Densities
- Appendix A-2 of the DEIS, Section 5.7 – Effects of the Operation of the Bathurst Inlet Port and Road Project on the Social and Economic Environment of the N.W.T.
- Appendix A-2 of the DEIS, Sections 2.7.2 and 2.7.3 – Road Operations and Contwoyto Lake Winter Ice Road Operations, respectively.

7.19.9 Information Request 18.9

7.19.9.1 Issue Identification - Proponent provides insufficient information on the trans-boundary social and economic effects of the Project

7.19.9.2 Concern

The Proponent's Trans-boundary Effects Analysis devotes three lines to Social and Economic Effects. It simply states that: "Potential trans-boundary effects on the Valued Social and Economic Components (VSEC) for the Project are minimal and positive. In addition to bringing job opportunities in Nunavut, the Project will contribute to GDP growth in the Northwest Territories and all of Canada." No further justification is offered for these conclusions. Also, no reference is made to the relevant sections of the draft Social and Economic Impact Assessment relating to the Project's social and economic impacts in the Northwest Territories.

7.19.9.3 Rationale

INAC requires further information in order to adequately assess the impacts of the Project on the well-being of Canadians outside of the Nunavut Settlement Area, particularly residents of the Northwest Territories.

7.19.9.4 Request

INAC recommends that the Proponent be required to present more detailed information to support its conclusions on the trans-boundary social and economic effects of the proposed BIPR Project. This information must be more clearly linked with the analysis in the Proponent's

Social and Economic Impact Assessment of the social and economic impacts of the Project in the Northwest Territories. As it presently stands, the Proponent's analysis does not provide an adequate basis for assessing the transboundary impacts of the proposed Project.

7.19.9.5 Response

Trans-boundary effects are the consequences of Project development on political jurisdictions outside Nunavut (municipal, provincial, or national).

The BIPR Project considered trans-boundary effects when conducting the cumulative effects assessment. The reason for this being that the trans-boundary effects of the BIPR Project are minimal and are of no disturbance to the external and internal areas of the project. According to Appendix G-3 of the DEIS, "potential trans-boundary effects on the Valued Social and Economic Components (VSEC) for the Project are minimal and **Positive**. In addition to bringing job opportunities in Nunavut, the Project will contribute to GDP growth in the Northwest Territories and all of Canada."

A trans-boundary effects assessment was conducted with the Cumulative Effects Assessment.

In the Socio-economic Cumulative Effects Assessment, the trans-boundary effects portion discusses potential trans-boundary impacts on the Valued Social and Economic Components (VSEC) in Nunavut and the Northwest Territories as a result of the Bathurst Inlet Port and Road Project. The VSEC's are defined by the Nunavut Impact Review Board as "the socio-economic attributes or components identified as a result of a social Scoping exercise as having scientific, social, cultural or economic value." The identification of VSEC's was determined by the SEIA Project Team from a scoping exercise based on information and input received during the Nunavut community consultation program, from published reports and experience of the analysts in Nunavut. Relevant VSEC's are listed in Table 7.19-5, in no particular order of importance.

Trans-boundary issues for the BIPR are minimal. There are no risks to NWT communities for water quality and minimal for air quality. Potential trans-boundary effects of the Project may include potential effects on migratory barren-ground caribou herds. First Nations and Métis in the Northwest Territories harvest Bathurst herd caribou that range into the Project area.

Table 7.19-5
Valued Social and Economic Components (VSECs)

VSEC	Rationale for Concern	Geographic Area/Extent
Community Health and Well-being	To ensure the health and safety of their homes and to ensure that community cohesion will not be disrupted by the BIPR Project.	SEIA area of influence
Environmental Conservation	The preservation and sustainable use of all biophysical elements; specifically wildlife and water.	SEIA area of influence
Education and Training Opportunities	Increased investment within region which would equate into expanded education and skilled labour training.	SEIA area of influence

(continued)

Table 7.19-5
Valued Social and Economic Components (VSECs) (completed)

VSEC	Rationale for Concern	Geographic Area/Extent
Wage Employment Opportunities and Economic Development	To experience the direct benefits of job creation from the development of the BIPR project.	SEIA area of influence
Traditional Economic Activity and Pursuits	Continued and promoted participation within the traditional/subsistence economy.	SEIA area of influence
Cultural Sustainability	The preservation of the Inuit traditional way of life.	SEIA area of influence

7.19.9.6 Information Request 18.10

7.19.10 Issue Identification - Proponent provides an incomplete analysis of the cumulative effects of the project on three key Valued Socio-Economic Components (VSECs)

7.19.10.1 Concern

The Proponent's Cumulative Effects Analysis of the three key Valued Socio-Economic Components (VSECs) lacks key details. The analysis doesn't assign any "Significance" ratings in its assessment of the potential cumulative impacts of the BIPR Project on Health and Wellness, Economic Development and Aboriginal Culture. As well, it fails to offer any indication of the "Confidence Levels" of its assessment of these impacts. This stands in marked contrast to the analysis, for example, of the cumulative impacts on Archaeology and Heritage Resources in Section 17, and of cumulative impacts in the other sections of the Analysis.

7.19.10.2 Rationale

INAC requires a more complete analysis from the Proponent if it is to adequately assess the cumulative impacts of the proposed BIPR Project on the VSECs identified as crucial in its Cumulative Effects Analysis.

7.19.10.3 Request

INAC recommends that the Proponent be required to provide significance ratings and an indication of confidence levels in its analysis of the potential cumulative impacts of its Project on the VSECs of Health and Wellness, Economic Development, and Aboriginal Culture. If it is unable to do so, the Proponent should be required to offer some justification for this.

7.19.10.4 Response

In determining the best method of reporting the significance of potential impacts, it is important to consider several factors:

- accuracy and completeness of the data used to conduct the assessment;

- degree to which the assessment is quantitative or qualitative;
- ability to identify/control mitigation;
- extent to which conclusions will be used for decision-making purposes; and
- extent to which the Cumulative Effects Assessment significance rating would be credible and defensible.

In the case of the cumulative effects analysis for the BIPR road, the following was concluded in respect of these considerations:

- As data were not published for a number of the projects included in the cumulative effects analysis, assessment of potential impacts of these projects was undertaken primarily from experience with similar projects on a generic basis. For those projects for which data/assessment analyses were available, conclusions were assumed to be accurate and complete.
- Most of the factors considered in the social and economic cumulative effects analysis are qualitative. Although it would be possible to derive a relative significance scale for the degree of potential effect, it could be considered somewhat arbitrary and simplistic to assign numbers to these effects. If the temptation is to add the significance ratings together to derive an overall 'scoring' or grade, the relative weighting of each factor would become an important consideration. For example, a significance rating of '2' on the potential to affect berry harvesting could be considered quite different than a significance rating of '2' in respect of the potential for accidents and safety concerns on the roadway.
- Because the projects considered in the social and economic cumulative effects analysis are out of the control of the BIPR proponent, it is very difficult to assign an impact score to the 'net' impact following consideration of mitigation, as mitigation on another developer's project is beyond the control of the BIPR team. As a result, the score identified could be considered somewhat inaccurate and arbitrary. Considering mitigation and 'net' effect on a more qualitative basis allows the analyst to draw reasonable conclusions about cumulative effects at a local and regional scale without implying a degree of confidence that can only be implied.
- Decisions made as a result of the conclusions drawn from the cumulative effects analysis are typically made at an aggregated level. Whether one criterion for one project scores one point higher or lower will usually have very little effect on the high level conclusions and the outcome of decisions taken in respect of the cumulative effects analysis. Further, an important benefit of a significance rating is to facilitate the comparison of options or alternatives. When the cumulative effects assessment is being undertaken to determine the aggregated effect of a number of projects over a broad geographic and temporal scale, the need for a numeric rating is considered to have a lower value. There was also concern that if a quantitative significance scale were applied to projects for which an EIS has not been prepared, there could be a temptation to assume the scores to be a definitive expert opinion of the BIPR team on the project being examined. In our experience, the more quantitative the rating, the more it is implied that a more detailed technical

assessment was undertaken, when that level of detail is not required to draw broad conclusions for the cumulative effects analysis.

Overall, it is the opinion of the SEIA Project Team that significance ratings would be very difficult to apply consistently across projects, would be very difficult to defend in the absence of quantitative and credible data, and would therefore not add significantly to the decision-making process, especially when it is not considered necessary for the purposes of drawing conclusions on cumulative effects.

In the end, the purpose of the cumulative effects analysis for the BIPR project is to identify the potential for secondary impacts that could occur as a result of road development, and to ensure that reviewers and community members are aware of these and consider the impacts to be tolerable. For the BIPR road, the key issue for all concerned is the extent to which the road will result in significant development opportunities that in themselves may have much more potential benefit in the region than the road itself. This is an important political decision that must be made. Our cumulative effects analysis has shown that the impacts of the 'downstream' projects that could be developed as a result of the road can be mitigated to acceptable levels.

8. NATURAL RESOURCES CANADA

8. Natural Resources Canada

8.1 Introduction

This chapter includes the issues, rationales, and information requests from Natural Resources Canada, and the proponent's response to them. To maintain consistency with other chapters, the issue and rationale precede the request here, in contrast to NRCan's format, which provides the request before the rationale.

8.2 Issue – Marine Coastal Environment and Processes

8.2.1 Information Request #1

8.2.1.1 Issue Identification – Marine Processes

8.2.1.2 Rationale

Water levels control the plane on which waves impact shoreline and port structures - these only have 1.5m of ship draft clearance.

At the port site detailed bathymetry, some boreholes and some oceanographic aspects such as sediment quality and fish habitat have been addressed. There is no rigorous analysis of oceanographic processes, e.g. waves, tides, surges and currents, and their impact on the project and the impact of the planned structures on those processes. The proponent appears to recognize this shortfall and is planning the deployment of oceanographic instruments at the site in 2008 which is encouraged. Tidal range is small and given the configuration of Bathurst Inlet the wave fetch is severely restricted except to the north and south. Better information on tides, waves and surges should be a priority and the data should be correlated with the meteorological data to determine correlations with oceanographic anomalies observed. Bathurst Inlet is fairly deep so surges may not be a major force nevertheless the port site is at the end of a long inlet which could accentuate water setup.

8.2.1.3 Request

Please provide an analysis of storm surge potential i.e. extreme water levels and wave run-up at the port site –from planned 2008 deployment which should also confirm tidal regime.

8.2.1.4 Response

Storm surges

During prolonged episodes of strong northwest winds it is probable that a sea surface slope is established upward to the south. Rises of sea surface elevation above astronomical high tide will therefore be larger in the southern reaches of Bathurst Inlet. The storm surges are accompanied by larger than average waves.

Some evidence of the effects of wave action during storm surges is available from the photographic record. During a surge, water levels are higher on the beach and waves break farther up the beach. The plunge zone of the waves will experience relatively greater erosion and have coarser sediment. Finer sediment will settle just offshore of the breakers during each event. Thus the observed banding structure is suggestive of the storm surges of the past. The features are likely preserved because they are above normal astronomical high tide.

The photos show that storm surges reached about 1 m above high tide, corresponding to the vegetation line. The vegetation may be salt intolerant, another indication of the highest sea level of the past few seasons.

The 2008 field work will measure time series of water levels at the port site. Correlation of these water levels with the wind data will permit an estimate of the largest likely storm surge during, for example, the 100-year return period wind storm.

8.2.2 Information Request #2

8.2.2.1 Issue Identification – Sea Ice Action

8.2.2.2 Rationale

Sea ice scour and pressures onshore are greater at headlands and structures that extend off shore.

8.2.2.3 Request

Potential ice pressures are provided. Will the extension of facilities offshore increase shore ice ride-up and ice piling on the facilities? Please explain.

8.2.2.4 Response

The 150 m extension of the facilities offshore is not expected to cause significant increase in ice ride-up and pile-up for the following reasons:

- The extension is less than 10% of the 2km wide channel at the location.
- Ride-up and pile-up is most active in the spring when ice blocks melt away from the shore and can move freely under the influence of the wind and waves. Prevailing winds from the NNW will make the NW slope of the causeway the most vulnerable. This slope is steep (1.5H:1V) and has a riprap armour which has a high coefficient of friction. These properties will resist the tendency for ice to ride up or pile up.

Bathurst Inlet is sheltered and tides are low so vertical cycling of water levels will not be significant.

8.2.3 Information Request #3

8.2.3.1 Issue Identification – Shoreline Character and Dynamics

8.2.3.2 Rationale

Shoreline character and stability changes alongshore.

The proposed port facilities cross the coastal zone from the land to the ocean making it a critical environment to understand. Yet apart from a description of fish habitat and an attempt at relating shore character to marine processes there is no detailed analysis of the physical beach and backshore character at and adjacent the proposed port site. There is a more complete description of the physical nearshore conditions. From shoreline photos scattered through the volumes and the report cover there is evidence of backshore erosion, ice pits, what appears to be lag coarse deposits on the lower intertidal zone and larger wave-built swash ridges toward the upper beach. What is the sediment mobility and occurrence of these features, i.e. seasonal, decadal, storm driven? What is the beach and backshore stratigraphy? Is the coarse material observed across the lower intertidal zone only a veneer over finer material? Forelands and small spits at sites 1 and 3 and south of site 1 (Vol. 6 E3, Fig2.2-1)indicate that sediment transport occurs and it is important for their continued building. There is evidence of sediment transport in both north and south directions whereas the reports suggest unidirectional transport. Impacts of the new wharf and jetty structures on local shoreline dynamics and stability are not provided and should be.

8.2.3.3 Request

Please provide an analysis of proposed structures on shore dynamics particularly sediment accretion and erosion at and adjacent to the site.

8.2.3.4 Response

Pertinent coastal processes are erosion, accretion, and sediment transport through the planned dock area. The dock structures will alter the natural shoreline and cause changes in certain aspects of the hydrodynamic regime, specifically local currents and waves. The relative importance of these effects is dependent upon the shape and nature of the seabed and the beach and the physical characteristics of the port area.

Port area description

The port is to consist of a rock-filled wharf and a barge loading dock. Rock-filled steel sheet pile cells were selected because foundation conditions (20 m clay) preclude other construction methods. Steel sheet pile cell wharves have been successfully employed at Nanisivik in Strathcona Sound (where they will likely be re-used for the planned naval base) and at the Polaris Mine on Little Cornwallis Island.

Sheet pile will be driven through the 20 m thickness of soft sediments to the underlying sandstone. The wharf face is to be approximately 150 m from shore at a water depth of approximately 13.5 m. The length of the wharf will be approximately 120 m.

A barge loading ramp will be provided approximately 250 m south of the wharf. The sloping ramp will extend from the beach to a depth of approximately 3 m.

Seabed

The seabed slope is approximately 8% from the shoreline to 10 m deep. The slope then increases to approximately 30% between the 10 and 40 m isobaths.

Sediment Transport

Particulate material can be transported from a source area down current. Finer particles settle more slowly (*e.g.*, Stokes Law) so they are carried farther before settling to the seabed. Thus sorting occurs at river mouths where the coarsest material accumulates closest to the source and the finest material is transported farther offshore. Currents can prevent settling of fine particles and re-suspension may occur after the initial settling of particles due to the larger waves and currents associated with strong winds.

There are two primary agencies for sediment transport in the sea:

- direct transport by currents; and
- longshore transport due to scour and the residual currents (or Stokes drift) of breaking or finite amplitude wind waves.

The currents in the port area are most probably primarily wind-driven with a smaller estuarine component. Northwest winds occur most frequently and the strongest winds originate from this direction. Surface water should move southeast in the presence of northwestern winds (there may be a general southeast transport in deep water with return northwest flows over the shallows). The largest waves will originate from the northwest and longshore transport will be to the south. The overall expectation is for southwest net sediment transport through the proposed wharf area.

Currents will be measured in the area during the summer 2008 field program.

A spit protruding to the south is present on the western shore of the peninsula, further confirming the concept of net southerly sediment transport.

At present, fine river-derived sediment is transported along the slope shoreward of the 10 m isobath. Suspended sediment concentration will be highest in the near-bottom (log) boundary layer. It is probable that suspended sediment transported to the steep slope at depths greater than about 10 m is lost to the near-shore region (the 30% slope is steep enough to promote gravity driven downslope transport through slumping and turbidity currents).

The proposed wharf will be an effective barrier to longshore sediment transport. Suspended sediment-bearing flows will encounter the up-current/upwind face. The flows will be diverted offshore and low velocity areas (stagnation points) may experience enhanced sedimentation. After diversion offshore, flow speed will decrease and sedimentation will occur in deeper water over the steep (30%) slope. As mentioned earlier, it is probable that sediment deposited on the steep slope will be transported downslope and lost to the shallow environment. A region down

current of the wharf could be deprived of its natural source of sediment supply while still exposed to wave scour, causing a coarsening of the bottom substrate.

In 2008, an effort will be made to quantify the interruption to natural longshore transport caused by the new wharf. Sediment samples in the near-shore (8%) slope region will be collected and analyzed for particle size distribution.

The effects of the proposed compensation structures will be negligible compared to the wharf itself.

Estuarine and wind-driven circulation

CTD casts at the port site show the surface layer is a few metres thick with a salinity of about 7 psu. The pycnocline/halocline extends to about 20 m deep, suggesting that the seaward estuarine flow would be present at depths less than 20 m. In 2008, current data will be collected to better describe the estuarine and wind-driven flows in the area.

Ice effects

Ice approximately 2 m thick and landfast will tend to include sediment as it grows and erode fine sediment from the shoreline to a depth of 2 m below low tide and up to high tide. The intertidal is therefore expected to consist of rather coarser sediments than the subtidal, at least before river freshet carries more sediment to the area. Sediment particle size distribution is likely to vary through the open water season as sediment from streams in close proximity 'nourish' the local beaches.

Storm surges

During prolonged episodes of strong northwest winds it is probable that a sea surface slope is established upward to the south. Rises of sea surface elevation above astronomical high tide will therefore be larger in the southern reaches of Bathurst Inlet. The storm surges are accompanied by larger than average waves.

Some evidence of the effects of wave action during storm surges is available from the photographic record. During a surge, water levels are higher on the beach and waves break farther up the beach. The plunge zone of the waves will experience relatively greater erosion and have coarser sediment. Finer sediment will settle just offshore of the breakers during each event. Thus the observed banding structure is suggestive of the storm surges of the past. The features are likely preserved because they are above normal astronomical high tide.

The photos show that storm surges reached about 1 m above high tide, corresponding to the vegetation line. The vegetation may be salt intolerant, another indication of the highest sea level of the past few seasons.

The 2008 field work will measure time series of water levels at the port site. Correlation of these water levels with the wind data will permit an estimate of the largest likely storm surge during, for example, the 100-year return period wind storm.

8.2.4 Information Request #4

8.2.4.1 Issue Identification – Thermal condition of marine clays

8.2.4.2 Rationale

Subsea permafrost or ice rich deposits could mislead mapping of solid foundations.

The nearshore environment was described in greater detail than the beach and backshore zones. Augering information provided a good first impression of nearshore stratigraphy. Only 3 of 6 auger attempts reached bedrock. No evidence about subsea permafrost was given but the thermal character of the thick clays should be understood before construction of the wharf.

8.2.4.3 Request

Please provide further information on the thermal conditions and presence of frozen layers or pockets in the subsea clays where wharf sheet cells are to be established.

8.2.4.4 Response

Future investigations will include more drilling and coring to obtain undisturbed samples and the installation of thermocouples to establish the physical and thermal conditions in the vicinity of the proposed wharf and jetty. The combination of warmer and more saline offshore water would tend to result in less likelihood of frozen layers or pockets being encountered in the nearshore environment than in the beach and backshore areas. Boreholes with thermocouples in the backshore, beach and nearshore areas will help to establish a geothermal model for the location

8.2.5 Information Request #5

8.2.5.1 Issue Identification – Sediment disposal

8.2.5.2 Rationale

Disposal of marine sediment onshore/offshore.

8.2.5.3 Request

Soft clay material within the sheetpile cells will be excavated and replaced with crushed rock. Where will the fines be disposed?

8.2.5.4 Response

Sediments will be pumped or hauled and stockpiled in a contained waste dump and when dewatered the remaining stockpile will be shaped to blend in with local topography.

8.2.6 Information Request #6

8.2.6.1 Issue Identification – Shoreline Mapping

8.2.6.2 Rationale

Oils spill trajectories show spills from the Port site would intersect adjacent shores. One of the major hazards to shipping is the convoluted passage and occurrence of shoals through Bathurst Inlet. An inventory of sensitive shore types within the Inlet is critical for planning response to any marine spill within the inlet.

8.2.6.3 Request

Are there maps of shore types within the area of spill trajectory from the Port site to determine highest shoreline sensitivity areas for cleanup planning and operations? Please clarify/explain.

8.2.6.4 Response

An inventory of sensitive shore types is critical for response planning to any marine spill within the area. Shoreline and off-shore sensitivity for the Kitikmeot region, including Bathurst Inlet, were mapped and ranked based on the relative sensitivity of shoreline and off-shore areas to the effects of an oil spill as part of the Arctic Environmental Sensitivity. This ranking system incorporates 20 biophysical and social components of the region that are considered important for effective oil spill response planning.

The information in the Arctic Environmental Sensitivity Atlas , along with that collected during the 2008 field season will be used to assist in spill monitoring and spill modelling trajectories for the Project area.

8.2.7 Information Request #7

8.2.7.1 Issue Identification – Shipping route bathymetry

8.2.7.2 Rationale

There are two locations where shoal patches and winds present navigational hazards.

The port is well situated for proximity to mining sites, providing deeper water depths and terrain for the airstrip but it is at the end of a very complex shipping route. Are the bathymetric surveys sufficiently detailed within Bathurst Inlet and the other shallow waters south of Victoria Island *e.g.*, Jenny Lind Island on route to Bathurst Inlet to provide adequate navigation for the proposed vessels?

8.2.7.3 Request

Are the bathymetric surveys around Breakwater Islands and Quadyuk Island, Bathurst Inlet and the mapping of all shoals adequate for navigation by vessels proposed?

8.2.7.4 Response

Bathymetric surveys of the proposed shipping route were completed by the Canadian Hydrographic Services during 1997 to 1998. The charts produced provide adequate detail for safe ship navigation. In addition, Captain Chris Anderson visually surveyed the Bathurst Inlet route via aircraft to develop a system of aids to navigation. Please refer to Section 4.3 of Appendix A-3 of the DEIS for further details pertaining to the proposed ship route.

8.3 Issue – Explosives Manufacture and Storage

8.3.1 Information Request #8

8.3.1.1 Issue Identification - Lack of information on explosives manufacture and storage

8.3.1.2 Rationale

NRCan requires the above information in an EA in support of it subsequent licensing process.

8.3.1.3 Request

Please provide details on the following:

- Specified location (*i.e.*, detailed site plan)for the explosives factory, with distances to vulnerable features such as dwellings, roads, camps, railways, bodies of water, *etc*. Infrastructures should be identified and include: explosives and detonator magazines, fuel storage, ammonium nitrate storage, maintenance/wash area, process trucks and their parking area, any offices, warehouses, buildings, *etc*. The proponent needs to demonstrate that safety distances required by the Explosives Regulatory Division (ERD)of NRCan have been considered and met.
- Fuel and ammonium nitrate storage plans. Storage of ammonium nitrate is to be in conformance with ERD guidelines.
- Liquid effluent disposal plans.
- Evaluation of worst case scenario(*i.e.*, accidental explosion).
- Spill contingency plans.
- Any other magazines if required that maybe located in quarries, *etc*.

8.3.1.4 Response

Layouts and general arrangement drawings will be finalized during basic engineering. It is not planned to have an explosive factory during construction. There are no immediate plans to use ammonium nitrate. Fuel will be stored in the tank farm

We are not planning to have ammonium nitrate storage nor an explosives factory on site during the construction of the BIPR. Future mine developers or current operators may need interim storage at the port and transportation along the route. At the appropriate time the specific

developer will have to obtain the necessary permits and an approved area prepared at the port area for temporary storage.

During construction stick explosives will be stored in magazines near the quarries. Detonators will be kept in a separate Seacan to the stick explosives.

Use of ANFO for construction quarries is no longer being considered. If the storage and transportation of ammonium nitrate is required by prospective or current mine operators, a separate application will be made and approved facilities prepared at the port site. Contingency plans specifically addressing the potential hazards and action plans for responding to spills or accidental explosion will be prepared and submitted in support of the application.

8.3.2 Information Request #9

8.3.2.1 Issue Identification - Lack of information on explosives storage during road operations

8.3.2.2 Rationale

The only apparent reference to explosives during the road operations is in Vol. II, AppendixA-5, Table 5.1.2 stating that magazines will be established in quarries.

8.3.2.3 Request

Please provide further detail on the planned use and storage of explosives during the operation of the road including permits required.

8.3.2.4 Response

As explained in row 83 of Table 5.1.2, bulk explosives will not be required by the road operator during the operations phase. Any road users requiring storage and transportation of explosives will have to secure the required permits and licence. Where required the road operator will cooperate in providing the proper allocation of space and protection at the port facilities and along the road.

9. NORTH SLAVE MÉTIS ALLIANCE

9. North Slave Métis Alliance

9.1 Introduction

This chapter contains the information requests from the North Slave Métis Alliance, and the Proponent's responses to them. To maintain consistency with other chapters, the section of Appendix F-1 of the DEIS that the North Slave Métis Alliance refers to in their document has been listed here as the Issue Identification.

9.2 Issue – Section F-1 - Heritage Resources Effects Assessment

9.2.1 Issue Identification - Introduction

9.2.1.1 Information Request 1A

Request

What is the definition of "heritage resource" contained in the Nunavut Archaeological and Palaeontological Sites Regulations? The introduction is unclear as to what heritage resources are being assessed.

Response

In the Guidelines for Applicants and Holders of Nunavut Territory Archaeology and Palaeontology Permits, (page 1, item 2) it is stated "The protection of Nunavut's archaeological and palaeontological heritage…" This is the reference for the use of the term 'heritage'. In the Nunavut Act, Nunavut Archaeological and Palaeontological Sites Regulations: Interpretation, (item 1) it is indicated that all archaeological materials consist of artifacts greater than 50 years of age. These definitions were used in the description of heritage resources in the DEIS (Appendix F-1, page 1-1).

9.2.1.2 Information Request 1B

Request

Why is there no mention of the ethnogenesis of the Métis culture in this area during the period between 1600 and present? The introduction gives the erroneous impression that there were no Métis occupants and users of the area before "contact" with Europeans.

Response

The majority of the Project falls within lands traditionally used by the Inuit. Contwoyto Lake was used by the Inuit from the Kugluktuk area. On the western edge (between approximately Nose Lake and Contwoyto lakes) lies Yellowknife traditional territory (after Beryl Gillespie). At the time of the field work, the Contwoyto Lake area held evidence of being used by Inuit from Kugluktuk for at least three generations (John Franklin). Further, Joseph Niptanatiak and Tom Kokak of Kugluktuk (Appendix F01, Section 4.5.5) stated that they had lived in this area. Two

historic period sites were identified near the Contwoyto Terminal; neither of these sites will be affected by construction of the Project. Finally, the field work that examined the proposed Contwoyto Lake site, road alignment and port site found no artefacts that point to historical Métis land use there.

9.2.1.3 Information Request 1C

Request

Since the Nunavut boundary overlaps with the NSMA's traditional territory, and the Inuit Heritage Trust presumably only deals with Inuit heritage, why is there no explanation in the introduction how the VSEC of heritage sites for the Métis (and presumably also the Yellowknives, Tlicho, Chipewyan, and Cree) will be dealt with?

Response

See Section 9.2.1.2 above. Because of the lack of cultural diagnostics, it is not possible to specifically identify non-Inuit cultural materials at most archaeological sites. As such, no differentiation was made.

9.2.2 Issue Identification - Boundaries

9.2.2.1 Information Request 3A

Request

Where is the map showing the "project area" and "study areas" for heritage resources?

Response

There is no map in the Appendix F-1 section specifically showing these areas; the route (Project area) is shown in Figure 4.5-1) and the limits of the regional study boundary are explained in Section 3.1 "…the regional study boundary was based on the 1:250,000 NTS map sheets of the Project area." Please refer to Section 4.5.1 for the NTS maps sheets that comprise the regional study area. The route and the 'Project area,' including previously recorded and sites recorded during the studies, are shown in Figure 5 of Appendix F-3 and Figures 5, 6, and 7 of Appendix F-4.

9.2.2.2 Information Request 3B

Request

Why is there no discussion of the exploration and environmental assessment portions of this project? Socioeconomic impacts are known to begin occurring as soon as a potential project is announced.

Response

The proponent has attempted to address the issues related to environmental and socio-economic effects as directed in the Guidelines issued by NIRB.

9.2.3 Issue Identification – Environmental Setting

9.2.3.1 Information Request 4A

Request

Conflicting information is presented in this section. The introduction states that the baseline studies enable prediction of effects and inform the design of mitigation measures, yet the introduction acknowledges that understanding may change as new data becomes available, and the methodology section states that only limited literature review was used to provide context, and only the Naonaiyaotit Traditional Knowledge Project (NTKP) was consulted to incorporate traditional knowledge (TK) into the study of heritage sites. Are the baseline heritage resource studies adequate to predict and mitigate effects on Métis heritage values?

Response

Our current understanding of archaeological materials and past lifestyles can and will change as new data becomes available (Appendix F-1 of the DEIS, Section 4.1)

Completion of baseline studies which contribute new data and augment current knowledge, do enable prediction of effects from development and provide information on which to base appropriate mitigation measures that minimize negative effects (Appendix F-1 of the DEIS, Section 4.1).

With the completion of the field studies sufficient archaeological and historical baseline information specific to the Project was acquired to predict and scientifically mitigate effects on these remains.

The technical review phase of the BIPR environmental assessment process will provide an opportunity for Métis to present materials that relate to Métis heritage in the Project area.

9.2.3.2 Information Request 4B

Request

What baseline research was done regarding Métis heritage values in the project area, and how was Métis TK incorporated into the research?

Response

No baseline research was done with regard to Métis heritage values as none of the archaeological sites identified in the Project area provided archaeological evidence of Métis occupation/use. We are not aware of documentation that demonstrates the Métis have historically used and occupied this area. Métis TK was not incorporated into the research of historic period archaeological sites.

9.2.3.3 Information Request 4C

Request

Is the researcher knowledgable of the ethical guidelines for conducting research involving Aboriginal People, and were the ethical guidelines followed? The methodology section should describe how the research complied with best practices in conducting traditional knowledge studies, and in conducting research involving Aboriginal Peoples.

Response

Relative to TK data collection, yes the researcher is aware of the ethical guidelines. Other than the community meetings and the field trip described in the baseline report, no other TK research was conducted that focussed on the archaeological program.

9.2.3.4 Information Request 4D

Request

In section 4.3.1 where the Interior Barren Grounds chronological period is discussed, why is there no mention of the transition period between the Taltheilei Shale Tradtion to the Athabaskan period, the ethonogenesis of the Métis, and the crucial role that the Métis played in the development of the area's cultural environment between the 1600's and the present?

Response

The last paragraph (Appendix F-1, Section 4.3.1) of the Interior Barren Grounds Archaeological Chronology indicates the development of the Taltheilei Shale Tradition into the Athabaskan culture. There is no mention of the Métis because the Project area was determined to have been largely occupied and used by the Inuit people.

9.2.3.5 Information Request 4E

Request

Why does section 4.4.2 regarding the Historic Contact not mention the Métis (or any of the other Peoples) who occupied and used and still do occupy and use the area, and who were key players in the social, cultural, technological, and economic evolution that occurred during that time?

Response

See NSMA 4D with regard to traditional land use and occupation. This section focuses on the ‘Copper Eskimo’ (after David Damas) as their early historic territory encompassed the entire Project area. The archaeological materials relating to historic period occupation are limited; they do not indicate intensive land use during the historic period.

9.2.3.6 Information Request 4F

Request

Why was community consultation conducted only in Kugluktuq, Ikaluktuuttiak, and Kingaok regarding the heritage resources and traditional knowledge of Contwoyto Lake area? Is current residency supposed to be a valid indicator of location of social, cultural, or heritage interests and values extending over past centuries?

Response

These communities were chosen partially in keeping with Item 8 of the Guidelines for Applicants and Holders of Nunavut Territory Archaeology and Palaeontology Permits which states "Consultation with the community nearest the research area is an integral part of the permit-granting process," and partially based on the orally documented use and identification of the historic sites at the Contwoyto Terminal as Inuit in origin.

9.2.3.7 Information Request 4G

Request

Shouldn't the Métis (and others) be included in the heritage resource assessment and traditional knowledge studies, given their ethnogenesis in the area, with their hundreds of years of occupation and use?

Response

See NSMA 4D with regard to use and occupation. The archaeological materials relating to historic period occupation are limited; they are not indicative of intensive use during the historic period. The communities chosen were partially in keeping with Item 8 of the Guidelines for Applicants and Holders of Nunavut Territory Archaeology and Palaeontology Permits which states "Consultation with the community nearest the research area is an integral part of the permit-granting process" and partially in the orally documented use and identification of sites at the Contwoyto Terminal as Inuit in origin. The traditional knowledge studies included in this DEIS were not conducted as part of the studies in the Archaeology and Palaeontology Permits and so TK is not reported in that context.

9.2.3.8 Information Request 4

Please see the image below of a map of the 1820 Franklin trip guided by indigenous Métis. We would of course be extremely interested in any remains of this trip that may be found, and we would like to know how closely the proposed project comes to this traditional trail and historic route.

Response

The map above is a portion of a map produced by John Thomson summarizing the explorations of John Ross, William Parry and John Franklin, up to 1823 (Hayes, 2003). A map accompanying Franklin's journal (A Chart of the Discoveries & Route Northern Land Expedition, under the command of Captain Franklin, R.N. in the Years 1820 & 21, Laid down

under his Inspection by the Officers Assisting in the Expedition) traces his route from Great Slave Lake to Point Lake from which he proceeded overland to approach the western shore on the north end of Contwoyto Lake (the area of the Willingham Hills). He rounded the north end of the lake and continued along the shore to the arm lying to the south of the Peacock Hills. Paralleling the north side of this arm, he then struck northeast, crossing the Peacock Hills to the encounter the Hood River well to the southwest of the Wilburforce Falls. No part of this route crosses the Project routing (Franklin, 1969). The closest that this overland route comes to the BIPR road is a straight-line distance of approximately 70 km. Franklin's journey by canoe through Bathurst Inlet, may have come close to the BIPR port site. No evidence of Franklin's 1820 party was noted in the heritage survey and examination of the port site.

9.2.4 Issue Identification – Effects Assessment

9.2.4.1 Information Request 5A

Request

How was the Ethnic value of the various sites assessed with regards to Métis values?

Response

Ethnic values were assessed on the basis of the ethnological evidence recovered at each site.

9.2.4.2 Information Request 5B

Request

How many of the previously recorded and newly discovered sites might have been of Métis ethnic affiliation?

Response

There were only six historic period sites found during the field studies; the remainder are all pre-contact containing only stone materials. Two historic period sites at the Contwoyto Terminal were identified as being used/occupied by John Franklin's father and grandfather. One of the sites is a legal survey marker, one is a weather station (well removed from the Project). The remaining two historic components are at Bathurst Inlet Port and are of unidentified cultural affiliation (*i.e.*, they may be Inuit or they may be the result of tourist use). Therefore, none of the sites show evidence of Métis land use and occupancy.

9.2.4.3 Information Request 5C

Request

When you speak of Elders, do you mean only Inuit Elders, or Elders from all the potentially affected communities? (meaning of course cultural communities, not geographic communities).

Response

In this instance, only Inuit Elders were referenced in the consultation sections.

9.2.5 Issue Identification – Mitigation and Management Plans

9.2.5.1 Information Request 6A

Request

How, when, and where will the Métis be involved?

Response

The Project assessment and review process hosted by NIRB is open and ongoing and provides opportunity for input both in a formal manner at hearings or informally by way of consultation and correspondence. Further consultations will occur between the Proponent and communities in the Project area but these have not been scheduled at this time (June 2008).

9.2.6 Issue Identification – Monitoring and Evaluation

9.2.6.1 Information Request 7A

Request

How, when and where, will the Métis be involved?

Response

Please see 9.2.5.1 above.

10. TRANSPORT CANADA

10. Transport Canada

10.1 Introduction

This chapter includes the issues, concerns, and rationales from Transport Canada and the Proponent's responses to them.

10.2 Issue - Marine Security at the Port Facility

10.2.1 Information Request TC IR#1

10.2.1.1 Issue Identification

The proponent has identified that they will have the capability of accepting large vessels in the range of (30,000 – 50,000 Dead Weight Tons) from Eastern Canada or Europe, how many of these will be foreign flagged? Would any of these foreign flagged vessels using the port facilities be cruise ships carrying 100 or more passengers?

10.2.1.2 Concern

Information regarding the number of foreign flagged vessels that potentially could use the port facility is lacking in the DEIS and is required to assess and determine if the Marine Transportation Security Regulations apply.

10.2.1.3 Rationale

If the port facility receives more than 10 foreign flagged vessels in a calendar year or 5 foreign-flagged vessels on a fixed schedule then Part 2 of the Marine Transportation Security Regulations (MTSR) would be applicable. If less than 10 foreign flagged vessels interface with the port facilities then the MTSR would apply to a lesser extent.

10.2.1.4 Response

If those services are required, the BIPR would be able to accommodate the large vessels. No discussions to this end have been initiated.

10.2.2 Information Request TC IR#2

10.2.2.1 Issue Identification

In the DEIS dangers goods, such as fuel and ammonium nitrate are identified and will be brought in and stored at the port facility. There is also mention of ice class vessels delivering significant amounts of fuel and bulk cargo on numerous occasions throughout the DEIS documents however there is no specific identification of other goods. Will the bulk cargo include other dangerous goods as defined in the Marine Transportation Security Regulations (MTSR) by definition as "certain dangerous cargos", and if so will foreign flagged vessels deliver these certain dangerous cargos?

10.2.2.2 Concern

Information regarding certain dangerous cargos and their delivery by foreign flagged vessels to the port facility is lacking in the DEIS and is required to assess and determine if the Marine Transportation Security Regulations apply.

10.2.2.3 Rationale

The MTSR definition of certain dangerous cargos "means dangerous goods, other than products, substances or organisms identified in Class 3, 4, 8 or 9 of the schedule to the *Transportation of Dangerous Goods Act, 1992*, that are carried in bulk or in such a quantity as to require an emergency response assistance plan under section 7.1 of the *Transportation of Dangerous Goods Regulations*."

10.2.2.4 Response

At this stage BIPR JV is just seeking permission to establish the route and bring in diesel fuel. When the transportation of other hazardous materials is confirmed the details will be available and the official applications for permits submitted.

10.3 Issue - Project Financing from the Federal Government

10.3.1 Information Request TC IR #3

10.3.1.1 Issue Identification

The proponent states that, "*the estimated capital construction cost of the Project is $164 million. The Project will be financed and developed as a Public Private Partnership (P3), where the cost and risks of the Project can be shared between the public and private sectors. The Project is technically practical, economically sustainable and bankable under a P3 arrangement.*"

10.3.1.2 Concern

Information identified in the DEIS regarding a Public Private Partnership (P3) is vague. It is unclear from the references to a P3 which level of government and specifically which department may enter into a contribution agreement with the proponent and possibly others.

10.3.1.3 Rationale

From an environmental assessment perspective it is important to know if another federal department is providing financial assistance to the project in whole or in part. There is the possibility that the potential contributor (a federal department) of such funds isn't currently involved in this environmental review process. Transport Canada isn't aware of the proponent entering into a dialogue with TC officials on the topic of funding under a P3 arrangement.

10.3.1.4 Response

The status of the Project and the feasibility in regard to financing will be updated in the FEIS.

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Chandler. 2006. *Review of Dioxins and Furans from Incineration in Support of a Canada-wide Standard Review*, Prepared by A. J. Chandler & Associates Ltd. for The Dioxins and Furans Incineration Review Group, CCME.

Lanfranco. 2006.*Emissions Compliance Survey Monitoring Report: Fort Smith Health Centre*, Prepared by A. Lanfranco & Associates INC. for GNWT.

UNEP. 2005. *Standardized Toolkit for Identification and Quantification of Dioxins and Furans Releases*, Second Edition, United Nations Environment Program. http://www.chem.unep.ch/pops/pdf/toolkit/toolkit.pdf

Webster, E.; Mackay, D., 2007. *Modeling the Environmental Fate of Dioxins and Furans Released to the Atmosphere During Incineration*, Prepared for Environment Canada by the Canadian Environmental Modeling Centre, CEMC Report No. 200701. http://www.trentu.ca/academic/aminss/envmodel/CEMC200702.pdf

APPENDIX 1-1
INTERVENOR COMMENTS

CANADIAN ARCTIC RESOURCES COMMITTEE

Information Request – Bathurst Inlet Port and Road Project

Date: Thursday - March 20, 2008

From: Canadian Arctic Resources Committee

IR Directed To: Bathurst Inlet Port and Road Joint Venture Ltd. (BIPAR JV)

Issue: Trans-Boundary Effects Analysis

Issue Identification:

Volume VIII Appendix G-3 The "Trans-Boundary Effects Analysis" contains no information on trans-boundary effects from other users of the Bathurst Caribou herd and shows no evidence of consultation with the Governments of the Northwest Territories, Nunavut, Saskatchewan or Aboriginal management bodies created by land claims. Nor does the analysis consider international trans-boundary effects.

Rationale:

The proponent is required to according to the DEIS do the following:

1. Consider as stated in Volume II Table of Concordance PDF page 3, 2.1 NIRB Principle bullet 4 "**The well-being of residents of Canada outside the Nunavut Settlement Area must be taken into account**. Significant Trans-boundary Bio-physical and Socio-economic Effects directly related to this Project must be included in the EIS in order to ensure the NIRB's assessment of the well being of Canadians outside of the Nunavut Settlement Area. Further to this, the Minister of Indian Affairs and Northern Development identified trans-boundary effects as an issue for NIRB to consider in the review of the Project in his letter to NIRB, dated May 4, 2004."

2. Consult as stated in Volume 1 Draft Environmental Impact Statement – Executive Summary, Socio-Economics PDF pages17, 18, 19 "…Fifteen communities within Nunavut and the NWT may be affected by the Project. As the proposed Project has generated economic interest in both territories, these communities are a potential source of labour, services, and supplies. NIRB has identified these communities for inclusion in the consultation process to ensure that public concerns are properly addressed, whether within or outside the Nunavut Settlement Area. All fifteen communities constitute the area of influence for this Project (Figure 2).

   Communities located within the West Kitikmeot Region include Bathurst Inlet, Omingmaktok, Cambridge Bay, Kugluktuk, Taloyoak and Gjoa Haven.
   The Akaitcho Dene First Nation inhabits the Traditional Akaitcho Treaty 8

Territory. The communities of interest for the Project within the Akaitcho Region are Yellowknife and Lutselk'e.

The Tlicho or Dogrib Region is located within the North Slave Region of the NWT. The communities of Rae-Edzo (Behchokò), Rae Lakes (Gamètì), Whatì, and Wekweètì make up this geographic area and are all communities within the Project's area of influence

The Sahtu Dene and Métis Comprehensive Land Claim Area are located to the northwest of the Tlicho Region and to the north of the Dehcho Region, touching the Yukon border. The community of importance in this region is Déline.

The small community of Reliance is located close to the community of Lutselk'e on the eastern end of Great Slave Lake. Holman is located on the western side of Victoria Island, on Amundsen Gulf and is approximately 925 km north of Yellowknife. Both are within the Project's area of influence."

3. Information is lacking in Volume II Section A4 Community Consultation - The proponent made enquiries about the socio economic benefits to community representatives but requested no information about the trans-boundary use of the caribou to the individuals nor to the respective wildlife bodies managing the harvesting activities of the users of the caribou herds on the impact of BIPAR in Nunavut nor the Northwest Territories.

4. Information is lacking in Volume VIII Additional Reports, Appendix G 3 Trans-boundary Effects Analysis - The proponent consulted no agencies responsible for caribou management in Nunavut, Northwest Territories nor Saskatchewan to examine domestic or international issues affecting caribou management.

Request:

To address these deficiencies and address the NIRB trans-boundary effect's principle at the local, regional, provincial, territorial, and at the national and international level we request the proponent to:

1. Please provide additional information from the communities named in the above "Rationale", from the three territorial/provincial governments, and caribou management bodies, i.e. the Nunavut Wildlife Management Board, involved in the management of caribou herds identified in the DEIS about domestic and international issues raised by the BIPAR DEIS in Nunavut, Northwest Territories and Saskatchewan.

2. Please provide additional information from the Government of Canada Department of Foreign Affairs, Indian and Northern Affairs Canada, Parks Canada, Environment Canada and the Privy Council Office with respect to position of the Government of Canada on whether the BIPAR road through the Bathurst Caribou

calving grounds would affect Canada and the Aboriginal peoples position on no development on the Porcupine caribou calving grounds in the Alaska Arctic National Wildlife Reserve

3. Please provide additional information from the International Porcupine Caribou Board, and the Porcupine Caribou Management Board on how the BIPR proposal for a road through the Bathurst Caribou herd calving grounds will affect the position that there should be no development in Porcupine Caribou heard calving grounds in the Alaska Arctic National Wildlife Reserve.

ENVIRONMENT CANADA

Environment Canada **Environnement Canada**

Environment Canada
Prairie and Northern Region
#301-5204 50th Ave.
Yellowknife, NT X1A 1E2

March 20th, 2008

Our file: 4703 003 014
Your File: 03UN114

Leslie Payette
Manager of Environmental Administration
Nunavut Impact Review Board
P.O. Box 1360
Cambridge Bay, NU X0B 0C0

Via email at lpayette@nirb.nunavut.ca

Dear Ms. Payette,

Re: Information Requests regarding the Bathurst Inlet Port and Road Project

Environment Canada has completed our initial technical review of the Draft Environmental Impact Statement (DEIS) for the above mentioned project that is comprised of Volumes 1-10. The review of the DEIS is to determine if there is sufficient information to meet the requirements of a DEIS as directed by the NIRB in their letter dated February 19th, 2008 and as per the mandated responsibilities of Environment Canada.

Attached are EC's information requests for the High Lake Project DEIS in which EC has outlined the main questions falling under the following categories:

- Closure and Reclamation
- Marine Water Quality
- Air Quality and Emissions
- Waste Management
- Wildlife and Species at Risk

EC looks forwards to continuing to work with the NIRB on the environmental assessment process for the Bathurst Inlet Port and Road Project. If you have any questions please contact Savanna Levenson at (867)-669-4772 or savanna.levenson@ec.gc.ca.

Yours truly,

Savanna Levenson
Environmental Assessment Specialist
Environmental Protection Operations

c.c: Carey Ogilvie, Head EA North, Environment Canada
Mike Fournier, Coordinator EA North, Environment Canada
Anne Wilson, Water Pollution Specialist, Environment Canada

Closure and Reclamation

Information Request (IR) Number: EC-1
IR Directed To: Bathurst Port and Road Project Joint Venture Ltd. (the "Proponent")
IR Submitted By: Environment Canada (EC)
References: DEIS Appendix G-6, 3.0 Reclamation and Closure Objectives

Rationale:
The C&R Plan states a number of objectives:

1. to protect the environment through sound reclamation practices
2. to restore the land to its original state as closely as possible.
3. to restore land uses
4. to minimize effects to aquatic habitat and water quality with proper engineering
5. to ensure that reclaimed and abandoned areas are safe and do not pose health and safety risks

In order to achieve all of these objectives, it is critical that the proponent have a clear understanding of existing background environmental conditions throughout the entire footprint of this project. It isn't clear from the C&R Plan that adequate background studies have been completed that ensure the aquatic, terrestrial and atmospheric conditions at both the Port Site and the areas affected by road construction have been adequately characterized.

Request:
EC requests that information detailing work done to characterize this site be presented, or, if not done, be carried out prior to any construction. A description of upcoming work should be provided.

Information Request (IR) Number: EC-2
IR Directed To: Bathurst Port and Road Project Joint Venture Ltd. (the "Proponent")
IR Submitted By: Environment Canada (EC)
References: DEIS Appendix G-6, 3.0 Reclamation and Closure Objectives

Rationale:
The C&R Plan states a number of closure objectives. The Plan does not however provide any detail on what criteria will be used to determine when these closure objectives have been satisfied. In order to ensure that the C&R plan is comprehensive and able to meet it's final objectives, the Plan will need to include more detail and describe the criteria.

Request:
The proponent is requested to provide additional information that demonstrates what criteria will be used to assess whether the stated closure objectives have been met.

Information Request (IR) Number: EC-3
IR Directed To: Bathurst Port and Road Project Joint Venture Ltd. (the "Proponent")
IR Submitted By: Environment Canada (EC)
References: DEIS Appendix G-6, 5.4 Road/Quarry Access Roads

Rationale:
The proponent has stated that the road will likely be constructed by end-dumping onto the tundra. This means of road construction will not allow for soil salvage that would be invaluable in final reclamation.

Request:
Environment Canada requests that the proponent includes in the plan to conserve as much organic soil suitable for reseeding the roadbed as possible during the road construction process. Any salvaged soil should be protected from erosion by seeding until it is needed in the final reclamation stage.

EC also recommends that monitoring be carried out in areas where stockpiled soils (organic and topsoil) have been seeded to prevent erosion prior to any final remediation/revegetation efforts of the roadways. In addition, EC requests that monitoring be carried out to ensure the vegetation mat is sufficient to control erosion on any reclaimed areas (in both progressively reclaimed and in final reclamation areas of both roadways and port site facilities).

Information Request (IR) Number: EC-4
IR Directed To: Bathurst Port and Road Project Joint Venture Ltd. (the "Proponent")
IR Submitted By: Environment Canada (EC)
References: DEIS Appendix G-6, 5.3.2 Fuel Storage & 5.3.3 Fuel Dispensing and Loading Area 5.3 Port Site

Rationale:
The proponent has not indicated how excess fuel will be treated post-closure, i.e., shipped out, incinerated etc. If incineration is required, EC suggest that an appropriate incineration device be selected in consultation with regulatory experts and that the proponent ensure diligent operation and maintenance of the incineration device and that appropriate training is provided to the personnel operating and maintaining the incinerator.

Request:
EC requests that the proponent indicate and discuss how excess fuel will be treated post-closure.

Information Request (IR) Number: EC-5
IR Directed To: Bathurst Port and Road Project Joint Venture Ltd. (the "Proponent")
IR Submitted By: Environment Canada (EC)
References: DEIS Appendix G-6, 5.3 Port Site

Rationale:
The C&R Plan states that the Port Site (at 159 ha) will include a 200 person camp with services, a 200+ million litre fuel tank farm, a diesel power plant, ammonium nitrate storage, two sedimentation ponds, a truck and trailer maintenance shop, a sewage treatment plant, a fuel disposal area, a heliport, an airstrip, a landfill/soil stockpile area, and two quarries.

Very little information is provided in this C&R Plan that outlines how all of these facilities will be decommissioned and the site subsequently reclaimed.

Request:
Environment Canada requests that substantially more information be provided such that an assessment of the success of final reclamation can be determined for all of these facilities. For example:

1. What are the technical details concerning the sewage treatment plant? What will be the fate of this facility at closure?
2. Where does the proponent intend to establish a soil bioremediation facility? What will be the capacity and the technical specifications? Will there be an area to treat petroleum hydrocarbon contaminated snow and ice?

3. What is the nature of the sedimentation ponds and will the proponent ensure there are no deleterious substances contained therein that can migrate to the receiving environment?
4. There is no discussion of the management of hazardous and/or waste materials at this site. Environment Canada recommends that a waste inventory or audit be implemented that outlines the nature, extent and eventual fate of all waste materials brought to, used and generated at this site. This type of audit will be helpful in determining appropriate landfill contents vs. items that **must** be moved offsite. Such a waste management plan should include, but not be limited to:
    - Purchasing policies that focus on reduced packaging,
    - A **hazardous materials management plan** for the site that ensures that all hazardous wastes, including waste oil, receive proper treatment and disposal at an approved facility.
    - On-site diversion and segregation programs (i.e. the separation of non-food waste items, non-combustible solid wastes etc. suitable for storage and subsequent transport and disposal or recycling).

Information Request (IR) Number: EC-6
IR Directed To: Bathurst Port and Road Project Joint Venture Ltd. (the "Proponent")
IR Submitted By: Environment Canada (EC)
References: DEIS Appendix G-6, 5.4 Road/Quarry Access Roads

Rationale:
The C&R Plan states that bridges will be removed on closure of the roads but the Plan does not reference how any disturbed streambeds will be re-established and whether appropriate bank stabilization will be carried out if required.

Request:
EC requests the proponent provide additional detail on reclamation measures for disturbances caused to streams, streambanks and water flow paths affected by any road construction. In areas where surfaces need to be resloped, EC requests the proponent to plan for erosion control features (e.g., diversion berms, contouring etc) that will prevent gullies, rills etc.

In addition, EC requests the proponent to provide additional details on how roadcuts and fill areas will be stabilized and how access will be controlled should there be a safety hazard or where access could impact fish or wildlife populations.

Marine Water Quality

Information Request (IR) Number: EC-7
IR Directed To: Bathurst Port and Road Project Joint Venture Ltd. (the "Proponent")
IR Submitted By: Environment Canada (EC)
References: DEIS Volume VI, Section 3.1

Rationale:
The proponent has provided maps with baseline sampling sites and a text description of the two different study areas, however it is difficult to determine which sites are within the zone of influence and if all areas affected by the projects activity have in fact been captured within these given study areas. A map would be helpful in identifying visually where the proponent has delineated the Local and Regional Study Areas and would also help determine whether the sample sites are in appropriate locations.

Request:

Environment Canada requests that maps are provided of the Regional and Local Study Areas for the Marine Water Quality.

Information Request (IR) Number: EC-8
IR Directed To: Bathurst Port and Road Project Joint Venture Ltd. (the "Proponent")
IR Submitted By: Environment Canada (EC)
References: DEIS Volume VI, Section 2.0

Rationale:
The proponent states that in 2001 five sampling stations were established for marine water quality and sediment quality. In 2002 sediment quality was again sampled at one of the previous stations. In 2007 the proponent sampled an additional 5 stations within the same area. EC understands that the total amount of baseline data that has been collected for the area includes 10 stations in total and one set of samples for each station, except a second sediment sample that was collected in 2002 at one station. In order to ensure that baseline data captures the variability of the environment and to ensure that monitoring of effects will be detectable; further baseline data will need to be collected. It should also be determined that these sites are within the zone of influence of the project and that the reference sites are outside the zone of influence.

Request:
EC requests that the proponent collect further marine water quality and sediment quality baseline data as part of a comprehensive Aquatic Effects Monitoring Program and discussions as to the reasoning for the sample sites chosen.

Air Quality and Emissions

Information Request (IR) Number: EC-9
IR Directed To: Bathurst Port and Road Project Joint Venture Ltd. (the "Proponent")
IR Submitted By: Environment Canada (EC)
Reference: DEIS Volume 4, Section 2, Air Quality
TOR 11.2.1 Air Quality

Rationale:
The Air Quality and Emissions Management Plan (AQEMP) will allow an organized approach to address air issues and annual reporting will allow tracking of emissions and efforts toward minimizing impacts. This approach is being applied to several northern developments including the Mackenzie Gas Project and the DeBeers Snap Lake Diamond.

The AQEMP should include strategies to comply with applicable CCME Canada-wide Standards that both the Government of Canada and Government of Nunavut are signatories. For example the Keeping Clean Areas Clean principal of the Canada-wide Standards for PM and Ozone and the Canada-wide Acid Rain Strategy require the use of best available technologies (BAT) and best management practices (BMPs) to minimize air emissions. The use of BAT and BMPs should be documented and discussed in the AQEMP.

Residual air pollutant emissions after the application of BAT and BMPs should not exceed relevant ambient air quality standards. The AQEMP should include results from the air monitoring program to demonstrate that these standards are being met.

An example template for an AQEMP is provided in Appendix A.

Request:

Environment Canada requests that the Proponents design and implement a comprehensive Air Quality and Emissions Management Plan (AQEMP) to:

- Ensure that project emissions of air pollutants and greenhouse gases from the entire range of sources are tracked;
- Meet any emission reporting that is legally required (i.e. NPRI);
- Demonstrate the application of BAT and BMPs;
- Document the proponent's continuous improvement efforts; and
- Ensure that contaminants of potential concern are monitored over the life of the project.

The AQEMP should be designed in consultation with EC and GN and include an annual report which is publicly available.

Waste Disposal

Information Request (IR) Number: EC-10
IR Directed To: Bathurst Port and Road Project Joint Venture Ltd. (the "Proponent")
IR Submitted By: Environment Canada (EC)
References: DEIS Volume 2, Section 4.2.3.3

Chandler. 2006. Review of Dioxins and Furans from Incineration in Support of a Canada-wide Standard Review, Prepared by A. J. Chandler & Associates Ltd. for The Dioxins and Furans Incineration Review Group, CCME.

Lanfranco. 2006.Emissions Compliance Survey Monitoring Report: Fort Smith Health Centre, Prepared by A. Lanfranco & Associates INC. for GNWT.

UNEP. 2005. Standardized Toolkit for Identification and Quantification of Dioxins and Furans Releases, Second Edition, United Nations Environment Program.
http://www.chem.unep.ch/pops/pdf/toolkit/toolkit.pdf

Webster, E.; Mackay, D., 2007. Modeling the Environmental Fate of Dioxins and Furans Released to the Atmosphere During Incineration, Prepared for Environment Canada by the Canadian Environmental Modeling Centre, CEMC Report No. 200701.
http://www.trentu.ca/academic/aminss/envmodel/CEMC200702.pdf

R**ationale:**
Environment Canada recognizes that timely disposal of camp waste - specifically food waste - is of critical importance to minimize safety risks associated with wildlife attraction. Timely disposal is usually achieved through burning. However, burning of waste products releases numerous contaminants to the air, many of them persistent, bioaccummulative and toxic (e.g. polycyclic aromatic hydrocarbons - PAH's - heavy metals, chlorinated organics – dioxins and furans).

The type of incineration technology and the management practices can greatly affect the amount of dioxins and furans released to the environment. Incinerators capable of meeting the Canada-wide Standards for Dioxins and Furans (controlled incineration) will release about 9.5 µg TEQ of dioxins and furan per tonnes of waste combusted (Chandler 2006, Lanfranco 2006). Poor incineration equipment (uncontrolled burning) can release much greater amount of dioxins and furans, 3500 µg TEQ per tonne of waste combusted (UNEP, 2005). Webster and Mackay (2007) used an environmental fate model to predict contaminant concentrations in air, soil, water, sediment, aquatic and terrestrial wildlife (including fish, birds and terrestrial herbivores and carnivores) resulting from incineration emissions at a typical remote work camp. The conclusions from the study are quoted below.

> *"It is concluded that uncontrolled burning of waste could result in substantial accumulations of dioxins and furans in the local ecosystem, some of which will persist for some 8.5-years with exposure levels approaching those considered to be of toxicological concern. The use of controlled incineration will substantially reduce the expected contamination levels and correspondingly reduce the likely exposure and effects."*

To minimize the release of contaminants the Proponent should include the following as part of the incineration management plan:

Technology:
The proponent should ensure that the incineration device is capable of meeting the emission limits established under the *Canada-wide Standards (CWS) for Dioxins and Furans* and the *CWS for Mercury Emissions* (both the Government of Canada and the Government of the Nunavut are signatories to these Standards and are required to implement them according to their respective jurisdictional responsibility). The minimum requirement for incineration technology should be a dual-chamber controlled-air incinerator.

Waste Management:
The goal should be to minimize the amount of waste to be incinerated and only incinerate appropriate types of waste.

- The amount of waste should be reduced through purchasing policies that focus on reduced packaging and on-site diversion and segregation programs (i.e. the separation of non-food waste items suitable for storage and subsequent transport and disposal or recycling).
- Only food and food contaminated waste should be incinerated.
- Used absorbent materials, oily or greasy rags, and equipment servicing wastes (such as used engine oil, antifreeze, hydraulic oil, lead acid batteries, brake fluid and other lubricants) should be safely stored and transported in sealed containers (odour free to prevent animal attraction) and safely transported to a facility that is authorized for the treatment and disposal of industrial hazardous wastes.

Operation:
Proper operation and maintenance of incineration equipment is essential to minimizing the release of contaminants

- Appropriate training should be provided to the personnel operating and maintaining the incinerator.
- Maintenance records should be kept and reported in an annual report
- The amount of waste incinerated is recorded and reported in an annual report.

R**equest:**
Environment Canada requests that Proponent develop an Incineration Management Plan in consultation with EC. The management plan should include annual reports to provide details on the following:

- Recycling/segregation waste program
- Incineration technology selected
- Waste audit -- amount and types of waste incinerated
- Operational and maintenance records
- Operator training
- Emission measurements
- Incineration ash disposal

Information Request (IR) Number: EC-11
IR Directed To: Bathurst Port and Road Project Joint Venture Ltd. (the "Proponent")
IR Submitted By: Environment Canada (EC)
References: DEIS Volume 2, Section A2 Section 5.1, 5.2.2.2, 5.4.2; Water Licence Application Form Section 7; Volume 2 Section A3 page 4-48

Rationale:
Mobile camps will be used during road construction, housing 60 persons and moving every 60 days. Tertiary-treated sewage will be discharged to the tundra from a skid-mounted treatment plant. During construction at the port, a 150-person camp will utilize a similar treatment system, with release onto the tundra. During operations, port camp effluent will be discharged into the marine environment. The water licence application states this is to be overland, while page 4-48 of the Feasibility Study states this will be via submarine pipe, and utilize disinfection. A 20-person camp will be set up at Contwoyto Lake, and there are conflicting descriptions of effluent disposal for this site also (land vs subaqueous disposal to Contwoyto Lake).

Specifications for the treated sewage equate to tertiary treatment, however there may still be toxicity associated with the effluent due to ammonia levels. There are also concerns with fluctuations in treated wastewater quality, as such systems may be subject to upset or take a while to achieve optimum performance, and nutrient additions to oligotrophic waters. For these reasons, EC discourages the direct discharge of treated wastewater to Contwoyto Lake. Similarly, wastewater discharged to the marine environment must also be non-toxic and comply with the *Fisheries Act* Section 36(3).

Disinfection of wastewater is generally done when there is a public health risk, rather than for reasons of environmental protection. It is not specified what disinfection method will be used, nor why it is necessary. Use of chlorination for disinfection is strongly discouraged.

Request:
Please clarify:

1. what the receiving environment will be for treated sewage effluent, and how compliance with the *Fisheries Act* will be achieved.
2. Why and how wastewater will be disinfected.

Wildlife and Species at Risk

Information Request (IR) Number: 1

IR Directed To: Bathurst Inlet Port and Road Joint Venture Ltd. (the "Proponent")

IR Submitted By: Environment Canada (EC)

References:

- Bathurst Inlet Port and Road Project – Draft Environmental Impact Statement: Volume Vb, Appendix D-10, Section 4 – Bathurst Inlet Waterfowl Survey, pages 4-1 to 4-2.
- Bathurst Inlet Port and Road Project – Draft Environmental Impact Statement: Volume VI, Appendix E-4 – Polar Bear and Seabird Effects Assessment

Rationale: The proponent has assessed the impacts of the proposed shipping route on birds (murres and eiders), but no assessment was provided in regards to specific impacts to birds that may be using the local marine area around the proposed port site. In order to evaluate the potential impacts to marine birds of the construction and operation of the proposed port, EC requires information on the use of the proposed area by birds. Birds such as sea ducks use marine areas for feeding, brood-rearing, and moulting, and are sensitive to disturbance at these times. Information on bird use of the area will help to determine potential impacts on birds and appropriate mitigation measures to minimize any impacts. The proponent did undertake an aerial waterfowl survey of Bathurst Inlet on June 25, 2007, although it is not clear on the exact extent of the area covered during this survey.

Request:

1. The proponent is asked to provide a map showing transects and/or coverage of the June 2007 surveys, locations where birds were observed, the area of the proposed port, and the shipping route within the southern part of Bathurst Inlet (i.e., in the immediate vicinity of the proposed port).
2. The proponent is asked to indicate whether any further wildlife information/data was collected on birds in the marine area around the proposed port. Information on numbers of birds using the area in late summer would especially be helpful, because this may indicate whether the area is being used by brood-rearing or moulting waterfowl. If information is available, the proponent is asked to provide details on the bird information collected. Useful information would include survey/observation methods, number of birds, species, location, whether birds were alone, in small groups or large flocks, if young birds were present, and if birds were moulting. Even if no formal baseline surveys were conducted, any observations of birds collected during other work in the area may be useful.

Appendix A: Example template of the Air Quality and Emissions Management Plan (AQEMP)

The following is an example of air quality and emissions plan that has been used in other the northern developments.

An air quality and emissions management plan should be designed in consultation with representatives of the appropriate governments, agencies and communities. It should include, but not be limited to:

- Clearly defined goals, objectives and methodologies for each of the component programs within the plan
- An emissions tracking and monitoring program including:
  - annual estimation of emissions from the facility, apportioned by major sources, using the same methodology as that used in the Environmental Assessment (EA). Emissions include:
    - nitrogen oxides (NO_x),
    - sulphur dioxide (SO_2),
    - particulate matter (PM) apportioned as total suspended particulate (TSP), PM_{10} and $PM_{2.5}$,
    - greenhouse gases (GHG) apportioned as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O)
  - annual summary of fuel use, apportioned by major source, and confirmation of use of ultra-low sulphur diesel fuel
  - a fugitive dust abatement program to minimize the generation of non-point source particulate (e.g. from roads, waste rock piles, quarries etc)
  - documentation of mitigation measures and pollution prevention strategies (e.g. best management/environmental plans, energy conservation strategies, best available control technology) used to ensure emissions are minimized
  - contingency or response plan to increasing trends or exceedances of emission estimates used in the EA
- An ambient air quality monitoring program including:
  - monitoring of pollutants of concern
  - monitoring of fugitive dust to determine the effects of dust deposition on the surrounding environment
  - monitoring of relevant meteorological parameters
  - documentation of quality assurance and quality control (QA/QC) procedures used to ensure valid data collection
  - contingency or response plans to increasing trends or exceedances of air quality criteria/dispersion modelling predictions
- An annual report summarizing and analyzing the emissions and ambient monitoring information, including:
  - comparison of annual emission estimates to previous years and the estimates used in the EA dispersion modelling
  - comparisons of ambient air quality and deposition monitoring results to previous years and the predictions of the EA dispersion modelling
  - analysis of emissions and ambient air quality trends and effectiveness of strategies employed to minimize emissions
  - responses (either initiated and/or planned) to issues (e.g. equipment failure, data loss, increasing trends or exceedances of air quality criteria/dispersion modelling predictions)
- A commitment to participate in future regional and cumulative effects assessment and monitoring programs

FISHERIES AND OCEANS CANADA

Fisheries and Oceans / Pêches et Océans

501 University Blvd
Winnipeg, MB
R3T 2N6

Your file Votre référence
NIRB # 03UN114

March 25, 2008

Leslie Payette
Manager, Environmental Administration
Nunavut Impact Review Board
Cambridge Bay, Nunavut

By e-mail: lpayette@nirb.ca

RE: Fisheries and Oceans Canada Information Requests on the Bathurst Inlet Port and Road Project

Dear Ms. Payette:

Thank you for your e-mail of February 19, 2008, requesting any information requests (IRs) from interested parties on the Bathurst Inlet Port and Road Draft Environmental Impact Statement (DEIS).

Fisheries and Oceans Canada (DFO) has conducted a preliminary review of the DEIS for the BIPR project and as a result have the following IRs:

INFORMATION REQUESTS RELATING TO ALTERNATIVES ASSESSMENT

1. Alternatives assessment for water crossings along the all weather road
The proponent's *DEIS* includes a report entitled:" *Bathurst Inlet Port and Road Project Alternatives.*" The alternative assessment was based on the following factors: capital cost, operation and maintenance cost, technical feasibility, freight and re-supply efficiency, operating reliability, community support, socio-economic effects, and environmental effects. The proponent reports that three of the 17 alternatives to the Tibbitt-Contwoyto Winter Road were considered. The three that were considered include: Seasonal (Winter only) Overland Road-Tibbitt to Lockhart, Grays Bay Port and Road (GBPR), and BIPR. The proponent indicates that the technical and financial feasibility component of GBPR is still in the conceptual stage. DFO requests the proponent provide justification for considering an alternative that is not yet considered technically and financially feasible.

2. Alternatives assessment for water crossings along the all weather road
The proponent's *DEIS* includes a report entitled:" *Bathurst Inlet Port and Road Project Alternatives.*" The alternative assessment was based on the following factors: capital cost, operation and maintenance cost, technical feasibility, freight and re-supply efficiency, operating reliability, community support, socio-

economic effects, and environmental effects. The proponent reports that three of the 17 alternatives to the Tibbitt-Contwoyto Winter Road were considered. The three that were considered include: Seasonal (Winter only) Overland Road-Tibbitt to Lockhart, Grays Bay Port and Road (GBPR), and BIPR. DFO requests the proponent provide the assessment criteria for the project alternatives evaluation of the three recommended options especially with respect to impacts to the marine and freshwater environment. There is currently insufficient information to review the alternatives assessment.

3. Alternatives assessment for water crossings along the all weather road

Water crossings of the Mara River and Amagok Creek along the all weather road will result in a harmful alteration, disruption or destruction (HADD) of fish habitat. DFO requests the proponent provide the following information:
a) an assessment of alternate water crossing designs to avoid the HADD of fish habitat at the Mara River and Amagok Creek bridges.
b) a description of the environmental impacts and the proposed mitigation measures for the preferred alternatives.

4. Alternatives assessment for wharf design at the port site

Construction of the wharf and dock at the port site will result in a harmful alteration, disruption or destruction (HADD) of fish habitat. DFO requests the proponent provide the following information:
a) an assessment of alternate wharf designs (including alternative locations) to avoid/minimize the HADD of fish habitat at the Bathurst Inlet port site;
b) a description of the environmental impacts and the proposed mitigation measures for the preferred alternatives (including recommendation for preferred timing of sheet pile installation).

5. Alternatives assessment for fish habitat compensation structures

DFO requests the proponent indicate whether an alternatives assessment for the physical location of the freshwater and marine compensation structures was conducted or is planned, for the compensation structures proposed for Bathurst Inlet and Contwoyto Lake?

***Rationale for IRs 1-5*:** The study of alternatives will demonstrate that the project design has considered all technically and economically feasible options to reduce potential environmental effects from the project. The information is necessary to assess the conclusions and predictions of alternatives means for the project. The assessment of alternatives is also a requirement of the NIRB's 10 minimum EIS requirements.

MARINE WATER QUALITY AND SEDIMENT QUALITY

6. Sediment quality monitoring

In Section 6 of Appendix E-1 the proponent indicates that sediment quality monitoring will be conducted once every two years. DFO requests that the proponent provide justification for the selection of this sampling regime. DFO also requests the proponent provide the rationale for the selection of the

monitoring sampling locations. In addition, DFO requests a rationale for why baseline sampling was not conducted at all of the proposed monitoring sites.

Rationale: An adequate baseline facilitates a clearer understanding of the impacts associated with the development and reduces uncertainty in predictions. Furthermore, an adequate baseline is necessary to verify predictions made in the environmental assessment and to identify unforeseen problems, in combination with an appropriately designed monitoring program.

INFORMATION REQUEST RELATING TO MARINE AQUATIC RESOURCES, MARINE FISH AND HABITAT, AND MARINE MAMMALS

7. Marine aquatic resources baseline data collection

The proponent states that marine aquatic resources baseline data were collected during the ice-free seasons of 2001, 2002 and 2007. The 2007 data were not presented in the DEIS, however the results were discussed. The proponent indicated that 5 sampling stations were established in 2001; in 2007 six stations were sampled in the same study areas (but not at the exact same location) as those sampled in 2001. A map was provided showing the location of all the sampling sites (pg 2-2 of Appendix E-2). DFO requests the proponent provide the rationale for the selection of the 2001 and the 2007 sampling site locations. In addition, DFO requests the proponent provide the rationale for why the same sites were not sampled both in 2001 and in 2007.

8. Marine Aquatic Resources monitoring program

Section 6 of Appendix E-2 includes a map of marine monitoring sampling locations. DFO requests the proponent provide the rationale for the selection of the monitoring sampling locations. In addition, DFO requests a rationale for why baseline sampling was not conducted at all of the monitoring sites.

9. Marine Fish and Habitat baseline studies

Section 6 in Appendix E-3 refers to the need for additional monitoring/baseline data collection prior to construction of the port facilities. DFO requests clarification regarding:

a) baseline and compensation monitoring (timing and methods) at the port site and proposed compensation sites;
b) methods that will be used to determine relative habitat units for the HADD and proposed compensation in Bathurst Inlet;
c) proposed methods/further studies to increase confidence of assessment of impacts on VECs at port site.

Rationale for IRs# 7-9: An adequate baseline facilitates a clearer understanding of the impacts associated with the development and reduces uncertainty in predictions. Furthermore, an adequate baseline is necessary to verify predictions made in the environmental assessment and to identify unforeseen problems, in combination with an appropriately designed monitoring program.

10. Marine Aquatic Resources-VECs

The VEC-Marine Aquatic Resources includes phytoplankton, zooplankton, and benthic invertebrates. The proponent has identified that these types of marine organisms were selected and grouped into a VEC as they are essential components of the marine food web. Changes to these communities could have effects on higher trophic level organisms. It was stated that these lower trophic level organisms could be used to monitor for adverse effects to the marine environment. The proponent, however, reports that assemblages of primary and secondary producers are highly variable from year to year and therefore may not be appropriate to monitor for potential effects on marine fish and marine mammals. DFO requests the proponent identify and provide the thresholds for measuring impacts.

11. Marine Aquatic Resources

The proponent reports that potential negative impacts to marine aquatic resources can occur from the release of deleterious substances, sediment, and from marine shipping. DFO requests the proponent identify the magnitude of these impacts and a description of how they are measured. DFO also requests clarification as to whether there are other suitable indicators to measure the negative impacts to fish and marine mammals.

12. Marine Fish and Habitat-VECs

The proponent identified fourhorn sculpin, Arctic char, Bering wolfish, and fish habitat as VECs. Sources of potential impacts on these species were discussed and presented in Table 4.2-4 and in Table 4.2-5 the potential effects and the significance determination are presented. DFO requests further discussion on the thresholds used for assessing impacts. DFO also requests the proponent provide clarification as to whether the impacts are quantifiable or if the analysis is qualitative.

13. Marine Fish and Habitat-Dredging

Section 4.2 p.4-4 of the feasibility study (Appendix A-3) states “The water depth directly adjacent to the wharf is sufficient for the vessels proposed to use the facilities and under these conditions it will not be necessary to undertake any marine dredging during the 20 year project life.” However, the proponent has used a 30 year project life as a basis for capital and operating cost estimates. DFO request the proponent please confirm whether dredging is likely to be required during the.30 year project life.

14. Marine Fish and Habitat - Water Intake and outlet footprint and design.

DFO requests detailed design drawings for any water intake and/or sewage outlet structures that will be constructed in Bathurst Inlet and/or the unnamed creek (referred to as a potential water source during construction of the port facilities). DFO also requests information regarding whether the unnamed creek is fish bearing and if so, potential impacts of proposed water use on fish and fish habitat.

15. Marine Fish and Habitat - Mitigation methods
Section 5.2.2 of Appendix E-3 refers to fish salvage as a mitigation measure. DFO requests details regarding proposed methods for fish salvage during wharf and jetty construction (e.g. salvage methods and timing to reduce fish mortality).

16. Marine Mammals
The magnitude of impacts to marine mammals were identified and presented in Table 4.1-1 of Appendix E-5. DFO requests the proponent provide clarification on how magnitude was determined and the use of any threshold values.

17. Coastal processes around the wharf, jetty, boulder field, rock spurs, and fish shelters
Appendix E-10 discusses marine physical processes. The proposed wharf, jetty boulder field, rock spurs, and fish shelters may directly influence coastal processes in the area and potentially impact marine fish and marine habitat. In addition, environmental effects related to shipping and mobilization activities along the dock, such as propeller wash and ship wake, may also have impacts on the surrounding marine environment. DFO recognizes that the proponent has planned a study for 2008 to assess the coastal process occurring around the site. However, in order for DFO to complete our technical review the assessment of the coastal processes occurring within the immediate area of the dock, jetty and the proposed compensation structures will be required.

18. Coastal processes around the boulder field, rock spurs, and fish shelters
Fish habitat compensation being proposed includes a boulder field, rock spurs, and fish shelters in the immediate vicinity of the wharf and jetty. DFO requests the proponent provide an assessment of how coastal processes, including but not limited to sedimentation, may negatively impact the proposed fish habitat compensation structures.

Rationale for IRs# 10-18: The negative impacts from the construction and operation of the wharf jetty and compensation structures as well as from marine shipping have not been fully assessed and reported. The information requested is necessary to complete the technical assessment of impacts to marine aquatic resources, to marine fish and habitat, and to marine mammals.

INFORMATION REQUESTS RELATING TO THE FRESHWATER AQUATIC ECOSYSTEM AND FISH HABITAT

19. Hydraulics within crossing structures in fish bearing waters
The *Draft EIS* does not include information regarding hydraulics through the water crossing structures (including bridges or culverts on installed in fish bearing waters) and potential for impacts to fish passage due to physical obstructions and/or velocity barriers during migration periods. DFO requests the proponent provide the following additional information on the proposed crossing design's ability to meet fish passage needs:
a) estimates of water velocity and depth for low, medium, and high flow events for all crossing structures installed in fish bearing waters,

b) information to show that the average velocity, through these crossing structures, during the time of fish migration does not exceed the swimming abilities of the target fish species for the 1:10 year, three day delay discharge (Q3d), average velocity information through the crossing structures of fish bearing waters for 1:2, 1:5, 1:10 and 1:100 year storm events.

Rationale: Water velocities and depths within the crossing structure during times of fish migration are required to ensure unimpeded fish access to spawning, nursery and feeding habitats. Improperly designed watercourse crossings can increase the impact to fisheries resources by preventing migration of fish to critical areas of their habitat. A 3-day delay during a 1 in 10 year storm event is a threshold used for establishing design criteria for fish bearing watercourse crossings. This information is used to describe the intensity and duration of the effect of water crossings on fish populations.

20. Clarification of criteria to determine width of crossing structures in fish bearing waters

Appendix C-2 p.4-8 states that "The 70 wetted stream crossings built with culverts or bridges that would be designed and be outside of the bankfull width of each stream to avoid any destruction of habitat." In addition, "to minimize disturbance to the bank and allow the bridge abutments to be reinforced with riprap without the need for instream work, bridge length will be a minimum of 5m greater than the bankfull width" and "culvert width will be at least 1m greater than the bankful width of the stream, thereby avoiding disturbance of the bank" (Appendix C-4 p.4-21).

According to the average bankfull width data provided in Table 4.6-1 in Appendix C-4 and statements in the feasibility study that bridges spans would range from 10-40m and arch culverts would span 1-3m (Appendix A-3, p. 5-22) a number of crossings would have structures located within the bankfull width. DFO requests clarification regarding:

a) the design criteria to determine watercourse crossing widths;
b) which watercourse crossings on fish bearing watercourses will meet the above mitigation;
c) whether site specific fish habitat data and impact assessment (including but not limited to potential impacts to fish passage/ loss of physical habitat due to infilling and downstream erosion due to constriction of the channel at watercourse crossings) will be provided at locations where crossings cannot be constructed entirely outside of the bankfull width (including riprap).

Further, Appendix C-2 p. 5-2 states that the recommended mitigation measures include installation of riprap at all crossings. DFO requests clarification regarding:

a) the identification of fish bearing watercourses (in addition to Mara River and Amagok Creek) in which instream work (including isolation/dewatering during construction) will be required for installation of riprap and crossing structures;

b) extent of riprap required at watercourse crossings on fish bearing watercourses;
c) impact of disturbance of bed and banks at crossing sites and mitigation related to design and placement of riprap.

21. Effects assessment for Arctic Grayling
DFO requests clarification why obstruction of fish passage was not considered as a potential impact to Arctic grayling in Appendix C-4 Table 4.3-1.

22. Impacts of flood events greater than 1:25 on fish and fish habitat adjacent to crossing sites
The project description (Appendix A-2 , p. 23) states that "It is expected that the project will be in use for many generations into the future, nevertheless the project proponents acknowledge that non-renewable resources are finite and that some day the road and associated facilities may no longer be required." DFO requests further clarification regarding the impacts of flood events on fish and fish habitat at and downstream of watercourse crossings on fish-bearing watercourses, assuming a 1:25 year design criteria, particularly in the event the project lifespan is extended or flood events are higher then 1:25.

23. Designation of watercourses as non-fish bearing at proposed ford crossing sites
The DEIS states that "a final survey of the road alignment will be undertaken to confirm fish absence at crossings classified as non-fish bearing, and to identify the exact crossing location where culverts and bridges should be installed to minimize both disturbance and cost". DFO requests further detail regarding the sampling methods and criteria that will be used in confirm absence of fish habitat at the crossing sites (including timing).

24. Impacts to shoreline of Contwoyto Lake
Potential for impacts to fish and fish habitat related to shoreline degradation at the terminal end of the road are mentioned in the DEIS. DFO requests clarification regarding potential impacts to the shoreline of Contwoyto Lake, including any proposed shoreline works (e.g. removal of riparian vegetation, installation of a water intake/diffuser structure)?

Rationale for IRs# 20 –24: The proponent's construction plans and conceptual drawings and details will be used to verify the impacts predictions to fish and fish habitat. This information is required for DFO's technical review of the environmental assessment.

INFORMATION REQUESTS RELATING TO THE ENVIRONMENTAL MANAGEMENT AND MONITORING PLANS
25. The *Fish Habitat No Net Loss Plan* identifies that fish habitat compensation monitoring will be undertaken, yet the plan provides only minimal detail on the proposed monitoring and follow up programs. DFO requests the proponent provide a more detailed preliminary Fish Habitat Compensation (No Net Loss) Monitoring plan. Details should include the methodology and reporting format for

monitoring surveys and a monitoring schedule with justification for the proposed schedule, frequency and duration. The monitoring program must assess the accuracy of the impact predictions and effectiveness of proposed mitigation and compensation measures.

Rationale: Monitoring and follow up is a requirement of the NIRB's 10 minimum EIS requirement. The draft monitoring plan will be required to verify the extent to which the plan's purpose (i.e. demonstrating No Net Loss) can be achieved. This information is necessary for completion of the technical review of the environmental assessment.

I trust this is of assistance and we look forward to the proponent's response to the information requests. If you have any questions would like clarification pertaining to any of the aforementioned comments, please do not hesitate to contact Beth Pechter at (867) 669-4919 or by email at Beth.Pechter@dfo-mpo.gc.ca.

Sincerely,

Original signed by:

Bev Ross
Regional Manager, Environmental Assessment for Major Projects
Fisheries and Oceans Canada
Central and Arctic Region

cc: Beth Pechter, Environmental Assessment Analyst, DFO
Sheena Majewski, Habitat Management Biologist, DFO

GOVERNMENT OF NUNAVUT

Bathurst Inlet Port and Road Draft Environmental Impact Statement (DEIS) Information Requests

Prepared by:
Government of Nunavut
Iqaluit, NU

June 2008

Water Quality

IR #1: Hold times for water samples

DEIS Reference: Vol. IVb, Appendices C-6 and C-8

Concern: Hold times for water samples collected during the 2001 and 2007 baseline monitoring are not mentioned. Delays in analyses may result in alterations in concentrations of nutrients and other parameters (e.g., alkalinity, conductivity, pH, turbidity, total dissolved solids, total suspended solids), therefore affecting the accuracy of baseline and predicted water quality characteristics.

Rationale: This information is required for QA/QC assessment.

Request: It is recommended that Bathurst Inlet Port and Road Joint Venture Ltd. provide the hold times (period between water collection and analyses) for water samples collected in 2001 and 2007.

Air Quality

IR #2: Air Quality Effects Assessment

EIS Guideline Reference: 4.7.3.3 Air Quality/Meteorological/Noise Impacts (Physical and Biological Impacts)

DEIS Reference: Section 13.1, pages 52–53; Supporting Document Volume III, B-1

Concern: The Proponent has indicated in Section 13.1 and in Appendix III that "the delivery of fuel to existing mines via the port and road will reduce emissions by replacing part of the current overland trucking route with ocean transport, which produces fewer emissions".

Rationale: In order for NIRB to assess the comprehensiveness of the environmental effect assessment, this information is required.

Request: To support this evidence provide specific details of the GHG emission inventory including; i) the spatial and temporal boundaries of the inventory for both the proposed port and road option and the current overland route; ii) the absolute amounts of GHGs emitted per annum for both options; and iii) the GHG emission intensity (CO_{2eq} / tonne delivered) for both options.

IR #3: Air Quality Mitigation and Management

EIS Guideline Reference: 4.7.5 Mitigation

DEIS Reference: Section 13.1, pages 52–53; Supporting Document Volume III, B-1

Concern: The Proponent has not discussed and evaluated the effectiveness of the proposed mitigation measures and assessed the likelihood of mitigation failure and the potential severity of the consequences.

Rationale: In order for NIRB to assess the comprehensiveness of the environmental effect assessment, this information is required.

Request: To support this evidence, provide specific information on similar mitigation methods used with similar projects and the degree of success achieved. All uncertainties related to the mitigation measure should be clearly described and, if possible, quantified. Discuss in detail how the four general design features and practices that will minimize CO_2 emissions will be executed.

IR #4: Monitoring Program

EIS Guideline Reference: 4.10 Monitoring

DEIS Reference: Section 13.1, pages 52–53; Supporting Document Volume III, B-1 and B-5

Concern: The Proponent states that some form of weather and climate data gathering will continue throughout the life of the Project, but does not satisfy all requirements of the NIRB Guidelines with respect to the monitoring program.

Rationale: In order for NIRB to assess the comprehensiveness of the environmental effect assessment, this information is required.

Request: To support this evidence, provide specific information as required in the NIRB Guidelines (Section 4.0):

a) integration of monitoring results with other aspects of the Project including adjustments to operating procedures and refinement of Mitigation measures;
b) procedures to assess the effectiveness of monitoring programs, Mitigation measures, and recovery programs for areas disturbed by the Project;
c) methodology of evaluation of monitoring results, including thresholds levels to trigger management responses;
d) details regarding management responses; and
e) the relationship between monitoring and Environmental Management Plans (Section 4.8 of NIRB Guidelines).

IR #5: Air Quality Effects Assessment

EIS Guideline Reference: 4.7.3.3 Air Quality / Meteorological / Noise Impacts (Physical and Biological Impacts);

DEIS Reference: 14.2, page 53-54; Supporting Document Volume III, B-2 & B-4

Concern: The Proponent has indicated that ships up to 50,000 tonnes, barges and tugs will deliver cargo to the port during the 100 to 110 day ice-free season in July to October. The proponent has also indicated that the dispersion model scenarios were set up to represent worst-case scenarios that could occur at any point during operation or construction. The proponent states that the CALPUFF model was run only for the road operating season (January to April) because maximum air contaminant concentrations will occur during this period. Emission estimates provided by the proponent related to shipping that were not included in dispersion modelling indicate potential SO_2 emission rates ranging from 0.6 to 18 g/s per ship, while the SO_2 emission rates for the assessment scenarios applied in dispersion modelling represent SO_2 emissions of 0.031 to 0.084 g/s.

Rationale: In order for NIRB to assess the comprehensiveness of the air effects assessment, additional information is required.

Request: To support this evidence provide specific details of the effects of the operation of the port facility during the ice-free period including: Update effects assessment

a) Expected emissions during the ice-free period including ship transport, manoeuvring, hotelling/cargo unloading, barge and tug operation, and all onshore port operations expected during the ice-free period.

b) Quantitative dispersion modelling to assess air quality effects of the port operations during the ice-free period including operations from ship during transport, manoeuvring, hotelling/cargo unloading, barge and tug operation and onshore port operations.

IR #6: Effects Assessment

EIS Guideline Reference: 4.7.3.3 Air Quality / Meteorological / Noise Impacts (Physical and Biological Impacts);

DEIS Reference: Section 14.2, page 53-54; Supporting Document Volume III, B-4

Concern: The Proponent has indicated in Volume III, B-4, that the grid resolution applied in the CALPUFF modeling domain was 1.0 km by 1.0 km. Best modelling practices, such as those found in the British Columbia Ministry of Environment Guidelines for Air Dispersion Modelling in British Columbia or that of the Alberta Environment Air Quality Dispersion Model Guideline recommend minimum receptor/grid spacing in order to delineate areas of highest predicted concentration. Both of these guidelines recommend receptor spacing to a minimum of 50 m as part of a regular system of receptors as well as a minimum of 20 m along project boundaries and areas of maximum predicted concentration.

Rationale: In order for NIRB to assess the comprehensiveness of the air effects assessment, additional information is required.

Request: To support this evidence, provide specific detail as to the receptor grid applied in the dispersion modelling and as to whether or not it is consistent with the best practices outlined in the British Columbia or that of the Alberta Environment Air Quality Dispersion Model Guidelines. If dispersion modelling was not completed consistent with the above requirement, please provide specific detail as to the change in predicted concentration if these best practices are followed.

IR #7: Effects Assessment

EIS Guideline Reference: 4.7.3.3 Air Quality / Meteorological / Noise Impacts (Physical and Biological Impacts);

DEIS Reference: Section 14.2, page 53-54; Supporting Document Volume III, B-2 & B-4

Concern: The Proponent has indicated that the CALPUFF model was run only for the meteorological period of January to April of 2002 and 2003. The proponent has also indicated that construction activities and, shipping and port operation will occur outside of this January to April time period. The proponent has only completed dispersion modeling representative of meteorological conditions during mainly 24-hour darkness, stable atmospheric, winter conditions. These meteorological conditions are not representative of spring, summer and fall periods when increased mixing heights and atmospheric turbulence may cause elevated plumes to mix towards the ground more readily causing higher concentrations from certain types of emission sources.

Rationale: In order for NIRB to assess the comprehensiveness of the air effects assessment, additional information is required.

Request: To support this evidence provide specific details of the following:

a) Summary of dispersion meteorology showing the seasonal variations in atmospheric stability/turbulent and mixing heights in all seasons.
b) Quantitative dispersion modelling results that incorporate the full range of meteorology representative of the full year of meteorology (winter, spring, summer and fall) that coincide with project activities.

IR #8: Effects Assessment

EIS Guideline Reference: 4.7.3.3 Air Quality / Meteorological / Noise Impacts (Physical and Biological Impacts);

DEIS Reference: Section 14.2, page 53-54; Supporting Document Volume III, B-1 & B-4

Concern: The Proponent has indicated that the CALPUFF model was run using measured meteorological data such as wind direction and wind speed collected at an onsite meteorological weather station located near the port facility. The proponent has indicated that the average wind speed measured at the port site meteorological station was 5.7 m/s and the average percentage of calm conditions was 3.4% of the time. The proponent has also presented a summary of wind speed and direction at the Lupin and George Lake meteorological stations located much further inland. These two stations indicate average wind speeds of 4.7 and 4.8 m/s and average calms of 9.2% and 13.3% of the time respectively. Wind speeds at the inland station were observed to be 16 to 18% less than that measured at the port site meteorological station. The proponent has applied meteorological data collected at the port site for the dispersion modelling of both project activities that occur at the port site and those that occur inland along the road.

Rationale: In order for NIRB to assess the comprehensiveness of the air effects assessment, additional information is required.

Request: Provide a description of the expected change in predicted maximum and average concentrations relative to the concentrations predicted for the Road Operation assessment scenario given that meteorological data collected at the port site overestimates the wind speeds and underestimates the periods of calm winds. Comment on its significance relative to the National Ambient Air Quality Objectives.

IR #9: Effects Assessment

EIS Guideline Reference: 4.7.3.3 Air Quality / Meteorological / Noise Impacts (Physical and Biological Impacts);

DEIS Reference: Section 14.2, page 53-54; Supporting Document Volume III, B-2 & B-4

Concern: The Proponent has indicated that dispersion modelling has predicted that maximum 1-hour, 24-hour average NO_2 concentrations are predicted to exceed the National Ambient Air Quality Objectives during port construction. The Proponent has also indicated that dispersion modelling has predicted that maximum annual average NO_2 concentrations are predicted to exceed the National Ambient Air Quality Objectives during port construction and Port operation, but that “even though runtime average values exceeds the guideline, the annual average value will likely meet it”. The

Proponent has indicated a low significance associated with the predicted changes in NO_2 concentrations.

The proponent has also indicated that maximum predicted 24-hour TSP concentrations are predicted to exceed the Nunavut Ambient Air Quality Guideline during Road Operation. The Proponent has indicated a moderate significance associated with the predicted changes in TSP concentrations.

Rationale: In order for NIRB to assess the comprehensiveness of the air effects assessment, additional information is required.

Request: To support this evidence provide specific details of the following:

a) Provide additional detail such as the frequency and meteorology typical of predicted exceedance of the 1-hour and 24-hour National Ambient Air Quality Objectives or Nunavut Ambient Air Quality Guideline for NO_2 and TSP in hours or days per year during Port Construction.
b) As the simplified assessment method indicated potential for annual average NO2 concentration greater than the National Ambient Air Quality Objectives, provide revised predicted annual average NO_2 concentrations that more realistically account for the changes in project emissions and meteorology over the calendar year.

IR #10: Effects Assessment

EIS Guideline Reference: 4.7.3.3 Air Quality / Meteorological / Noise Impacts (Physical and Biological Impacts);

DEIS Reference: Section 14.2, page 53-54; Supporting Document Volume III, B-4

Concern: The Proponent has indicated that acid deposition is another potential air quality effect to consider for the Project. The proponent also indicated that use of ultra low sulphur diesel fuel will result in negligible SO_2 emissions and that acid deposition derived from sulphate formation is therefore limited. It is also stated that the formation and kinetics of nitric acid deposition are not well understood and due to uncertainty are not included in the air quality model study.

Rationale: In order for NIRB to assess the comprehensiveness of the air effects assessment, additional information is required.

Request: To support this evidence provide specific details of the following:

a) Compare the annual SO_2 emissions from all shipping related activity which was excluded from dispersion modelling to that of the emission source included in the dispersion modelling and effects assessment.
b) Given the emission estimates in part a) of this question, please confirm that SO_2 emissions from this project are negligible.
c) Given that the majority of SO_2 emissions from shipping occur in summer when precipitation is greatest, please provide specific detail or references to confirm that sulphate formation would be limited.
d) Given that estimates of nitric acid deposition are routinely performed as part of most air quality model studies for similar projects and that the CALPUFF model has a simplified routine to assess atmospheric chemistry and deposition of NO_x emissions, please provide specific detail or references to support the conclusion that model uncertainty prevents the proponent from quantitative estimates of acid deposition.

IR #11: Monitoring Program

Issue: Monitoring Program

EIS Guideline Reference: 4.10 Monitoring, Evaluation

DEIS Reference: Section 14.4, page 55; Supporting Document Volume III, B-2 & B-4

Concern: Dispersion modelling predicts exceedances of the National Ambient Air Quality Objectives and Nunavut Ambient Air Quality Guidelines for both TSP and NO_2. However, the Proponent does not propose any ambient air quality monitoring during construction and operation of the Port and Road.

Rationale: In order for NIRB to assess the comprehensiveness of the monitoring program, this information is required.

Request: To support this evidence, provide the following:

a) Please provide additional detail as to why some form of ambient air quality monitoring for TSP and NO_2, both of which dispersion modelling simulations predicted exceedances of the National Ambient Air Quality Objectives and Nunavut Ambient Air Quality, is not proposed.

Noise Management

IR #12: Environmental Setting

EIS Guideline Reference: 4.6.2.4 Air Quality and Noise

DEIS Reference: Appendix B-3, pages 2–4

Concern: The Proponent presents background sound level data that are not relevant to the Local Study Area,. For determining the background sound level in the areas of concern, an assumption of Leq (24 hours) was made based on collected data at different sites. Background noise should be measured at site and quantified in various terms, not assumed.

Any noise impact assessment should consist of fundamental information that can help determine the accuracy of the results and help provide realistic conclusions and valid recommendations. These necessary noise assessment fundamentals are not included in this study under review and should include an applicable noise level criteria for planning along with recently measured background sound level data and acoustic modeling of future noise levels at representative receptor locations in the vicinity of the project.

Rationale: In order for NIRB to assess the comprehensiveness of the consultation efforts, this information is required.

Request: Provide background sound level measurements representative of Bathurst Inlet, the road, and the shipping route These measurements should be capable of describing the existing conditions of the acoustic environment before the start up of construction, and before the beginning of operations of port and road.

IR #13: Methodology

Issue: Methodology

EIS Guideline Reference: 4.7.3.3 Air Quality/Meteorological/Noise Impacts (Physical and Biological Impacts)

DEIS Reference: Appendix B-3.1, pages 4 and 5

Concern: The Proponent has used guidelines that are suitable for oil and gas utilities in Alberta but are not suitable for the assessment of traffic noise and complex port projects. A specific acoustic model for this project has not been completed.

Rationale: In order for NIRB to assess the comprehensiveness of the consultation efforts, this information is required.

Request: Provide construction noise models for the road and the port to quantify the noise impact on the environment due to construction. Also, provide operations noise models for the road and the port to predict the increase of noise level in the environment. Should there be any excess above a noise criteria limit, then mitigation measures are to be specified in the models.

IR #14: Effects Assessment

Issue: Effects Assessment

EIS Guideline Reference: 4.7.3.3 Air Quality/Meteorological/Noise Impacts (Physical and Biological Impacts)

DEIS Reference: Appendix B-3.1, pages 5–8

Concern: The Proponent uses impact rating values that are not contained in Guideline 38-Noise and does not reflect the response of humans to noise and vibration.

Rationale: In order for NIRB to assess the comprehensiveness of the consultation efforts, this information is required.

Request: To establish the magnitude of noise excess above the pre-existing ambient sound level and the rating in terms of human response to noise increase in the environment, provide an acceptable provincial or federal noise rating criteria. It is suggested here that the magnitude of noise problem be established based on accepted human response to noise increase in the environment. The rating criteria should be based on a generally-accepted rating and magnitude of noise problem, similar to the Ontario Ministry of the Environment well-established methods to determine the representative magnitude and the rating.

Trans-boundary Effects

IR #15: Potential Effects of the Project Outside of Nunavut

EIS Guideline Reference: 2.2.2 Spatial Boundaries

DEIS Reference: Volume I, Section 33, Volume II - Report A5- Effects Assessment Methodology, Volume VIII – Report G-3 Trans-boundary Effects Analysis

Concern: Individual VECs effects analysis treats the trans-boundary nature of the geographic extent of residual effects in an inconsistent manner, resulting in at least one VEC with a residual trans-boundary effect not being reported in the trans-boundary effects analysis. As a result of inconsistent application of methodology the potential for additional unreported residual trans-boundary effects exists.

Rationale: The Trans-boundary Effects Analysis (Document G-3, Volume VIII) documents the proponent's assessment of potential trans-boundary effects resulting from the project. Table 6.4.1 in the Effects Assessment Methodology (Document A-5 Volume I) states that the geographic extent of a residual effect will be rated as **trans-boundary** if the effect extends beyond Nunavut. Accordingly, the effects assessment for each VEC or VSEC includes a spatial or geographic analysis. Some effects assessments refer to a residual effect being trans-boundary whereas others refer to the effect occurring in the Local or Regional Study Area. The proponent has identified the following VECs or VSECs subject to potential trans-boundary effects: caribou grizzly bears, wolves, migratory birds, marine mammals, air quality and climate change, and social and economic. As wolverine is attributed the same geographical rating as caribou, it is not clear why the residual effect for wolverine has not been carried forward to the trans-boundary effects analysis. Given the inconsistent application of the trans-boundary ratings in the effects analysis there is potential for additional VECs or VSECs to have a trans-boundary residual effects and not be reported in the trans-boundary effects analysis.

Request: The proponent is requested to review the geographic extent rating criteria for all VECs and VSECs where a residual effect is identified, confirm where there is a trans-boundary geographical extent and carry all residual trans-boundary effects forward to the trans-boundary effects analysis.

Project Alternative

IR #16: Alternative Methods of Carrying out the Project

EIS Guideline Reference: 4.4.1

DEIS Reference: Volume I, Section 5.6, Volume II- Report A2- Feasibility Study Sections 2.3 and 5.2, Volume VIII, Report G-1 Project Alternatives Report

Concern: The proponent has carried forth a discussion of the 3 highest rated alternatives of the 17 alternatives for transportation to the SGP reported by EBA. Rationale for the selection of the BIPAR project over the other options is provided. Additionally, the review of alternative road alignments is well documented and the rationale for selection of the preferred route is provided. However, while design requirements for the port are identified, an analysis of alternative locations has not been provided in the DEIS or supporting documents.

Rationale: The EIS Guideline requires the proponent identify alternatives to the project and alternative methods to carry out the project. The proponent is also required to provide the rationale for selection of the preferred alternative and rejection of others.

Request: The proponent is requested to outline the alternative port locations considered and rationale for the selection of the preferred site in comparison to other locations.

Legislation and Regulation

IR #17: Legislation Applicable to the Project

EIS Guideline Reference: 4.2 Regulatory Context

DEIS Reference: Volume I, Section 10

Concern: The proponent has identified most legislation applicable to the project in Section 10 of the DEIS, however legislation or regulations applicable to wildlife (which are documented in the Wildlife Mitigation and Management Plan of the Wildlife Effects Assessment, Document D3) is not referenced

in this section. Additionally, the Spill Contingency Planning and Reporting Regulations under the Nunavut *Environmental Protection Act* are not referenced in the DEIS.

Rationale: The EIS Guideline requires the proponent to identify all federal and territorial and related laws that require compliance in respect to the Project. The proponent is also required to provide a list of currently held permits and licences.

Request: The proponent is requested to identify all territorial legislation with which the project must comply.

Wildlife

IR #18: A reference is given to an Appendix 1 for full results of the species search

DEIS Reference: Vol. 5a, Section 2.3.3

Concern: The list of species identified as *unlikely* and *very unlikely* in the project area is not provided in Appendix 1. This appendix may be misidentified or misplaced.

Rationale: In order to assess the appropriateness and value of the species categories, the full results of the species search is required.

Request: The GN recommends that Bathurst Inlet Port and Road Joint Venture Ltd. provide the missing appendix.

Cumulative Effects

IR #19: Climate

EIS Guideline Reference: 4.7.2 Cumulative Effects Assessment; 4.7.3.3 Air Quality / Meteorological / Noise Impacts

DEIS Reference: Section 35.3, page 124; Supporting Document Volume VIII, G-5, 3-1 to 3-2

Concern: The Proponent has indicated in sub-section 35.3.2 (Climate) that that the delivery of fuel to existing mines via the Project facilities may reduce GHG emissions by replacing part of the current over-land trucking route with ocean transport, which is less emissions intensive. They also state that a "complete life-cycle analysis of diesel fuel produced for, shipped to and used by the existing mines would be required to quantify the potential reduction in emissions.".

Rationale: In order for NIRB to assess the comprehensiveness of the environmental effect assessment, this information is required.

Request: To support this evidence, incorporate the findings of Climate IR #1 (same issue) into this cumulative effects assessment.

IR #20: Air Quality

EIS Guideline Reference: 4.7.2 Cumulative Effects Assessment; 4.7.3.3 Air Quality / Meteorological / Noise Impacts

DEIS Reference: Section 35.3, page 124; Supporting Document Volume VIII, G-5, 3-2 to 3-4

Concern: There is a lack of quantitative analysis supporting the conclusion that the magnitude of potential air quality effects will increase in proportion to future increases in truck traffic and shipping. While the expected increases in traffic is stated, there is no dispersion modelling to support the conclusions. There is also a failure to support conclusions respecting the air quality effects of the project vs. the potential increase in traffic on the current overland route.

Rationale: In order for NIRB to assess the comprehensiveness of the environmental effect assessment, this information is required.

Request: To support the conclusions respecting the magnitude of potential future air quality effects and the conclusions respecting the project effects vs. the current overland route provide i) dispersion modelling results for the cumulative effects case, and ii) an annual emission estimate for all substances of concern comparing the project effects vs. the current overland route.

IR #21: Noise

EIS Guideline Reference: 4.7.2 Cumulative Effects Assessment; 4.7.3.3 Air Quality / Meteorological / Noise Impacts.

DEIS Reference: Section 35.3, page 124, Supporting Document Volume VIII, G-5, 3-4 to 3-6

Concern: The Proponent presents evidence that increased traffic volumes on the road and near the port facility may result in increased 24-hour average and maximum noise levels, but will not exceed the guideline value of 40 dBA. They do not present quantitative evidence such as site-specific noise modelling for the operations and future cases to support specific conclusions.

Rationale: In order for NIRB to assess the comprehensiveness of the environmental effect assessment, this information is required.

Request: Provide operations noise models for the road and the port for the operations and future cases to predict the increase of noise level in the environment. Should there be any excess above a noise criteria limit, then mitigation measures are to be specified in the models.

Spill Contingency Planning

IR #22: Spill Planning and Response

DEIS Reference: Vol. I, Environmental Effects Assessment, Section 34, Volume VIII, Appendix G-4 “Environmental Management Plan for Road, Port, Camp and Shipping

Concern: The project is being proposed to provide transportation alternatives for the shipment of approximately 3 million tonnes of fuel and operating supplies annually. The project will involve the use of ocean going ships, barges and trucks to transport the material, requiring the storage and multiple transfer of significant volumes of fuel and dry goods. While the proponent will own and operate the

infrastructure, third parties will own the fuel and operational supplies and contractors will be hired to transport the fuel and supplies. Multiple parties and interests are involved during the operational phase, responsibility for spill planning and response need to be clearly established and communicated

Rationale: While detailed Spill and Emergency Response Plans can be prepared during the permitting stage, responsibilities need to be confirmed during the environmental review.

Request: It is recommended that Bathurst Inlet Port and Road Joint Venture Ltd. clearly document responsibilities for spill planning and response for all activities and phases of the project.

Waste Management

IR #23: Sewage Sludge Management

DEIS Reference: Vol. I, Environmental Effects Assessment, Section 7.3, Volume VII, Appendix A3-Feasibility Study, Sections 4 and 6.

Concern: The method of managing sewage sludge has not been confirmed by the proponent. The proponent intends to use prefabricated sewage treatment plants at both the port site and Contwoyto Camp during construction and operation phases. Discharge of treated effluent will be to the marine and freshwater environment, respectively. The terms of reference requires documentation of how sewage sludge will be managed. On Page 4-49 of Document A3, the proponent states " Sludge from the STP will be removed to a suitable storage facility approximately every 2 months." The DEIS does not provide an indication of what is a suitable storage facility or what volume of sludge will be generated.

Rationale: The assessment of potential effects of sewage sludge management cannot be completed until the volume of sludge method of management is identified.

Request: It is recommended that Bathurst Inlet Port and Road Joint Venture Ltd. clearly document the method for managing sewage sludge.

IR #24: Solid Waste Management

DEIS Reference: Vol. I, Environmental Effects Assessment, Section 7.3, Volume VII, Appendix G4 Environmental Management Plans, Section 7.

Concern: Management of solid wastes from the project is not documented. The EIS Guidelines required the proponent to document how all types of waste will be handled, stored, transported and disposed of. The DEIS does not address this requirement. Section 7 of Document G4 provides some general direction on waste management but does not present a Waste Management Plan. The volumes, types and waste disposal methods are not identified in the DEIS or supporting documents.

Rationale: The project has the potential to generate a variety of wastes during construction and operational phases. Proposed volumes, types and methods of managing the wastes should be identified to enable a full assessment of potential effects.

Request: It is recommended that Bathurst Inlet Port and Road Joint Venture Ltd. clearly identify the volume, types and locations of waste generated during each phase of the project and the proposed methods for managing the waste.

Hazardous Materials

IR #25: Hazardous Materials Management

Issue: Hazardous Materials Management has not been addressed in the DEIS

DEIS Reference: Vol. I, Environmental Effects Assessment, Section 7.3,

Concern: The EIS Guidelines require the proponent to identify the types and volumes of hazardous materials to be used or produced during the project. Additionally, a Hazardous Waste Management Plan was to be prepared. The proponent has addressed the main hazardous material to be stored and transported during the project, diesel fuel, but has not identified what other hazardous materials may be used/generated/transported, etc.

Rationale: The project has the potential to use/produce/transport a variety of hazardous materials during construction and operational phases. A full assessment of potential effects requires understanding of the types and volumes of hazardous materials involved and methods to manage them.

Request: It is recommended that Bathurst Inlet Port and Road Joint Venture Ltd. clearly identify the volume and types and hazardous materials involved in the project and management strategies to mitigate potential environmental effects.

Socio-Economic Issues

IR #26: Work Rotations

Reference:

Draft Social and Economic Impact Assessment (SEIA), Section 4: Page 10

Issue:

In the section *Effects Assessment* under *Effect Statement: Potential for rotational work schedules to disrupt aboriginal family unit/cohesion* it notes that the workforce rotation would be based on two weeks on, two weeks off format based on the current industry norm for Nunavut and Northwest Territory mining developments. While it is understood that this rotation is current industry standard it would be interesting to know if the Proponent considered other workforce rotation options for this project or consulted with individuals in the region in terms of the format of the rotation.

Recommendation:

The Proponent should provide some details on whether other workforce rotations were considered and whether consultation on the proposed workforce rotation occurred in the region.

IR #27: Area of Influence

Reference:

Vol. I, Page xvi

Issue:

In the section *Socio-economics* it notes that 15 communities within Nunavut and the Northwest Territories may be affected by the project. Further analysis throughout the DEIS notes various ways that these communities may be impacted by the development of the Bathurst Inlet Port and Road. It should be noted that for certain aspects of the project this area of influence may need to be expanded as there will be impacts on other communities, outside of these 15, that will be impacted. In particular, employees will come from other communities outside of the 15 noted and thus impacts will be felt in these origin communities.

Recommendation:

In the course of outlining the impacts of the project in the DEIS the Proponent should consider increasing the area of influence for certain aspects of the project.

IR #28: Treatment of Mining Developments in the Framework of the Project

Reference:

Vol. I, Page xix

Issue:

In the section *Socio-economics* it notes that "it is predicted that proposed and potential future developments including Gahcho Kue, Hackett River, Hope Bay deposits and Izok Lake will use the Project facilities to import supplies and export products." On what basis does the Proponent make the inference that these projects will actually use the Bathurst Inlet Port and Road facilities? Has the Proponent has discussion with the Proponents of these potential mining developments? Given imperfect information related to the nature of how these projects might use BIPR facilities, the timelines of these proposed projects and activities associated with these projects it could call into question assumptions associated with BIPR development.

Recommendation:

The Proponent should provide details on the information that was used to determine what projects might use BIPR facilities and what project's development might be positively impacted by BIPR development.

IR #29: The Proponent's Industrial Benefit Commitments are Limited and Unclear

Reference:

Vol. VII, Appendix F-7: Page 36/4

Issue:

Community economic development and the evolution of local and regional economies have been identified as important local concerns, and Wage Employment Opportunities and Economic Development is one of the assessment VSECs. Industrial benefits planning (respecting, for example, bid packaging, the arrangements for providing local companies with timely information about requirements and procurement processes, and any local preference policy) will be a key contributor to success in delivering local and regional economic benefits. However, the draft assessment provides limited operations phase-only discussion of the business opportunities and the Proponent's commitments respecting delivering local opportunities.

Recommendation:

The Proponent should provide a concise list of its construction and operations phase industrial benefits planning commitments in the DEIS in order to assess the Proponent's commitment to, and likely success in, delivering local business benefits.

IR #30: Impacts on Nunavummiut

Reference:

Vol. VII, Socio-economic Impact Analysis

Issue:

The socio-economic analysis in the DEIS does not clearly outline the socio-economic costs and benefits that could accrue to Nunavummiut. The DEIS often presents the costs and impacts in terms of Nunavut and the Northwest Territories combined.

Recommendation:

The Proponent should include more discussion of the impacts on Nunavut solely as this is of most importance for the purposes of the Government of Nunavut's review.

IR #31: Rationale for 20-Year Project Life

Reference:

Vol. I: Page 5

Issue:

The discussion under the section *Project Cost and Schedule* notes that the analysis is done on a project-life of 20 years.

Recommendation:

The Proponent should provide some rationale for why only a 20-year life of project was used for the analysis when intuitively one might expect the time-frame of study for this road and port project to be longer.

IR #32: Insufficient Use of Literature on the Socio-economic Effects of Northern Resource Development and Infrastructure Projects

Reference:

Volume VII, F-8 Page 769 (and References), F-9 Page 844 (and References)

Issue:

A review of references listed in the supporting documents for the Proponent's Social and Economic Assessment suggests that it has made only limited use of the extensive documents currently available on the socio-economic effects of northern resource development and infrastructure projects. The 2006 Review of Socio-economic Impacts states that in identifying and assessing VSECs of the Project, it made use of, among other things, a "comparative analysis of socio-economic reports for comparable projects impacting the same communities such as Doris North." Yet, the only report it cites is the analysis prepared for the Doris North project. Similarly, the 2003 Review of Socio-Economic Dimensions states that: "Based on the experiences in other northern areas, it is known that projects of this nature have certain known human and financial costs on families, community life and the demands for public services." However, it cites only one study undertaken for the National Round Table on the Environment and the Economy in support of its assessment of the potential impacts of the Project.

Recommendation:

The Government of Nunavut needs to be assured that the Proponent has adequately reviewed and taken into account the experiences of other northern development projects in assessing the effects of the proposed BIPR Project on the key VSECs that it has identified in its Social and Economic Impact Statement. As such, the Proponent should conduct a more comprehensive review of the existing literature on the socio-economic effects of northern developments and provide an accessible summary of its main findings. Particular attention should be given to concerns that have been raised about the socio-economic effects of developments similar to the proposed BIPR Project, as well as to the various policies, programs and initiatives that have been undertaken to address them.

IR #33: Requirement for a More Detailed Analysis of Project Impacts

Reference:

Vol. II, A-4; Vol. VII, F-2 Subsections 4.2.2 and 4.2.3, F-8 Page 30

Issue:

The Draft Social and Economic Impact Assessment identified a number of potential cultural and social effects from the BIPR Project anticipated for Nunavut communities. It also highlights the need for various mitigation measures to address these effects; these will be undertaken by the Proponent working together with other public and private agencies. Concerns about increased "strains on community services" and about "community preparedness" are articulated in the Proponent's *Report on Community Consultation* and in the 2006 *Report on Socio-economic Impacts*. But, beyond this, the analysis gives little attention to the Project's effects on the programs, services and institutions that will be responsible to deal with social issues arising at the community and regional levels during its

construction and operations phases. It says very little, in particular, about the capacity of existing programs and institutions in Nunavut communities to address the effects that may be generated by the proposed Project.

Recommendation:

The Proponent should prepare a more detailed analysis of the effects of the BIPR Project on community programs, services and institutions. Particular attention should be given to the ability of community institutions to effectively address the cultural and social impacts resulting from this Project.

IR #34: Requirement for More Analysis of Traditional or Land-based Harvesting

Reference:

Vol VII, F-2 ss.4.2.2 Pages 4-13 to 4-15, ss. 4.2.3 Pages 4-21 and 4-27; F-8 Pages 48-51 and Pages 87-89, F-9 Pages 15-17.

Issue:

The *Social and Economic Impact Assessment* discusses potential effects of the BIPR Project on "traditional pursuit skill levels" and on "participation rates in traditional pursuits" among residents of impacted Nunavut communities. Supporting documents briefly analyze the role of the "traditional economy" in the so-called mixed economy which currently supports Nunavut communities. However, this assessment fails to deal with the traditional economy or traditional activities in an integrated or holistic fashion. It neglects the crucial role of households and extended families in structuring the harvesting activities of community members, and of ensuring the coordination and distribution of income and other economic benefits from subsistence and commercial harvests. Also, it doesn't incorporate the findings of the extensive literature on the traditional or land-based economy in Nunavut, in particular, the detailed analyses of the dynamics of this economy, the conditions making for its viability, its contribution to household income, and its function in sustaining Inuit culture.

Recommendation:

The Government of Nunavut will be unable to adequately assess the Proponent's predictions about the effects of the BIPR Project on traditional activities in Nunavut communities until it is provided with a more detailed account of the dynamics of and role played by the traditional economy in Inuit community life. As such, the Proponent should prepare a more detailed and comprehensive analysis of the continuing role of the traditional economy in Nunavut communities, with attention to the crucial part played by households and extended families in structuring this economy. In undertaking this analysis, the Proponent should make use of the growing literature on the land based or traditional economy in Nunavut.

IR #35: Access Control and Monitoring Program for the Road

Reference:

Vol. 7, Appendix F-2; Appendix 1 (No. SE-NU-O-14)

Issue:

It is unclear how the Proponent (or any other entity which may seek an investment in the project in the future) will control access to the proposed road and continuously monitor tourist use of the road at the Contwoyto Camp, including the intended activities of tourists in Nunavut. Access to the road includes both the use of the road itself as well as crossing the road by foot/skidoo etc. In addition, it is unclear as to the nature of conditions that will be requested in any permit that may be issued to for the road. Of the 211 km of the proposed road, 82 km passes over Inuit Owned Lands and 129 km crosses Crown land.

The proposed access control and monitoring program may effectively eliminate the potential for locals and tourists to use the road throughout the entire year, potentially having a great impact on tourism and other activities in the region.

Recommendation:

The Proponent should describe in greater detail their proposed access control and monitoring program including the provision of additional information regarding the importance of an access control and monitoring program to the stakeholders consulted. In addition, it is recommended that the Proponent describe the nature of conditions that will be requested as part of the permitting process for the road. Depending upon the scope of the proposed access control and monitoring program, there may be additional jurisdictional questions that need to be addressed.

IR #36: The Need for Additional Wildlife Officers

Reference:

Vol. 7, Appendix F-2; Appendix 1 (No. SE-NU-O-14)

Issue:

The extent of consultation regarding the proposed solution of hiring of additional Wildlife Officers to patrol during prime hunting season is not described in the DEIS. Hiring additional Wildlife Officers will imply a budgetary commitment on the part of the GN that needs to be addressed. The extent of the current documentation on consultation does not indicate that these discussions have occurred. In order for the GN to assess its ability and/or willingness to support this proposed solution further information is required.

Recommendation:

It is recommended that the extent of these consultations and their outcomes be included in the consultation summary portion of the DEIS.

IR #37: Need for Tourism-related Discussion in the Baseline Report

Reference:

Vol. 7; Appendix F-7; Page 32

Issue:

Many communities within the area of influence have identified growth in the tourism industry as a goal for local economic development initiatives. Without an understanding of the extent to which the tourism industry is currently operating in Nunavut, the potential implications of the proposed project on the tourism industry cannot be determined.

Section 1.3.1 in Volume 7; Appendix F-7 identifies that the baseline report will consider tourism. Section 1.3.10 in Volume 7; Appendix F-7 notes that “Nunavut is focusing on the diversification of the economy through tourism”, and includes a listing of popular tourist attractions within the area of influence. However there is little qualitative and no quantitative tourism-related information in the baseline report.

Recommendation:

It is recommended that baseline conditions for the tourism industry be described in greater detail and included in the DEIS and that the comprehensiveness of the impacts assessment portion of the DEIS be re-evaluated in the context of this information.

IR #38: Impacts on Local and Regional Transportation Patterns

Reference:

Section 5.3 “Implications for Regional and Territorial Transportation Networks”. Abridged Feasibility Study, Document A3, Section 3.0 Port and Road Users. Socio-Economic Assessment, Document F2.

Issue:

The DEIS and supporting documents do not clearly state the changes to the existing transportation patterns on either the barge service or traffic patterns on the Tibbit to Contwoyto Winter Road that will result from the project or present an analysis of potential impacts to existing transportation systems and patterns.

Section 5.3 of the DEIS acknowledges difficulties with the Tibbit-Contwoyto Winter Road and benefits provided by the project; however an analysis of transportation pattern shifts is not presented. Tables 3.4-1 and 3.5-1 in the Abridged Feasibility Study appear to indicate that all diesel fuel and operating supplies currently being delivered by existing barge and winter road infrastructure will be delivered through the project. Section 3.5 states that only 10% of operating supplies to Nunavut communities will be delivered through the project with the remainder being transported on the existing barge system.

Recommendation:

The Proponent should provide an analysis of the potential impacts to local and regional transportation pattern shifts resulting from the project.

IR #39: Impacts on West Kitikmeot Barge Service

Reference:

Section 5.3 “Implications for Regional and Territorial Transportation Networks”. Abridged Feasibility Study, Document A3, Section 3.0 Port and Road Users.

Issue:

Removing 100% of the diesel and approximately 10% of operational supplies to the annual load shipped on the West Kitikmeot barge system is expected to have some impact to the viability and current level of barge service. Reduced freight volumes could affect tariff rates, frequency of service and ongoing employment from barge operations. An assessment of potential impacts to the existing barge service is necessary, especially as it is proposed to continue to fulfill a vital service after the project is implemented.

Section 5,3 of the DEIS states the project would not remove the need for the regular community barge resupply system from the south; however details on potential impacts to freight costs, schedules, locations of goods purchasing and potential effects on employment of barge network employees are not provided. This issue is not addressed in the Socio-Economic Effects Assessment (Volume VII, Document F2).

Recommendation:

The Proponent should provide an analysis of the potential impacts from the project to the West Kitikmeot community barge system addressing issues including future freight tariffs, schedules and employment.

IR #40: Cumulative Impacts on Traditional Land Use Patterns

Reference:

Vol. VIII, Report G-5, Sub-section 18.7.4, Page 11-7; Vol. VII. F-2, Sections 4.2.2 & 4.2.3, Pages 4-15 and 4-31

Issue:

The Proponent’s Cumulative Effects Analysis states: “Increased mineral development in the West Kitikmeot region of Nunavut facilitated by the Project will limit the traditional land use of the aboriginal groups within the cumulative effects assessment area of influence…although the Project does not itself encroach on land used by the Aboriginal populations, future mineral developments will create a much larger footprint that may encompass traditional lands.” It also highlights increased risks to water and air quality from ARD, sedimentation of aquatic ecosystems, and dust. However, the Proponent doesn’t address how these potential cumulative impacts will be mitigated, monitored or managed, or the role that it will play in undertaking these functions—either on its own or in cooperation with other parties. This is in contrast to other sections of the Cumulative Effects Analysis that specifically deal with issues of mitigation and monitoring.

Recommendation:

The Proponent should provide details on how it proposes to participate in mitigating, monitoring and managing the cumulative impacts of future developments “facilitated by the Project” on traditional land use patterns in the West Kitikmeot. The Proponent should also be required to link this additional analysis to its treatment of impacts on local Inuit land use patterns in its Social and Economic Impact Assessment.

IR #41: Direct Employment Opportunities

Reference:

Vol. 2, Appendix A-2, Sections 2.6.4 and 2.7.4.

Issue:

Employment and job opportunities have been identified as important community concerns, and Wage Employment Opportunities and Economic Development is one of the assessment Valued Social and Economic Components. The current direct employment information does not provide the basis for assessing the project’s effects.

Recommendation:

The Proponent should provide lists of the occupations (by NOC code) required by the project during the construction and operations phases, indicating the annual person-years of employment (for construction) and the average annual person-years of employment (for operations) involved.

IR #42: Local Wage Employment Estimates

Reference:

Vol. 7, Appendix F-2; Pages 12/4 and 24/4

Issue:

Employment and job opportunities have been identified as important community concerns, and Wage Employment Opportunities and Economic Development is one of the assessment VSECs. The draft assessment provides limited baseline information, asserts that certain numbers of direct jobs will be created, and states Inuit employment targets. No information is provided in support of the direct job creation numbers or Inuit employment targets, or the likelihood that they will be achieved, and it is not clear how or whether the project employment requirements (including the types and duration of employment) have been taken into account.

Recommendation:

The Proponent should provide estimates of the local direct wage employment resulting from the project construction and operations, and describe the basis for these estimates.

IR #43: Employment Multiplier Effects

Reference:

Vol. 7, Appendix F-2; Page 12/4 and 24/4

Issue:

Employment and job opportunities have been identified as important community concerns, and Wage Employment Opportunities and Economic Development is one of the assessment VSECs. The draft assessment provides limited information on the project's 'spin-off' effects and how they have been assessed.

Recommendation:

The Proponent should provide estimates of the amount and broad types of local indirect and induced employment resulting from the project construction and operations, including the basis for these estimates.

IR #44: Training Commitments

Reference:

Vol. 7, Appendix F-7; Page 24/4

Issue:

Employment and job opportunities have been identified as important community concerns, and Wage Employment Opportunities and Economic Development is one of the assessment VSECs. Training will be a key contributor to success in achieving local employment targets. However, the draft assessment provides no discussion of construction phase training and unclear commitments with respect to operations phase training.

Recommendation:

The Proponent should provide a concise list of its construction and operations phase training commitments in the DEIS.

IR #45: Statistical Socio-Economic Data and References

Reference:

- DEIS Volume 7, Appendix F-2 Socio-economics Effects Assessment, Appendix 2;
- DEIS Volume 7, Appendix F-7 Socio-economics Baseline Studies; all tables and charts
- DEIS Volume 7, Appendix F-9 Review of Socio-economic Dimensions of Bathurst Port and Road Project, Chapter 2, footnotes referring to Statistics Canada data, all tables and charts referring to Statistics Canada data.

DEIS Volume 7, Appendix F-10 The Economic Benefits for Nunavut and Canada; all tables and charts

Issue:

Some socio-economic statistical information was not well sourced in the text, charts, tables, footnotes and reference lists. In order to review the appropriateness and the correctness of the statistical information included in the DEIS and the FEIS, it is very important that detailed information about the data sources used be provided.

Recommendation:

The proponent should provide detailed sourcing for the data in the text, charts, tables, footnotes and reference lists. It is especially true for data sourced to Statistics Canada where a great amount of survey data is available. The name of the survey and the year of that survey, along with a catalogue number or CANSIM table number should be indicated (e.g., Statistics Canada, 2001 Aboriginal Peoples Survey, Catalogue # XXX). It is not sufficient to put only the website link. These links could change in the future or could already have changed. It would also be time consuming to verify each link to determine which survey was used.

IR #46: Survey conducted on behalf of the proponent

Reference:

DEIS Volume 7, Appendix F-9 Review of Socio-economic Dimensions of Bathurst Port and Road Project, Section 3.2, pages 35 to 49.

Issue:

The proponent indicates that a questionnaire was administered in two communities, the results of which were provided in volume 7, Appendix F-9, section 3.2 of the DEIS. Some information and results were provided for the communities of Cambridge Bay and Kugluktuk. There is little information regarding the methodology used to conduct this survey and the quality of the data.

Recommendation:

The proponent should provide the methodology for the above-mentioned survey (e.g., sampling method and size), explain why the survey was conducted only in two communities, and provide information on how the data was processed and weighted as well as information on the data quality (e.g., response rates, data limitations to take into consideration).

Heritage Resources

IR #47: Up-to-date Archaeological Resource Surveys

Reference

DEIS Vol. VII, Section 4.2 and 4.5

Issue

In these sections there is reference to archaeological work being conducted in 2000 and 2001 as well as possible some work being conducted in 2002. There are references to the fact that development plans for disturbance at these times were not finalized. All potential areas of disturbance must be finalized and reviewed for archaeological resources before it can be said that the area has been adequately investigated from and an archaeological perspective.

Recommendation

It is recommended that the proponent compare 2000, 2001 and 2002 development plans with the most up to date development plans and clearly indicate if all disturbance areas have been surveyed or evaluated for their archaeological resources.

IR #48: Status of Work on Archaeological Sites

Reference

DEIS Vol. VII, Table 5.2.1 (p. 5-4), Section 6

Issue

Table 5.2.1 list the archaeological resources found within the project area. The last column makes mitigation recommendations; for those entries that indicate "Further Study" it is unclear what if any action has been taken.

Recommendation

It is recommended the proponent provide information about the status of work on archaeological sites for which the archaeological recommendation is "Further study" even if the response to this is the regulator (CLEY) did not approve the work. The proponent also indicates that final field work will be done the prior to road construction, what plans are in place for this work to be conducted.

IR #49: Protection of Archaeological Resources

Reference

DEIS pp. 5-6, 5-7

Issue

The proponent acknowledges that the project with increase human activity in the areas where the archaeological resources are located. Indication as to what the proponent will do in order to assist with the protection of these resources is unclear.

Recommendation

It is recommended that the proponent consider ways in which it could assist with the protection of these sites from human distance.

HEALTH CANADA

Health Canada Santé Canada
Environmental Assessment Division
Safe Environments Programme,
HECS Branch, Health Canada
269 Laurier Ave W. AL 4904B
Ottawa, ON, K1A 0K9

March 20, 2008

Ms Leslie Payette
Manager of Environmental Administration
Nunavut Impact Review Board
P.O. Box 1360
Cambridge Bay, NU, X0B 0C0

Sent by e-mail to lpayette@nirb.ca

Subject: Health Canada's Information Requests for the Bathurst Inlet Port and Road project.

Dear Ms Payette,

As requested in your letter of February 19, 2008, Health Canada is submitting information requests related to our review of the Draft Environmental Impact Statement of the above-mentioned project. Health Canada's (HC's) questions all relate to our technical expertise in human health.

HC has identified a gap in the draft environmental impact statement related to potential project-related contamination of foods harvested and consumed by people in the study area.

An assessment of country food issues was not identified in the draft environmental impact statement (EIS) for the Bathurst Inlet Port and Road Project (BIPR). At a minimum, the human health impacts related to the potential contamination of country foods gathered from the area of this project should be considered.

The draft EIS indicated that hunting, trapping and fishing occurs in the area of the proposed BIPR. Therefore, the following information requests are required in order for the proponent to determine possible impacts related to of potential country food contamination from the perspective of human health:

1. Identify country foods (e.g. edible vegetation such as berries, the tissues (e.g. meat and liver tissues) of fish and wild game, etc.) gathered from the project area and consumed by local residents or by persons hunting or fishing in this area on an occasional basis;
2. Identify potential contaminants taking into consideration all project activities;

3. Identify contaminants of potential concern (COPCs) based on the feasibility of pathways of potential contaminants into country foods harvested from the project area;
4. Identify potential human receptors who may consume country foods harvested within the study area.
5. Based on information above, the proponent should determine if further assessment of human health risks from country foods is needed or whether periodic monitoring of levels of COPCs is needed in the country foods under study.
6. If it is determined that no further assessment or monitoring is necessary, a rationale should be provided to support these statements.

Detailed risk assessment information concerning food issues is provided in Volume 3, Chapter 8 of the Health Canada publication entitled “Canadian Handbook on Health Impact Assessments”. All of the volumes of this document is available on our website, at **http://www.hc-sc.gc.ca/ewh-semt/pubs/eval/index_e.html.** The information presented in this chapter of the handbook may be of assistance in providing the risk assessment information requested for the BIPR Project.

Thank you for the opportunity to participate in the environmental assessment process for this project. Should you have any further questions or comments, please feel free to contact me at (613) 948-2875 or by email at Carolyn_Dunn@hc-sc.gc.ca

Sincerely,

Carolyn Dunn

cc: Nellie Roest, HC – National Capital Region

INDIAN AND NORTHERN AFFAIRS CANADA

Indian and Northern Affairs Canada
www.inac.gc.ca
Affaires indiennes et du Nord Canada
www.ainc.gc.ca

Indian and Northern Affairs Canada's Information Request Submission to the Nunavut Impact Review Board on the Draft Environmental Impact Statement for the Bathurst Inlet Port and Road Project

March 20, 2008

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1.0 INTRODUCTION

Indian and Northern Affairs Canada (**INAC**) has prepared this letter to assist the Nunavut Impact Review Board (**NIRB**) with their coordination of the environmental review of the proposed Bathurst Inlet Port and Road (**BIPAR**) project. The comments are based on our review of the Draft Environment Impact Statement (**DEIS**) submitted for the BIPAR project (Rescan, December 2007: Volumes I-VIII). The comments are not intended as INAC's detailed technical evaluation of the project DEIS; rather, we identify herein especially those major issues from the DEIS which might be relevant for catalyzing additional thought and especially the resolution of knowledge gaps prior to commencing preparation and submission of a final project EIS document. Detailed EIS review comments will follow in the future.

In preparing these comments, we acknowledge that there has been limited time to undertake the review of information provided in the DEIS, including its seven major appendices. It is possible, therefore, that at least some of the information needed to address the data needs described herein may in fact already exist either within the appendices to the DEIS or elsewhere. Nonetheless, the issues identified herein arise out of either (i) an inability to find adequate explanatory information within the overall DEIS; (ii) apparent contradictions within different sections of the DEIS documentation; and/or (iii) concerns that the underlying issues have not been addressed by either the adequate identification of Valued Ecosystem Components (**VECs**) and potential impact scenarios, or by credible predictions of what might happen in association with various project activities and components.

Major issues identified from our examination of the DEIS are provided below in approximately the same order as information is laid out within the BIPAR DEIS. The majority of these were deemed by INAC to be substantive issues in the context of the overall environmental/regulatory review process.

As an overarching issue, we note that the proposed road alignment, anchored at either end by a proposed port location in Bathurst Inlet and a camp/staging area on the eastern shore of Contwoyto Lake, has not really changed since around 2000. This is in spite of the fact that a very good recent understanding has emerged about geology, landforms, ecosystems and biota - mapped at a relatively detailed scale along the Local Study Area corridor- from studies completed since then (based on documentation provided in various DEIS appendices), and especially based on 2007 field studies. An obvious question, therefore, is "*how has the new information gathered in support of the project application been used during project planning, to best support the project sustainability goals and minimize project impacts?*"

2.0 PROJECT RATIONALE

2.1 Information Request: Clarification of Project Rationale

Issue: There are possible discrepancies within the stated project rationale, associated in particular with the degree to which the new project will (i) reduce dependence on transport to/from current land-locked areas (or the coast) via the winter road, (ii) increase potential for and reduce costs of shipping of fuel from Bathurst inlet to more southerly operations, and/or (iii) increase options for transport of fuels and other supplies to other coastal communities.

Within the project description, it appears that there has been an attempt to demonstrate that current Kitikmeot and ISR region residents would be direct beneficiaries via increased access to cheaper goods and supplies, when the case for this might be relatively weak in comparison with the case for economic spin-offs associated with increased mineral resource extraction opportunities.

Appendix F-10: *Bathurst Inlet Port and Road: The Economic Benefits for Nunavut and Canada* did not formally assess economic benefits to northerners other than indirectly via enhanced operational efficiency/viability of Kitikmeot region mining activities.

There are other issues associated with the project justification as well. For example, if the annual fuel and supply haul period from the proposed port to Contwoyto Lake staging area is restricted to the January 31st to April 30th period as formally proposed, this would result in essentially the same timing implications associated with current use of the Tibbet to Contwoyto Winter Road, and the associated transportation cost benefits are not immediately apparent, since there would be an added requirement to move fuel and supplies to the new port facilities in addition to the over land/ice transportation costs.

The EIS would benefit from an enhanced description about the anticipated south to north or north to south movement of goods and services within periods of 2-5 years, 5-10 years, 10-20 years and beyond. A more concrete base case should be developed, without reference to e.g., fuel supply via ship from Europe of the middle east or other highly speculative events, unless the proponent specifically seeks approval for such events as core aspects of the project. Consideration of fuel transport via deep oceanic tanker has not been considered in the DEIS, and would significantly complicate the review of an already complicated project.

Reference: Executive summary, p. ii.; Appendix F-10 (Vol. VII)

Concern: The case for lower landed fuel and material costs at Cambridge Bay or other coastal communities in the Kitikmeot Region or Inuvialuit Settlement Region, and other direct benefits, might be over-stated.

Rationale: Based on the DEIS, impacts to some VECs cannot be absolutely precluded either through avoidance or mitigation. It is important, therefore, that residents of the region have information that is as accurate as possible about the reasonably anticipated benefits and costs.

3.0 PROJECT ALTERNATIVES

3.1 Information Request: Project alternatives

Issue: The DEIS does not contain an adequate assessment of alternatives within the project and alternatives to the project.

The Proponent should provide a much more detailed description and analysis for all alternatives within the project that were considered, as well as alternative means of carrying out the project. This should include a summary of the developments that lead to the 2003 project proposal.

A more complete and current list and analysis of alternative means of carrying out the project should be provided, including but not limited to a combined all-season road and winter road BIPR option. Formal applications for the Hackett River Project have been submitted, however the Izok Project has yet to be advanced. In light of this, an analysis of the option of constructing a portion of the BIPR road to all-weather standards to facilitate the development of the Hackett River project, followed by a winter-only road to Contwoyto Lake warrants consideration. Any proposed transportation routes that may have been announced since the alternatives assessment was completed should also be provided.

The assessment of alternatives within the project need to better consider finer-scale decisions for each major component (port, vessel type selected for fuel transport, fuel storage options, road, location and nature of construction and operations camps, airstrip, quarries and granular borrow areas), clearly indicating how the siting and size have been optimized in light of the overall need.

The alternatives and analysis presented should reflect the current development scenario in the Kitikmeot Region.

Reference: DEIS (vol. I.), Section 5.6; Appendix G-1.

Concern: The DEIS makes reference to 17 alternative project configurations that have previously been evaluated, toward selection of the preferred BIPAR option. These are not described at all in the DEIS, however. Furthermore, only three short-listed of 17 alternatives are discussed in Appendix G-1 (while four alternative road routes are shown on Figure 5.6-1 of the DEIS (Vol. I)). All alternatives presented in the 2007 DEIS are based on work that was completed in 2006 and 2007, most of it not in direct association with this proposed project.

The information provided is cursory. Only six pages of analysis are afforded this issue in the entire DEIS and appendices, including figures. Additional information is undoubtedly available in the EBA (2007) report referenced in Appendix G-1; however, this needs to be provided in the BIPAR EIS as well. The decision criteria used to rank the 17 alternatives (or three short-listed options) are not evident. Perhaps more importantly, several questions arise regarding the proposed project and alternatives that are not addressed in the DEIS:

- What port locations were considered within Bathurst Inlet?

- Why the choice of vessels for fuel supply of up to 50,000 tonne capacity and 213 m length?
- Why the choice for the fuel storage volumes at the port (220,000,000 L)?
- Why was the Contwoyto Lake terminus site chosen and what alternatives were considered? Could this impede future development of an all-weather road in future decades?
- What specific road alignments were considered in the context of route selection options such as maximizing traverses over exposed bedrock, and minimizing travel times, wetlands and surface water crossings, and wildlife habitat areas?
- Which, if any, of the options would allow extension of the operational window beyond Jan. 31 - Apr. 30, while minimizing environmental impact potential (e.g. to caribou populations on breeding and calving grounds, or to surface water resources)?

Rationale: The BIPAR EIS is not complete and cannot be adequately evaluated in terms of regional or cumulative impacts without better information on how various alternative routes and solutions for fuel and materials transport have been optimized in the context of ecologically sustainable economic development.

4.0 PROJECT DESCRIPTION

A well developed Project Description is critical to conducting an environmental impact assessment, including determining potential environmental impacts, risks, mitigation and monitoring requirements. Overall, Indian and Northern Affairs Canada (INAC) finds the Project Description to be conceptual and lacking certain critical details. In addition, a few components of the DEIS are self-contradictory with regard to project components or details. Such discrepancies merit resolution so that there is a clear understanding of the proposed project by all participants to the decision-making process.

It is clear that several aspects of the proposed project are not adequately documented within the DEIS. In particular, clarifications are sought on (i) materials handled at the port; (ii) camps/staging areas; (iii) anticipated road use; (iv) the airstrip; and (v) marine transportation.

4.1 Information Request: Materials moving through the port

Issue: The project description included in Volume 1 of the DEIS does not describe the types of materials anticipated for shipment via the proposed port on Bathurst Inlet other than diesel fuel, or for storage at the lay-down and storage areas. Figure 7.3-2 (Vol 1, p.24) shows “material laydown/rock quarry” area, but does not provide any details of design principles for adequate containment. Additional materials that need to be considered in the environmental assessment include the following:

- Various appendices to the DEIS (e.g. - Vol. II) make reference to the shipment and storage of concentrates from base metal mining. No plans were located for the storage or transport (terrestrial or marine) of concentrate, with the appropriate environmental safeguards.

- Given the obvious proposed users of the transportation route, it is reasonable to assume that process chemicals used especially in base and gold metal mining will be transported in the future, including but not necessarily limited to cyanide.

- It is stated on p. 25 of Vol. I that-

> "The ammonium nitrate prills will be barged or trucked to site in 1.5 tonne tote bags, packed in containers. Until mixed with fuel oil, ammonium nitrate is not an explosive, is stable, and requires no special storage facility."

This statement applies only to the explosive potential. Both diesel and ammonium nitrate must also be considered as potential contaminants (if released) in their own right, and must be handled and stored accordingly. Note also that it would be expected that the constituents of ANFO will be shipped and stored not just during road construction but also for the purposes of mining re-supply. Several sections of the EIS require adequate clarification in this regard.

The proponent should either indicate the limitations around materials that may be transported, handled and/or stored in the foreseeable future, or provide plans for the safe and environmentally benign movement and storage of various mining-related or other hazardous substances or other potentially contaminating materials.

Reference: Various, as listed above [Figure 7.3-2 (Vol 1, p.24); Vol. I, p. 25; etc.]

Concern: Failure to adequately anticipate materials transport and handling will result in loss of opportunity to address environmental, safety, and associated concerns during project planning, both within the port area and along the larger transportation corridor.

Rationale: The economic feasibility assessment and environmental impact assessment should be more fully aligned in terms of expectations for future project activities.

4.2 Information Request: Additional camps/staging areas

Issue: It is evident from the project description (Vol. 1) that there will be a requirement for at least two construction camps, not just the Contwoyto Lake camp.

The port camp, and any additional temporary or longer term camp and construction or operational staging area should be fully described in the project scope. Number of seasonal or long-term occupants should be described, along with expectations for solid and liquid waste generation, water needs and medical as well as other basic needs.

Reference: Several sections of the DEIS make reference to a camp at the port facility.

Concern: Environmental issues associated with the port construction (and operational era?) camp facilities have not been addressed in the DEIS. Anticipated issues might include sewage treatment and discharge (including localized eutrophication), solid waste management, various aspects of materials handling, and over-exploitation of local natural resources by employees and contractors.

Rationale: The proponent has provided figures of the proposed port and camp layout; however, the overall level of detail is too superficial relative to regulatory interest at the EIS review stage, since it is both highly conceptual and lacks adequate accompanying descriptions about important design principles to be incorporated during subsequent preliminary and detailed design.

4.3 Information Request: Road

INAC requests more detailed estimates (along with the identified degree of uncertainty) regarding the predicted types, volume and seasonality of use of the road in each of the following categories:

- Heavy equipment use during the construction phase, including periods outside of the Jan.-Apr. window, and expected degree of wetland and stream crossings;
- Lighter vehicle transit during the construction phase, including smaller vehicles and ATVs;
- Routine fuel and freight haulage, and worker transit trips, from January to April during the post-construction operational phase, especially for mine supply (Bathurst Inlet to Contwoyto Camp);
- Routine fuel and freight haulage from January to April during the post-construction operational phase (Tibbett to Contwoyto Camp and continuing north);
- All traffic associated with worker/contractor movements and road/route maintenance outside of the Jan.-Apr. window;
- Incidental traffic by regional residents and works outside of the Jan.-Apr. window.

It should be confirmed that the current development scenario in the Kitikmeot Region is reflected in the estimates provided.

Issue: It is very difficult for the reader of the DEIS to gain an adequate appreciation of the anticipated amount and type of traffic on the proposed road. Reviewers were particularly interested in expectations for use outside of the Jan. 31 – Apr. 30 annual window.

Reference: DEIS Vol. I, p. 25; others

Concern: The particulars of seasonal use of what was originally proposed as an all-weather road is viewed by INAC as an extremely important aspect of the project from the perspective of avoidance or mitigation of project impacts, both under current climate regimes and under future altered climatic conditions. For example, finfish use of surface waters for most species is transient based on migrations. Stream crossings and various maintenance activities along the

road may have the potential to adversely impact fish at or downstream from some road crossings if they occur at an inopportune time relative to fish movements.

It is stated on p. 25 of Vol. I of the DEIS that –

> "During spring migration, almost all of the animals in the Bathurst caribou herd could move through the Project area. The road will operate between January and April, so there will be no interaction between traffic on the road and caribou during spring migration. There will be far fewer caribou along the road during the winter hauling seasons".

In addition, the road traverses important caribou calving grounds.

There is a strong seasonal component to surface runoff and freeze-thaw cycles in the active layer. It is relatively clear that proposal of an all-weather road open for use year-round would elevate various concerns about impacts to fish, wildlife and surface water supplies. Nonetheless, it is apparent from an evaluation of the proposed construction schedule and road maintenance schedule that there is anticipated to be some use of the road year-round. A large number of rock-filled ford crossings of surface flows is proposed, and the implications of vehicular traverses of such crossings during mid-winter and mid-summer (or during peak run-off periods) are likely to be very different.

Finally, there is expected to be significant pressure once the road is built to use it for especially the transportation of mining supplies and concentrate outside of the four month, January to April period. The possible future relaxation of restrictions on seasonal use of the BIPAR road alignment should be considered in the context of the larger environmental implications.

INAC acknowledges the proponent's plans to limit public access; i.e. -

> "Public access to the road will be restricted due to safety issues. A gatehouse will be located at the Bathurst Inlet port and the Contwoyto Camp operations to monitor and dispatch traffic, and will be active year round. Similar to the existing TCWR, use of the all-weather road will be monitored under radio/satellite communications control to let all users know where vehicles are, to schedule departures and arrivals, and monitor operations for safety."
>
> (BIPAR DEIS, Vol. 1, p. 36)

Rationale: DEIS addresses primarily road use after freeze-up (Jan. 31 - Apr. 30) period and would not address concerns for wildlife impacts or surface water quality issues associated with other proposed activities outside of this window, including the construction phase activities.

4.4 Information Request: Road embankment construction design

Issue: The design intent for the roadway embankment is not clear.

The Proponent is requested to provide (i) additional information with respect to the design intent(s) and the results of any geo-thermal modeling completed for the roadway embankment;

and (ii) re-consider whether the proposed design will have the intended benefit of substantially facilitating cross-flows of near-surface and surface waters in lowlands portions of the route.

Reference: Appendix A-2, Sect. 5.2.5 – BIPAR Feasibility Study – Abridged Version September 2007, pg. 5-14.

Concern: Based on extensive granular embankment case history review and experience at several Arctic locations, fill depths of 1.6 and 2.0 m were recommended by the Proponent for ice rich and flood plain soils respectively. It would be helpful if the case histories studied were documented or summarized as they relate to this Project.

The use of large diameter rock at the base of the embankment was noted in the DEIS to improve cross drainage. INAC questions if the use of this material could potentially cause a cooling influence (via convection) contributing to eventual aggradation (mounding) of permafrost below the embankment. Will the allowance for cross drainage be sufficient to prevent alteration to the natural hydrological regime and permafrost conditions in the vicinity of the road? How much reliance is placed on cross drainage compared with engineered crossings such as fords, arch culverts and bridges? How will a lower embankment height facilitate improved cross-drainage?

Rationale: Without more information, INAC is unable to assess the full extent of impacts to sensitive permafrost terrain. It is recognized in the DEIS that alterations to surface flows and ponding can result in both permafrost effects and shifts in plant communities. It is important, therefore, to understand the potential for alterations in surface hydrology associated with the road design and configuration.

4.5 Information Request: Refinements to road alignment

Issue: It is unclear if the limitations for road construction described in Table 8 have been used to refine the proposed road alignment.

INAC requests that information with respect to avoidance of problematic or sensitive areas be incorporated in a final proposed alignment.

Reference: Appendix D-5, Section 2.3, Preliminary Bedrock Geology Characterization, page 32 and 33.

Concern: The terrain along the road corridor has been classified based on air photo review and field classification. Table 8 identifies limitations for the road location based on parent material types; e.g. lacustrine. In several cases, it has been recommended that certain terrain types be avoided e.g. boulder fields. It is unclear if the proposed road alignment has taken these concerns into account. If not, will adjustments be made to the alignment at a later date, and if so, at what stage in the project implementation.

Rationale: Without more information, INAC is unable to assess the full extent of impacts to unique landforms and sensitive permafrost terrain.

4.6 Information Request: Airstrip

Issue: The DEIS is very vague on the airstrip component; i.e. –

> "The airstrip will be used year round for operating personnel and light/perishable (food) cargo movements. A 75 m by 75 m helicopter landing area will be provided at a gravel pad adjacent to the northwest end of the airstrip."

The DEIS does not describe critical components such as the inter-relationship with other project components, infrastructure associated with the airstrip, expected number and types of flight, or expected influence of overflights on avian or mammalian wildlife. Will the airstrip have storage facilities for Aviation gas and / or Jet B?

Each BIPAR project component (i.e. -port, tank farm, fueling and truck storage area, port camp, road, Contwoyto camp, et cetera) merits consideration of the rationale, possible alternatives, and optimum configuration – both in isolation and holistically with other project components.

Reference: Vol. I – Draft EIS, p. 26; Appendix A-2 (Vol. II) (Project Description) is essentially silent on the airstrip component.

Concern: No environmental assessment of the airstrip component of the project has been provided to date (limited analysis has been completed of aircraft noise: Appendix B-3).

Rationale: The airstrip, like all other individual project components, needs to be assessed to develop a better understanding of the overall project implications.

4.7 Information Request: Controlling fuel spills in surface runoff

Issue: The DEIS is missing important information to how the diesel fuel will be stored and dispensed.

The Proponent should provide more detailed information on the transferring of diesel fuel from the tanks to the equipment at the camps.

Reference: DEIS Vol.1 Sect. 7.3.3.5.

Concern: Are there drip/spill plans or berms being used when transferring diesel fuel from the tank to the equipment being used at the camp? Would surface runoff from fuel storage and transfer areas be treated for more than suspended sediments, prior to discharge into fish-bearing waters?

4.8 Information Request: Fuel handling and spill response plans

Issue: The Proponent has not presented sufficient information on project construction and operations, with regard to petroleum hydrocarbon spill prevention and response.

INAC requests more specific details regarding spill contingency plans found in Volume 8 of the DEIS.

Reference: DEIS Vol. 1. Sec. 7.3.2.5.

Concern: INAC is concerned that in this section of the DEIS, there is no mention of a spill contingency plan. There are going to be 73 trucks (58 being fuel trucks) operated on the road on an annual basis. Accidental and chronic releases of fuel might occur during:

- Marine transport;
- Offloading from tankers at the proposed port;
- Transfer by fuel lines to the tank farm;
- Transfer to B-train tanker trucks and along lines and valves connecting the filling station with the ten 220,000 L tanks;
- Transfer to barges at the barge facility, for delivery to coastal communities and other supply areas;
- Transport along the roadway;
- Offloading at the Contwoyto Lake staging area;
- Storage at the Contwoyto Lake staging area;
- Subsequent transfers for delivery to mines and other areas.

In addition, there is expected to be potential for low volume releases associated with general handling and disposal/recycling of waste oils; materials handling at maintenance facilities; temporary fuel storage, transfers and use during various construction activities; *et cetera*.

It must be made evident that the spill contingency plan will be put in place without reading the Environmental Management Plan. Adequate planning for all expected uses of fuel/hydrocarbons needs to be addressed both from a spill response and release prevention perspective.

In addition, INAC seeks re-assurance from the project proponent that – as part of fuel transfers via barge – fuel will not be stored in barges for extended periods, nor over winter.

Rationale: Given the large volumes of petroleum hydrocarbons that would be transported, handled and stored, an ability to respond to spills is an essential component of environmental impact minimization.

4.9 Information Request: Utilities, power supply and water supply

Issue: Utilities, Power Supply and Water Supply

The Proponent should provide a more detailed plan for taking water from Contwoyto Lake, including amount, water treatment measures, and wastewater issues.

Reference: DEIS Vol. 1 Sect. 7.3.3.4

Concern: Data showing the amount of water being taken from Contwoyto Lake was not found in the EIS. Information on both daily and yearly water use should be provided. Information on water treatment, including a discussion of the adequacy of treatment should be provided. If waste water will flow in the direction of another camp downstream, this should be discussed as well.

Rationale: INAC requires more information in order to fully understand the effects of the project on water quantity and quality based on proposed operations at the Contwoyto Lake camp.

5 VALUED ECOSYSTEM COMPONENTS

5.1 Information Request: Baseline assessment and Evaluation of Project impacts to land forms and permafrost features

Issue: The DEIS (especially as documented in Vol. I) has overlooked important VECs, especially eskers as important geomorphic forms and wildlife habitat, other important geomorphic forms and permafrost features, and wetlands in general. This is in spite of the inclusion of these in the NIRB 2004 Final BIPAR Project EIS Guidelines.

INAC requests that the proponent re-consider choice of VECS, which should include important/unique landforms and permafrost features, as well as wetland features. This should lead to an in-depth analysis of the project with these VECs in mind.

Reference: Vol. I – Draft EIS; Vol. II (Appendix A-5), Section 5.3.2 and Table 5.3.-1; Appendix D-4

Concern: According to the NIRB, 2004, Final BIPAR EIS Guidelines –

> "Reasonable goals for reclamation normally include the re-establishment of stable physical landforms and land-use productivity, and the long-term physical and chemical stability of water resources. The Closure and Reclamation Plan shall discuss reclamation methods, the feasibility of those methods in the north, schedule and time frame."

Furthermore, according to the guidelines –

> "Baseline description shall include, but not be limited by, the following Biophysical components and processes within the Regional Study Area:
>
> **4.6.2.1 Terrestrial Environment:**
>
> a) special, sensitive, or unique geological or landform features (including inventory of wetlands and their function in the Local Study Area);
>
> …
>
> c) surface Geology and soils (including eskers);

d) coastal and marine Geology, processes and stability;

e) sediment mobility;

f) granular sources and characterization;

g) permafrost and ground ice conditions;

i) fluvial geomorphology and stability of stream and river crossings;

j) coastal and seabottom stability;

k) areas of ground instability and flood zones, if any;

l) seismicity; and

m) existing or proposed protected areas, special management areas or conservation areas, such as those proposed by caribou co-management boards and land use plans."

Several of these have not been adequately documented at a geographic (or temporal) scale that is conducive to project planning. In particular, the BIPAR DEIS has not considered unique or important landforms within the proposed project footprint as Valued Ecosystem Components. The DEIS does not provide an adequate baseline description of important landforms, including wetlands, eskers, or major permafrost features including massive ice deposits (ice-core hills and eskers, e.g.); nor does it evaluate potential project impacts to such features.

Eskers are important geomorphic features in their own right, but also provide micro-habitat variations for plants, and are important denning grounds for terrestrial mammals such as wolverines, wolves, and bears.

According to Table 21.2-2 (Vol. I., p. 66), 26% of vegetation on 347 ha of esker in Local Study Area (LSA: within 0.5 km on either side of the road and around staging areas) will be lost or disturbed. The loss of esker habitat and area is not identified as a project impact (no other vegetative habitat will be as affected on a percent basis).

Furthermore, it is not clear from the DEIS how much esker area would be affected by road alignment versus borrow areas. The loss of esker as potential denning habitat was apparently not one of the criteria used in evaluating routing options. According to Appendix D-8, "Wolf denning and pup rearing habitat occurs mainly in esker complexes, which is limited habitat throughout the local and regional study areas."

The main body of the DEIS does not provide adequate summary of baseline status of "riparian tall shrub" plant associations or wetlands in general.

If esker habitat was considered as part of road and quarry siting criteria, a different alignment might have been proposed.

Rationale: Eskers within the LSA are significant and important regional features, with heights of up to 20 m and lengths of more than 30 km. The biophysical assessment justifies a higher degree of concern for such features.

METEOROLOGY AND CLIMATIC EFFECTS ASSESSMENT

INAC has only limited specific information requests at this time, pending more detailed review of the DEIS. The reconstruction of climate norms (1971 – 2000) for the port area appears reasonable. The Appendix B-1 assessment attempted to quantify the amount of greenhouse gases that will be generated as a direct result of the project, and rated the potential impact as "moderate" for the simple reason that the estimate would comprise more than 1% of the total projected emissions from the NWT and Nunavut.

5.2 Information Request: Climate change influences on DEIS assessments

Issue: Of greater interest to INAC is the possible influence that climate change might have on the expectations for project – environment interactions, and project planning/design.

INAC would appreciate some analysis about how future climate change scenarios (including both temporal changes in averages and changes in more extreme events) might influence the EIS conclusions and project design.

Reference: NA

Concern: Climate change is of major concern to arctic residents, based on recent observations of relatively rapid ecosystem-scale responses to climate change, with impacts that are likely to be of much higher magnitude than in more southerly regions. Longer-term, synoptic changes in climate 'norms', as described in the DEIS, Appendix B-1, could influence one or more of the following:

- Seasonality of fish and wildlife migrations and other life cycle traits,
- Average and upper end air temperatures, leading to permafrost degradation and associated failures,
- Severity and frequency of storms,
- Magnitude of frequency of extreme rainfall events, potentially leading to alterations in hydrograph profiles for various surface water flows in the vicinity of the project footprint,
- Changes in erosional tendencies of surface runoff, and/or effects associated with wind erosion or drying,
- Changes in sea ice,
- Presence, persistence and severity of ice fog,
- Other.

Rationale: Given the scope of the project and possible longevity, it will be important to assess whether the various EIS assessments and conceptual design features are robust in the face of various climate change predictions over a time horizon of ~20 to 50 yr.

6 NOISE

6.1 Information Request: Noise effects to wildlife from blasting/underwater noise in Bathurst Inlet

Issue: The formal assessment of noise-related impact potential excluded any consideration of ship's noise (including underwater acoustic disturbances) and blasting at quarries during road and site construction.

INAC requests that the Proponent extend the assessment of noise-related impact potential to include especially blasting at quarries, and underwater noise transmission and area of influence with Bathurst Inlet. The focus should be much more on wildlife than humans, relative to the information presented in the DEIS (including appendices). In addition, there needs to be strong substantiation for any recommended acceptance of blasting during critical reproductive, migratory and other periods of important wildlife species, including raptors, waterfowl, other bird species, carnivorous mammals, and ungulates.

Reference: BIPAR DEIS Appendix B-3; Appendix D-3; Vol. I.

Concern: The anticipated traffic-related noises appear to have been adequately assessed in the DEIS, with a focus primarily on human perceptions and effects, as opposed to wildlife aversion/effects. According to the DEIS –

> "The assessment for construction of the port and road is based on Snap Lake results for construction (Table 4.1-3)"

It was not clear what construction-related activities his would include. In addition, no details of model and modeling parameters/assumptions were provided in the DEIS support material. Such information must be included in the Final EIS.

The evaluation of noise impacts on wildlife appears to have been cursory. According to the DEIS –

> "For a detailed discussion of the effects of noise on wildlife see Appendix D-3 of the DEIS (Wildlife and Wildlife Habitat Effects Assessment)."

> "Research indicates that animals may habituate to periodic noises if the noises are predictable. Insome studies, for example, animals were not affected by airplane noise when they could see the airplane before hearing it, but responded negatively when the noise occurred without warning (Weisenberger et al., 1996; Conomy et al., 1998)."

Additional relevant information was not found in Appendix D-3. It also appears that no description of possible wildlife effects associated with blasting (e.g. during critical periods, or near occupied denning sites) has been provided in the DEIS.

Rationale: It was unclear to INAC reviewers why the project construction schedule did not consider modifying the type and intensity of various activities in relation to caribou migrations and calving, raptor and carnivorous mammal reproductive periods, or even fish windows. Such an encumbrance on the project construction schedule is typical for other similar types of activities within and beyond the region of interest. Relaxation of scheduling around wildlife effects avoidance periods would require a very strong technical substantiation with a very low degree of uncertainty about predicted impacts.

7 SURFACE WATERS

7.1 Information Request: Water extraction from un-named creek at port site

Issue: It is proposed on p. 26 of Vol. I that water will be drawn from an un-named creek at the Bathurst port facility site, and "used for concrete, granular fill materials washing and potable use"

Adequate information on seasonal and annual flows, and minimum stream flow requirements is a prerequisite to evaluating acceptability of this and indeed all proposed water sources.

Reference: DEIS Vol. I, p. 26.

Concern: More information on the predicted impatct to the un-named creek is needed. This should include seasonal, annual and minimal flows, the estimated volume of the un-named creek. If water will be released to the un-named creek, information on this should also be provided, including whether it will be treated.

Rationale: This information is necessary to verify that water utilization rates will not impair other important functions.

7.2 Information Request: Hydrological data

Issue: Appendix C-1 discusses hydrographic data availability and mean monthly discharge estimates for watersheds influenced by the proposed project; however, the information summary is largely derivative, and detailed underlying data would be useful.

INAC requests that the Proponent provide more detailed information on the hydrograph of the actual or estimated data for various streams, including the particulars of the underlying data.

Reference: DEIS Vol.1 Sect. 16.1; Appendix C-1; DEIS Vol. 2 A-2 Sect. 3.2; other (see below).

Concern: Underlying data are needed, along with assumptions, so that flow projections and seasonal trends can be better understood. Annual runoff for the area ranges from approximately 200 to 250 mm, depending on latitude and precipitation amounts, of which the freshet period can be greater than 70% of this volume. Where did this data come from and can it be provided? Does this data have a range of at least 25 years?

Additional questions arising from the initial review of the hydrological assessment follow:

Reference; DEIS Vol.2 A-2 Sect. 3.2

- Figure 10 and 13: Are these extreme daily maximums or monthly highs or average monthly highs (1956-1982)?
- Figure 11 and 14: Is this the mean monthly precip? …or the average of extremes? Should include max and min monthlys for period of record.

- Figure 12 and 15: Provide wind roses. Consider combining Contwoyto Lake and Lupin records.

Reference; DEIS Vol.2 A-2 Sect. 3.4

- Where are the calculations on precipitation and runoff? The numbers and precipitation profile don't add up (For example figure 15).

- Estimated hydrology of Amageok Creek and Mara River?

Reference; DEIS Vol. 3 B-1 Sect. 2.2.2

- Table 2.2-3 & figure 2.2.-4: Monthly rainfall(mm) at the Port, Lupin, Kugluktuk and Cambridge Bay for the period of August 2001 to August 2004. Are there any data collected from September 2004 to the present date (March 2008)?

- Table 2.2-4: Precip Climate Normals for Lupin and Bathurst Inlet. How were the monthly averages calculated?

Reference; DEIS Vol. 3 B-1 Sect. 2.3.2

- Not enough info about the climate along the road; specifically precipitation. The Proponent should indicate the year(s) the data from Figure 2.3-4 was taken. INAC is concerned about Figure 2.3-4 Adjusted Climate Normals for Precipitation at Lupin…This figure does not show a timeline…What year(s) is this data taken from? Where does this data come from?

Reference: DEIS Vol. 3 B-5 Sect. 3.2

- Concerns: Table 3.2-1 and Figure 3.2-1: Total Monthly Precip at Bathurst Inlet and Regional Meteorological Stations, August 2001 to August 2002…. Provide data that is more recent!! Also provide a longer time period of data! Recommend 25 year period.

Rationale: Underlying data descriptions needed to assess accuracy of EIS assessment/predictions.

7.3 Information Request: Wetlands and distributed flows

Issue: The hydrological analysis, water quality, and effects assessments appear to be virtually silent on the role of wetlands habitats in water conveyance/supply or based on ecological value. The wetlands can likely be variously divided in arctic bogs, fens, marshes, swamps, and shallow open waters (e.g. based on the Canadian wetlands ecosystem classification system or a system better suited to arctic wetlands ecosystesm). In addition, various fens and bogs along the route could be classified as ombrogenous or geogenous depending on seasonal and annual water supply and fluctuations.

A better understanding of the extent and types of wetland in the LSA would provide an improved understanding of several emergent characteristics of relevance to the EIS, potentially including –

- Open-channel stream flow elevations and seasonal trends;
- Expectations associated with road-induced changes in surface flows and subsequent thermokarst formation potential;
- Water movements through road beds;
- Migration potential of any ML/ARD releases;
- Vegetation community status.

INAC requests that more discussion in the EIS be focussed on wetlands in the LSA.

Concern: Failure to appreciate water flows through not just open channels flows but also contiguous wetlands might result in underestimation of stream height variation or erosional potential at road crossing sites.

Rationale: Adequate consideration of wetlands processes and distribution may help with planning around the type and specific configuration of stream crossings, especially in light of the very limited hydrographic data available at each proposed crossing.

7.4 Information Request: Culverts and bridges

Issue: There is inadequate information on design parameters for culvert and bridge crossings.

INAC requests additional information on (i) the conceptual design guidelines and rationale (i.e., what design standard that was followed?), and (ii) how local site water elevation benchmarks will be established.

Reference; DEIS Vol. 1 Sect. 16.2

Concern: Information should be provided to allow reviewers to assess the validity of the following information. A basis for estimation of the 1 in 25 year level should also be provided:

- Arch culverts and bridges will be designed to pass a 1 in 25 year flood event with additional 0.3m of freeboard to pass ice and snow debris during the freshet period.

Rationale: INAC requires this information to assess the suitability of various stream crossing options. Given the large number of stream crossings over the 211 km of road length, it will be important that the design features are clearly laid out, substantiated, and consider all relevant issues such as future changes in extreme and longer term flows.

7.5 Information Request: Fords

Issue: Fords and Stream Crossings

The Proponent should provide evidence of researching the stability of fords during spring runoff.

Reference; DEIS Vol. 2 A-3 Sect. 5.2.8

Concern: INAC is concerned that during the spring fords may wash away due to their loose structure. Fords, which are essentially a combination of loose gravel and rock, are designed to accommodate some amount of runoff, but may become impassable with heavy runoff.

Rationale: The possibility of fords washing away should be discussed to ensure a complete assessment of the impacts of the project.

7.6 Information Request: Surface water quantity monitoring

Issue: Plans for surface water quantity monitoring/hydrographic data collection, beyond the port area, were not evident in the DEIS.

The Proponent should provide a detailed description of any surface water quantity monitoring plans.

Reference; DEIS Vol. 1 Sect. 16.4

Concern: Plans for a surface water quantity monitoring program were not found in the DEIS. Without these it is not clear how the proponent will ensure that predictions with respect to surface water quality are accurate and how surface water quality will be ensured.

Rationale: Without these it is not clear how the proponent will ensure that predictions with respect to surface water quality are accurate and how surface water quality will be ensured.

8 SURFACE WATER QUALITY

8.1 Information Request: Stream and wetland crossings

The Proponent has not presented sufficient information concerning the effects of the project on stream and wetland ecosystems.

INAC requests references for these specific indications.

Reference: DEIS Vol. 1 Sect. 7.3.2.3 (Stream crossings); Appendix C-1

Concern: Are there any data for the rate of natural flow (speed, direction) for all the streams? Is the data taken from a minimum of 25 years? Are there any data showing the estimated flow change when stream crossing are put into place. Are the stream crossings built to last the flow of water? What type of stream crossings are being used for the three large streams (catchment areas of > 100km^2)? When installing stream crossings, it may cause a constriction in the waterway which can obstruct flood flow and cause flow backups or washouts. Also water levels may rise causing ice dams?

Table 7.3-1 (Road Design Criteria) shows the width of the bridges at 6.0m. Where did this 6.0 m come from? Table 7.3-2 (Numbers of Crossings per Watershed Size) shows the watershed area range (km^2). What about showing flow, speed, width and direction! When referring to handling peak flows(ie., 1:25-year event) where did the numbers 1:25 come from?

Rationale: In order to fully understand the full effects of water quantity of the stream crossings, INAC requires a more detailed description.

8.2 Information Request: Bank stability/permafrost conditions at bridge and culvert stream crossing

Issue: Descriptions of bank stability and permafrost conditions at bridge crossings are not provided.

INAC requests that information be provided with respect to the stability of banks where bridge abutments or culvert installations are planned; e.g. Mara River.

Reference: Appendix A2, Sect. 5.2.7 – BIPAR Feasibility Study – Abridged Version September 2007, pg. 5-21

Concern: Failures of frozen soils at river crossings are of particular importance in permafrost settings. Has the condition of the riverbanks been characterized with particular attention to

potential failure modes associated with degrading permafrost or ice lensing/wedging in sedimentary bedrock formations?

Rationale: INAC is currently unable to fully assess the suitability of major river crossings proposed for this project.

8.3 Information Request: Construction site water management

Issue: There is missing information about the dewatering process at the construction sites.

The Proponent should provide a more detailed plan of the de-watering process of construction sites.

Reference; DEIS Vol. 1 Sect. 16.3,

Concern: It is stated that during construction, erosion will be minimized by de-watering construction sites as required. However, the proposed methodology for dewatering is not provided.

Rationale: INAC does not have enough information on the dewatering process to determine the significance of environmental effects, if any.

8.4 Information Request: Planning associated with potentially acid generating (PAG) materials

Issue: ML/ARD from quarry materials and granular material has the potential to influence especially surface water quality. The mitigative measure that will be employed should it be determined that bedrock or granular resources have the potential for acid rock drainage is not clear.

INAC requests that the Proponent clarify the mitigative measures that will be employed should it be determined that quarry or granular sources have the potential for acid rock drainage.

Reference: Appendix A2, Sect. 3.1 – BIPAR Preliminary Project Description, pg. 25

Concern: Two mitigative measures are proposed. One is to blend acid generating rock with basic rock so that the acid run-off is neutralized. The second measure, described as a more satisfactory strategy, is to avoid using road-building materials that show acid generation potential. It is not clear if these are alternatives and if they are what rationale would be followed for the selection of the preferred strategy. If the strategy is to avoid the use of quarries or granular sources that have a high potential for acid rock drainage, the Proponent should respond to the following questions:

- Will additional quarry sources be identified or will the currently proposed sources (deemed to have a low potential for acid rock drainage) be expanded to obtain the required granular volumes?

- Are there any associated environmental considerations associated with increased haul distances that may be required if fewer quarry sites are utilized?

- If blending is proposed, where and how will the buffer material be incorporated within the road embankment and what material will be used as a buffer?

Rationale: Without information concerning the selection of mitigation measures and the rationale for the selection of these measures, it is difficult for INAC to determine if the impact assessment is appropriate.

8.5 Information Request: Existing water quality data

Issue: Missing data in DEIS regarding water quality in Contwoyto Lake.

The Proponent should provide stream water quality data from 2001 and 2007, justification of gathering the temperature at Contwoyto Lake. They should also provide data on turbidity and water quality.

Reference; DEIS Vol. 1 Sect. 17.1

Concern: INAC reviewers were not able to ascertain from the DEIS where the data 2001 and 2007, showing the water quality of each stream, was collected from. How was the average temperature for August of 12.7^{o}C arrived at for Contwoyto Lake? Was the average taken from a minimum of 25 years?

This is a relatively high summer-time temperature for a mid-arctic lotic system. There might be greater concern, therefore, about the localized or broader influence of sediment and nutrient inputs (e.g. from treated sewage effluent) on bacterial and algal productivity and composition.

Rationale: It will be necessary to evaluate in more detail the proposed treatment type and performance levels of various wastewater treatment options for the camp at Contwoyto Lake. The characteristics of the receiving environment will have some bearing on the effluent quality requirements.

9 FRESHWATER LIFE

9.1 Information Request: Impact associated with increased fishing pressure

Issue: Increased exploitation pressure of fish and wildlife is expected near focal points of human activity, especially the Contwoyto Lake and Port Camp areas.

The Final EIS should better address possible pressures on fish and wildlife populations associated with increased pressure by especially employees and contractors working on the BIPAR project.

Reference: None – this issue has not been addressed in the DEIS (?). Camp workers will be precluded from hunting while in camp, but no mention is made regarding fishing.

Concern: It is stated on p. 62-63 of Vol I of the DEIS that –

> "There are 104 stream crossings along the proposed road from Bathurst Inlet to Contwoyto Lake. These were sampled in 2001 and 2002 for fish habitat and fish community. The majority of active streams were wide and shallow, with low gradient and low discharge in the late summer. Glides were the dominant habitat type, with riffles and pools also present. Cascade habitat was rare. Few pools occurred due to the wide, shallow nature of the streams typical of the region."
>
> "All potential lethal effects were classified as having **Negligible** residual significance for Arctic char, lake trout and whitefish because these species use the streams in the Project area mainly as migratory corridors. Streams may be used by some fish as spawning or rearing habitat, but the presence of these species outside of Contwoyto Lake was uncommon to rare. Impacts in Contwoyto Lake were deemed to be **Negligible** because of the size of the lake relative to the small footprint of the camp."

The assignation of impact ratings to various fish populations in the DEIS did not account for direct mortality associated with exploitation.

Rationale: Increased access to an area is generally accompanied by increase access to fish and wildlife stocks. Without adequate anticipation or management, impacts may occur.

10 TERRESTRIAL – GEOLOGY AND SOILS

10.1 Information Request: Use of esker materials

Issue: The expectations for use of esker material for road construction are not clear from the DEIS.

The Proponent is requested to give an estimate of how much esker material is anticipated to be used compared to other materials, and to minimize the use of esker materials so that there is consistency between this proposed project aspect, the wildlife baseline assessment information, and proposed risk management measures.

Reference: Appendix A2, Sect. 2.4 – BIPAR Preliminary Project Description, pg. 12

Concern: Although it appears that the road embankment is to be constructed using crushed rock, it is unclear if the crushed rock will be exclusively sourced from bedrock quarries. The comment on non-availability of esker material in the winter months contradicts the proposed schedule that shows production and placement of granular material during the summer. It is also possible that granular material from Gravel-site G5 (esker) might be used as a buffer to offset the ARD potential in other zones (reference Appendix D-2, Section 2.1, Bedrock Geology, Surface Material, and soils Effects Assessment, pg. 2-2).

Rationale: Without more information, INAC is unable to assess the full extent of impacts to unique landforms such as eskers which may be deemed Landforms and Soil VEC.

10.2 Information Request: Granular materials grain size analysis

Issue: Laboratory test results for the engineering properties of granular material from the eskers have not been provided.

INAC requests that any information with respect to the engineering properties of the granular material from eskers be provided, in particular grain size distributions.

Reference: NA

Concern: Without further descriptions of this material, its suitability for the intended purposes cannot be assessed. Gradation results would help assess the fraction of the material that meets the requirements of the project and what percentage of reject material might be encountered.

Rationale: INAC is unable to fully assess the suitability of granular resources from eskers for use on this project.

10.3 Information Request: Ice core eskers

Issue: The potential for and measures to deal with massive ice that may be encountered in eskers is not described.

INAC requests that the likelihood of massive ice be evaluated and mitigative measures be proposed should massive ice be encountered in granular borrow areas, or in areas immediately adjacentn to disturbed areas.

Reference: Appendix A2, Sect. 5.2.9 – BIPAR Feasibility Study – Abridged Version September 2007, pg. 5-26.

Concern: INAC is concerned that massive ice within eskers may be encountered and there exists a potential for run-away thermokarst in these areas of thick massive ice, should such features be disturbed.

Rationale: INAC is currently unable to assess the full extent of impacts to uncommon landforms such as eskers which are a Landforms and Soil VEC.

10.4 Information Request: ML/ARD from quarried materials

Issue: Potential quarries sites were not available at the time samples were collected for ARD testing. Where possible, the potential for ARD has been determined by comparing rock types between quarry locations and bedrock outcrops which were sampled and tested for ARD.

The Proponent is requested provide the protocol and timing for a screening program to determine the potential for ARD at proposed quarry sites.

Reference: Appendix D-5, Section 4.0, Preliminary Bedrock Geology Characterization, page 4-1

Concern: The preliminary ARD screening process demonstrated that potentially acid generating bedrock may be present within the vicinity of the proposed road route. A more detailed ARD screening program is required for each of the proposed quarry sites and bedrock cuts. Of particular concern is the timing of the screening program with respect to construction start-up and what screening measures are planned during quarry development or are to be included in the Project Environmental Management Plan.

Rational: Without confirmatory information concerning the site specific potential for ARD from the quarried rock or rock cuts, it is difficult for INAC to determine the potential for environmental impacts.

10.5 Information Request: Physical and chemical characteristics of potential quarry sites

Issue: Site specific characterization of bedrock at potential quarry sites was not carried out.

The proponent is requested to provide the timing for additional geological mapping/investigations at proposed quarry sites to confirm or determine rock type classification.

Reference: Appendix D-5, Section 3.1.6, Preliminary Bedrock Geology Characterization, page 3-9

Concern: Potential quarry sites and road cuts were identified after field work and field mapping. Bedrock evaluation and rock type classification has been based on bedrock geology maps and the results of field-mapping in nearby outcrops. Quarries that did not occur on or near field-mapped outcrops were not assigned a rock type classification.

It would also be helpful if the boundaries for IOL and Crown Land be provided on drawings where quarry sources are provided or if this information was provided in a summary table with the requested information on physical and chemical properties.

Rationale: INAC is unable to fully assess the suitability of quarry sites for use on this project.

10.6 Information Request: Additional field sampling of surficial soils

Issue: Additional field sampling of surficial soils is required for detailed planning.

INAC requests that the details and timing for any additional field sampling be provided.

Reference: Appendix D4, Section 2-3, Geology, Soils and Ecosystem Mapping, pg. 31

Concern: The comments provided in the report are for the general surficial geological conditions described for each material. Detailed planning will require additional field sampling in particular to determine adverse terrain types.

Rational: INAC is unable to fully assess the suitability of the roadway alignment with respect to adverse soil conditions without the benefit of additional field sampling to confirm parent material types and limitations for road construction.

10.7 Information Request: Saline permafrost occurrences.

Issue: There is no mention of permafrost salinity.

INAC requests that information with respect to permafrost salinity be provided.

Reference: NA

Concern: Saline permafrost may impact the freezing point depression.

Rationale: Measured values would help INAC assess the expected performance of constructed works.

10.8 Information Request: Additional soils/geology issues

Issue: In addition to the five items discussed above, INAC's preliminary review of the BIPAR DEIS has raised a variety of other questions.

INAC requests clarifications regarding the following additional points.

- Vol II, Appendix A-3, Section 4.4.1: Port Geotech – Could permafrost agrade into the wharf structure and causeway? If so, what is the implication to performance and operation?
- Vol II, Appendix A-3, Section 5: Road. It is stated that the bedrock for the first 70 km is predominately sedimentary. Page 5-11 states "gritstone, mudstone and shale". Experience with shallow sedimentary rock (shales for example) in the Igloolik area has shown that some outcrops are very ice rich. The shales have fractured along bedding planes and allowed water to enter forming ice lenses. Has the presence of ice-rich sedimentary bedrock been considered in the routing and road design?
- Vol II, Appendix A-3, Section 5.2.5: Geotech design of the embankment – DEIS states that a lower embankment height is better than a high one. The text further indicates that a lower embankment improves cross drainage.

11 TERRESTRIAL – ECOSYSTEMS, VEGETATION, WILDLIFE

11.1 Information Request: Uncommon plants and communities

Issue: The main body of DEIS is dismissive of plants as VECs, stating –

> "No rare or sensitive ecosystems or plants were identified within the RSA or port or road LSAs; they are all commonly distributed throughout the Arctic coast wherever the terrain is suitable."

This statement is inconsistent with the summary of the plant assessment, which states –

> "Although there are locally uncommon species such as ferns, orchids, louseworts, legumes, and violets, in this study no species considered "rare" by international standards were encountered. In many cases, the project area occurs at the edges of the ranges of certain species, or in habitat that does not support them. This study produced a few range extensions, not unexpected, as the area is not botanically well known."

The possibility of and merits of avoidance of disturbance to locally uncommon plant (and allied faunal) species should be considered in the project design.

Reference: Appendix D-4

11.2 Information Request: Spatial scale of wildlife assessments and associated project planning issues

Issue: The proposed project siting and timing do not adequately reflect the stated impact avoidance guidance

INAC requests that the appropriate impact avoidance and mitigation measures addressed in detailed DEIS appendix material be better used and referenced in defining the overall project scope, siting, and as captured in the main body of the DEIS. In particular, it appears that wildlife and habitat management recommendations arising from earlier assessments is not reflected in the currently documented project design.

Reference: Appendix D-3. Wildlife and Wildlife Habitat Effects Assessment; Appendix D-7, Wildlife Baseline Studies, 2001-2002.

Concern: Appendix D-7, and especially Figures 2.3-2 and 2.3-3 provide detailed locations of observed wildlife observations, raptor nests and carnivorous mammal denning sites. Since this information is only available at the LSA as opposed to RSA scale, it is not known whether minor or major route alternatives could result in reductions of potential project conflicts. Since the proposed route has not been substantively altered since prior to completion of the 2001-02 wildlife surveys, it raised the question about whether route selection has adequately considered minimizing risks to raptors, carnivores and/or other VECs.

According to the DEIS Project Description (Vol. I, p. 32) –

> "A number of competing alternative route corridors were investigated based on construction, operating costs, terrain controls, and the following factors:
>
> …
>
> - environmental controls, impacts and mitigative measures;
>
> …
>
> Potential effects on caribou were also considered in the route selection and road engineering study."

Since route selection seems to have been substantially established prior to availability of the wildlife baseline studies, it is difficult to see how wildlife and water quality effects minimization was considered.

Rationale: The overall DEIS, and in particular road routing and granular material source assessment should be far better linked to the recommendations arising from highly detailed biophysical assessment work completed to date.

12 MARINE ENVIRONMENT

12.1 Information Request: Marine transport methods

Issue: The BIPAR DEIS (Vol. I) addresses only two of many important aspects associated with the transportation of diesel fuel and other materials to and from the proposed port facility via large marine vessels (up to 50,000 tonne capacity, 213 m length and 12 m width): (i) general features of potential shipping routes via the eastern and western arctic; and (ii) recommendations for additional navigational aids for Bathurst Inlet. Figure 7.3-5 (Vessel Approach Route and Navigation Aids) makes it very clear that navigation through the Bathurst Inlet access route without incident for a large sea-going vessel will be far from trivial.

There is restricted passage especially in the vicinity of Entry Islands, Breakwater and Fishers Islands, Ekalulia/Shoe Islands, Red Islands, Quadyuk Islands, and near Kingaok, which will make safe navigation difficult even on clear, fair weather days. Freighters or tankers may be hauling large amounts of refined hydrocarbons, metal concentrates, and a wide variety of potentially hazardous materials.

INAC requests additional information on the following:

- types of marine vessels proposed;
- whether tankers will be single- or double-hulled;
- anticipated needs for tug support (port selection criteria include adequate turning/wharfage area for “tugless” operation; however, this may not alleviate the need for tugs for other purposes. Interested parties should evaluate tanker traffic safety and environmental requirements for Prince William Sound);
- anticipated needs for use of a harbour pilot and vessel to assume control of ship operations within constricted waters and near the community and port;
- expectations regarding safe and environmentally sustainable operational window with regard to wind and sea state, visibility, sea ice, presence of marine mammals, presence of other vessels (including small boats);
- grounding and spill avoidance measures;
- spill response measures;
- availability of oil spill response infrastructure and capacity;
- presence of viable shellfish beds along the Bathurst Inlet portion of the route, the future use of which could be encumbered or lost as a result of accidental or chronic spills and contaminant inputs);

- baseline data on PAH (as petroleum hydrocarbon constituents) and metal levels in representative shellfish (clam, other) samples;
- presence of important marine mammal or fish foraging grounds within Bathurst Inlet;
- mapping of sensitive shoreline habitat, including estuaries and staging areas for migrations of aquatic species such as anadromous stocks of arctic char;
- needs for financial securities against future marine accidents.

Reference: BIPAR DEIS, Vol. I., sections 7.3.4 and 7.4.3.1; Figure 7.3-5 (Vol. I); Appendix E.

Concern: There is a concern that the large number of avoidance/mitigation measures proposed by technical experts (DEIS Appendix E) for water and sediment quality, plankton, fish, seabirds, and marine mammals will be lost in the larger planning and implementation process. In addition, the spatial scale and depth of knowledge documented in Appendix E is not adequate relative to project issues and planning needs.

Rationale: The ability to transport large quantities of fuel and supplies via the marine environment is an integral part of the project rationale as well as acceptability from an environmental and socio-economic perspective. Since no detailed EIS has been completed of proposed marine activities to date, no reasonable set of decisions can be provided on the project acceptability.

12.2 Information Request: Probability of marine oil spills

Issue: The methodology used to estimate probabilities of a marine oil spill are not considered to be useful for the BIPR project, owing to an expected departure between marine, climatic and operational conditions of the Bathurst Inlet area from the expected range of conditions at other global temperate and tropical sites.

INAC questions the applicability of the U.S. Mineral Managements Service (MMS) marine oil spills database to the BIPR project, and recommends against reliance on the low stated probabilities of release as the primary impact avoidance/risk management measure. Furthermore, INAC seeks a strongly supported prediction of hydrocarbon releases from all major reservoir types and transit points.

Reference: Draft EIS, Appendix E-6.

Concern: The MMS database primarily reflects deep-sea, large tanker traffic moving in largely unconfined waters except when leaving or entering port over a very small portion of the overall transportation route. In addition, the MMS would not be generalizable to waters with sea ice and strong limitations to visibility by ice fog. Furthermore, it is not clear that the MMS database

captures all release types of interest, including release of hydrocarbons in bilge water discharge, limited leakage at transfer points, and other types.

Most ports require escort of ships by a harbour pilot, and occur in waters for which regulatory oversight of ship movement and illicit or accidental contaminant releases is more easily derected and deterred. Such is not the case for the proposed BIPAR marine transportation route. Another issuee is that the MMS database might be biased relative to the current proposal, given that movement of larger tankers through such constrained access areas enroute to port would not be favoured for port location. It needs to be considered that the Bathurst Inlet portion of the route is at the atypical end of the spectrum of current use fueling ports based on ease of coastal marine access.

Finally, INAC would argue against use of a median or average spill incidence as a conservative estimate of impact potential for the BIPAR project; rather a reasonable, relevant upper-bounds estimate should be used.

Rationale: Expectations regarding fuel release are a very important aspect of the decision process. It will be important to obtain feedback from several different objective sources before INAC can make a rationale decision about the actual potential risks.

12.3 Information Request: marine facilities – sediment dredging/excavation

Issue: The design currently proposed by the Proponent requires excavation and disturbance of very soft seafloor sediment for the wharf and Causeway that will likely release a large quantity of fine-grained sediments into the water.

INAC requests that the Proponent propose mitigation measures that will address the release of sediment into the water.

Reference: Appendix A2, Sect. 4.4.2 – BIPAR Feasibility Study – Abridged Version September 2007, pg. 4-23.

Concern: Geotechnical investigations conducted by the Proponent determined that the seabed at the wharf location is about 20 m thick, consisting of soft clay. The Proponent considered three wharf foundation types; pre-built concrete cells, reinforced concrete drilled piers and steel sheet pile cells (SSPC). The Proponent justifies the selection of the SSPC based on successful performance in Arctic locations. INAC agrees that a SSPC may be appropriate, however, is concerned that the excavation of soft clay seabed material for backfilling with rock is expected to release large quantities of sediments into the water. The same concern exists for the construction of the causeway that may or may not require the excavation of seabed sediments. Information on the transportation, disposal and closure of the landfill area along the road at the Port Facility is limited as well as environmental control measures to prevent the release of sediment for the landfill location to the water.

Rationale: Without further information concerning mitigation measures, INAC is unable to evaluate whether the impacts to the environment under the current design scheme are sufficiently addressed.

13 TRANSBOUNDARY EFFECTS ANALYSIS

13.1 Information Request: Transboundary Effects- missing information

Issue: The DEIS does not contain sufficient analysis of transboundary effects

> The transboudary effects of the proposed project should be further characterized, including a discussion of the nature, magnitude and geographical extent and how these were determined.

Reference: DEIS Vol. VIII, Appendix G-3

Concern: The transboundary effects analysis presented in the DEIS is limited to the following: 1. listing which effects presented in the broader assessment may extend across boundaries, 2. stating what rating the broader impacts received, and 3, in some cases, stating a rating for the transboundary effects. No or very limited analysis is provided to justify these statements and a description of the broader effects is only occasionally provided. The entire Appendix is limited to five pages in length. Descriptions of the nature of impacts that will occur across boundaries are generally not included. Information needs with respect to transboundary socio-economic effects is detailed in section 18 of this document.

Rationale: In order to adequately assess transboundary effects, a more detailed analysis should be conducted. The effects should be characterized and detailed information on how the analysis was conducted and how conclusions were reached should be provided.

14 ACCIDENTS AND MALFUNCTIONS

14.1 Information Request: Accidents and Malfunctions- missing information

Issue: The DEIS does not contain an adequate assessment of the potential environmental impacts of accidents and malfunctions

> A comprehensive assessment of the potential environmental and human health risks of accidents and malfunctions should be provided. This should include an assessment of their likelihood and of the magnitude and significance rating of their potential effects.

Reference: DEIS Vol. VIII, Appendix G-4, Section 6

Concern: The assessment of the potential effects of accidents and malfunctions contained in the DEIS is limited to listing what the proponent has identified as "major environmental and safety risks" and for each of these, listing the plan that will describe prevention, mitigation and response. It should be noted that these plans are not contained in the DEIS.

Rationale: The environmental impacts of potential accidents and malfunctions should be considered potential impacts of the project, and as such, should be assessed comprehensively.

15 CUMULATIVE EFFECTS ASSESSMENT

15.1 Information Request: Cumulative Effects- outdated information

Issue: It is not clear that the cumulative effects assessment reflects the current development scenario in the Kitikmeot Region.

INAC requests that the proponent confirm whether the cumulative effects assessment reflects the current development scenario in the Kitikmeot Region and provide an updated assessment if warranted.

Reference: DEIS Vol. VIII, Appendix G-5

Concern: The cumulative effects of the BIPR project will be highly dependant on predicted resource development activity in the project area. As this activity can be highly dynamic in nature, it should be confirmed that the December 2007 assessment accurately portrays the current scenario.

Rationale: Ensuring that the cumulative effects scenario that is considered is as accurate and current as possible will enable a better assessment of the cumulative effects of the proposed project

16 SUSTAINABILITY ANALYSIS

16.1 Information Request: Sustainability Analysis- missing information

Issue: The proponent has not demonstrated how they have incorporated sustainable development principles throughout all phases of the project.

The application of the sustainable development principles should be specifically documented and referenced for all phases of the project.

Reference: DEIS Vol.2, Appendix A-5 p. 1-1

Concern: The DEIS does not contain specific information about how sustainable development principles have been applied, including an analysis of the capacity of renewable resources affected by the project. The proponent's analysis is limited to stating that "The Project has been developed to facilitate economic development in accordance with sustainable development principles…" and that "the environmental assessment process has been designed to ensure that the Project does not affect the availability of renewable and non-renewable resources in the Project area…" These are statements rather than analysis. Specific measures that have been taken to incorporate sustainable development should be documented and discussed for all phases of the project. Information needs with respect to the assessment of sustainability from a socio-economic perspective is detailed in section 18 of this document.

Rationale: INAC cannot assess how the principles of sustainable development have been implemented by the proponent. A sustainability analysis is required as per NIRB's 10 minimum EIS requirements for a part V review.

17 GENERAL

Issue: The Proponent has not used the same scale for Mapping

The Proponent should make sure that all maps should be 1:50,000/1:250,000.

Reference: All maps in entire DEIS and appendices.

Concern: The scale of maps within the DEIS are very inconsistent

Rationale: It is difficult to interpret maps when they are different scales and very inconsistent.

Issue: The Proponent has not distinguished between Crown Land and Inuit Owned Land on all maps of the Road nor do they indicate quarry locations.

INAC is requesting the proper delineation of IOL and Crown Land on all maps in the entire DEIS and its appending documents. Quarry locations need to be clearly indicated on all the maps referencing roads.

Reference: All maps in entire DEIS and appendices.

Concern: It is difficult to determine which quarries are on Crown Land and which are on IOL. It would be beneficial to have a layer added indicating which is IOL or crown lands. This feature will help provide information pertaining to quarry royalties, lease cost, etc.

Rationale: INAC cannot fully assess the impacts of the quarries without knowing what land they are sitting on.

18 INFORMATION REQUESTS: SOCIO-ECONOMICS

INAC has completed its review of the socio-economic elements of the Bathurst Inlet Port and Road (BIPAR) DEIS. INAC collaborated with the Government of Nunavut on the formulation of IRs and technical socio-economic comments. For the benefit of the both governments, Jacques Whitford was contracted to provide a technical evaluation and expert advice on issues related to the design of the project and its associated socio-economic effects. The GN and INAC identified key issues for Jacques Whitford to address in its analysis of the BIPAR DEIS. These include:

- Impacts of the proposed project on cultural and heritage resources;
- Impacts of the proposed project on tourism in the area surrounding the BIPAR project;
- Impacts of the proposed project on local and regional transportation patterns;
- Impacts of the proposed project on community barge service and community resupply, and;
- Use of IQ/Traditional Knowledge in the development of the BIPAR DEIS.

Technical advice was also obtained in such areas as trans-boundary and cumulative effects, and training and employment opportunities. The results of the technical evaluation were provided to both INAC and the GN to assist them with their overall assessment of the proposed project, and to support their respective interventions to NIRB's environmental review process. Below, 10 Information Requests (IRs) are provided related to the adequacy of the DEIS.

NOTE

The following notes with respect to Aboriginal consultation provide some background regarding the Information Requests ("IRs"). Given the uniqueness of this issue, it is recommended that these points be forwarded together with the Information Requests.

1. "Aboriginals" in this report includes Inuit of Nunavut and First Nations/Aboriginals of the Northwest Territories.

2. In the IRs listed below, consultation is most often referred to as "engagement" rather than "consultation" given the legal, serious, somewhat ambiguous and sensitive nature of the word "consultation" at this point in time in Canada. The reviewers were unable to locate definitive and consistent definitions of "consultation" in NIRB documents. As there is no specific and consistent definition of consultation, the word "engagement" is used interchangeably with consultation as engagement is more generic.

3. The ("IRs") attached below refer to "community" consultation/engagement in the description of the assessment rather than "Aboriginal" consultation/ engagement as there is no apparent requirement under the governing documents for separate

Aboriginal engagement. All references to consultation within the BIPAR Final Guidelines 2004 issued by NIRB refer to consultation with people in general ie public, stakeholders etc. without any reference to Aboriginals. The NIRB "A Proponents Guide to Conducting Consultation for the NIRB Environmental Assessment Process dated 2006 ("Proponents Guide") does not provide specific references to Aboriginals. General NIRB EIS Principles do not include a particular reference to Aboriginals. Accordingly "community engagement" was viewed as more appropriate for the purposes of this review.

4. A detailed conformity review between the Table of Concordance and the Final Guidelines was not conducted. Assessments were based on the requirements as outlined in the Table of Concordance/Final Guidelines.

5. It should be noted that a few references to consultation within the Table of Concordance are obligatory/mandatory (the proponent "shall") whereas many are discretionary (proponent "should"). This difference should be taken into account when assessing the DEIS.

6. The Proponents Guide outlines general guidelines for consultation and a few specific requirements. The Guide states the following principles "which underlie the concept of effective and appropriate consultation":

   a) Consultation should be part of an ongoing relationship between the Proponent and the potential affected communities by a project proposal, in which mutual trust and understanding is built up over time, through a continuing process of discussion, decisions, and follow-through. Importantly, consultation generally takes place before a project proposal is developed and decisions are made regarding the project.

   b) Consultation is a two-way communication process in which all parties listen and contribute views, information and ideas. The Proponent should communicate back to participants to confirm understanding of the information, and indicate what happened with their views, information and ideas.

   c) Consultation leads to action. It is an opportunity for genuine and respectful listening. This does not necessarily mean that every suggestion made in a consultation is implemented, but that input will always be taken into account before a decision is made.

   d) NIRB recognises that the extent to which consultations are conducted will depend upon the scope, size and location of the project proposal.

18.1 Information Request # 1

Directed to: Bathurst Inlet Port and Road Joint Venture Ltd.

Issue: The DEIS does not clearly outline how public consultations have influenced the design of the Project.

INAC recommends that the Proponent clearly outline how public consultation has influenced the design of the BIPR Project.

EIS Guidelines Reference: 4.5.2 DEIS (Section 11), Appendix A-4

Concern: The BIPR team has conducted numerous meetings, interviews and presentations over time with various communities within the area of influence. Section 4 of Appendix 2 attached to A-2 (Project Description) requires that the Proponent identify how consultation has affected project design prior to the issuance of the EIS Guidelines. Section 4.5.2 of the Final 2004 Guidelines also states this requirement. The referenced documents in the Table of Concordance, Section 11 of the DEIS and Appendix A-4, describe the nature of community consultation methodology as well as the feedback from various communities but the referenced documents do not clearly indicate how the feedback from the community engagements was incorporated into the design of the project

It appears that previous community interests and concerns were taken into consideration in the initial design, for example the Project Description indicated the Draft West Kitikmeot Regional Land Use Plan by the Nunavut Planning Commission 1997 was used in the selection of the route. As well, there seems to be an employee rotational change from three weeks in/one week out to two week in/two weeks out, presumably at least partially because of community concerns for community wellness etc. as indicated in community interviews. However, these and various other community interests are not clearly identified as being incorporated into the current design as revealed in DEIS Section 11 and A-4.

It is noted that the project description was prepared in 2003 after community engagement in 2001/2002. The project feasibility study was prepared in September 2007 after community engagement again in 2006/2007. Accordingly, there should be ample opportunity within the feasibility study and the DEIS to indicate where engagement has affected project design. Additional references in the Table of Concordance would help capture the efforts the Proponent has already undertaken and how they were transformed into action by way of inclusion in project design.

Rationale: This information is required in order for INAC to assess the comprehensiveness of the consultation efforts. Many community members may view this information as necessary components to meaningful engagement and in some respects, is what many people view as “consultation”. This section may be a key section of the EIS that is reviewed by community members.

18.2 Information Request #2

Directed to: Bathurst Inlet Port and Road Joint Venture Ltd.

Issue: Section 5.5 of the DEIS "Community Support Analysis" does not include the full range of socio-economic groups engaged and requires a reassessment of conclusions based on this information.

INAC recommends that the Proponent include all of the socio-economic groups engaged in DEIS Section 5.5 and that it re-examine its assessment of community support, referencing in the Table of Concordance applicable support within the DEIS documents.

EIS Guidelines Reference: 4.4 DEIA Section 5.5, Appendix A-3.

Concerns: Section 4.4 of the Guidelines indicates that the Proponent should provide an analysis of the support for and opposition to the project, including the groups that stand to benefit and lose from the Project and including a description of how the Proponent has sought input from a broad range of socio-economic groups. Section 5.5 of the DEIS and Appendix A-3 outlined in Section 4.4 of the Guidelines do not clearly address the requirements in Section 4.4 of the Guidelines as pertains to community support.

Section 5.5 of the DEIS states that responses from the communities included local organisations such as elders, youth groups, Inuit leaders, hunters and trappers associations, government officials and RCMP officers and that they were generally positive given factors which will affect lower costs of living. This section also states that an assessment on a community by community basis was not possible as this was not the way the SEIA process was conducted (impacts on VSECs and VECs in Nunavut and NWT were assessed).

The description within this section is limited and somewhat confusing. It is recommended that the Proponent reassess this section and clarify if each of those socio-economic groups were engaged in their entirety or if individual members from each group were engaged. Additional references in the Table of Concordance might be helpful so that the reader can clearly identify support for the project. By viewing the sign-up sheets from various engagement activities, various socio-economic groups seemed to be left out of this description including educational groups/teachers, mining business/executives, tourism lodges, members of Inuit communities (not just leaders), etc. The overall conclusion of positive support based on longer term stable employment and lower fuel costs requires further information regarding how this conclusion was derived at, including references within the DEIS where this sort of overall assessment has taken place. The various studies that have taken place regarding consultation processes might be referenced.

Rationale: This information is required in order for INAC to assess the comprehensiveness and adequacy of the consultation efforts.

18.3 Information Request #3

Directed to: Bathurst Inlet Port and Road Joint Venture Ltd.

Issue: The DEIS does not include copies of all materials presented at consultation meetings and other relevant materials.

INAC recommends that the Proponent include all materials presented at community meetings as well as any correspondence regarding interests and concerns from community members.

EIS Guidelines Reference 4.12

Concern: Section 4.12 of the 2004 EIS Guidelines requires that the Proponent provide in an appendix copies of all materials presented at consultation meetings and other relevant materials. Understanding the information presented at meetings is important to understand the nature of the engagement process and whether all key aspects of the project have been discussed with communities, including the public's use of the road, anticipated closure plans etc. Clarifying the nature of the information which has been distributed is especially important given the notations by Jemma Scoble in her 2006 report of consultation activities (Appendix F-8 p. 39 & 40) of a) the discrepancy in the nature of project related messages or "mixed messages" in Cambridge Bay and Kugluktuk and b) the importance of improving the mechanism for the dissemination of project information and the handling of interests and concerns. While efforts were made to engage communities during 2007 prior to the completion of the feasibility study, it is unknown if the material presented in Nunavut and NWT in 2007 was substantially consistent with the material contained in this EIS.

It can be noted that Section 1.3 of Appendix F-8 (Review of Socio-economic Impacts, Cambridge Bay and Kugluktuk, by Jemma Scoble dated March 2006) indicates that there are transcripts of hearings and presentations available as well as correspondence from stakeholders. The inclusion of all materials presented at consultation meetings and all correspondence from stakeholders outlining issues of concern and interest, including any responses that were provided to the communities, would be valuable information in the assessment of this project.

Rationale: This information is required in order for INAC to assess the comprehensiveness and meaningfulness of the consultation efforts. This is particularly important as the Feasibility Study was produced in September 2007 after most, if not all, of the initial consultations were concluded (or consultation invitations had been distributed). Ensuring that the Feasibility study approximates the information presented at community consultations is important to understanding community expectations and facilitating the EIS review of this project.

18.4 Information Request #4

Directed to: Bathurst Inlet Port and Road Joint Venture Ltd.

Issue: A list of organisations consulted has not been provided in the DEIS.

INAC recommends that the Proponent provide a complete list of the organisations invited to "stakeholder meetings" and those who attended. An indication as to why those stakeholders were invited in particular would be helpful in this assessment process.

EIS Guideline Reference: 4.12 A-4 and associated appendices

Concern: Section 4.12 of the EIS Guidelines requires that the Proponent prepare a list of the organisations consulted, including the time, place and purpose of the consultation and the contact information for the organisation. A-4 and associated appendices provide lists of names but do not always identify their affiliated organisation. Section 1.1.3 of A-4 indicates that stakeholders were notified of the meeting by email and telephone, at least the stakeholders of Cambridge Bay. Accordingly lists of organisations contacted for engagement should be easily obtainable.

Rationale: This information is required in order for INAC to assess the comprehensiveness of the consultation efforts.

18.5 Information Request #5

Directed to: Bathurst Inlet Port and Road Joint Venture Ltd.

Issue: The Proponent's analysis of how the proposed BIPR Project will contribute to sustainable development, particularly in Nunavut is inadequate.

INAC recommends that the Proponent be required to develop a more substantial analysis of how the BIPR project will contribute to the creation of self-sustaining and self-sufficient communities. In undertaking this analysis, the Proponent should take into account the key goals associated with Sustainable Development that NIRB has highlighted in its EIS Guidelines.

EIS Guidelines Reference: Subsection 2.1.1, pgs.2-3.

DEIS Reference: Vol. VII, F-2, ss. 4.2.2 pgs. 4-13 to 4-14, ss. 4.2.3 pgs. 4-24 to 4-25.

Concerns: The Proponent deals with the proposed BIPR Project's contribution to "Sustainable Development", as defined on pg. 3 of the EIS Guidelines, in a cursory and incomplete fashion. Its assessment of the Project's contribution to the sustainability of cultures and communities in

Nunavut is notably inadequate. “Sustainability” issues are explicitly dealt with only twice in the DEIS, and in both cases the treatment is brief. This analysis claims, in relation to the construction and operations phases of the Project, that it “will meet the regional and territorial economic development goal of assisting in the creation of self-sustaining and self-sufficient communities by providing additional employment opportunities within the Kitikmeot region.” However, it gives few details on how exactly the Project will assist in creating “self-sustaining” communities. In general, the Proponent fails to effectively demonstrate that the Project will contribute to a key goal identified by NIRB as being crucial to sustainable development: “the attainment of durable social and economic benefits, particularly in Nunavut.”

Rationale: Without a more detailed analysis from the Proponent, INAC will be unable to adequately assess the proposed BIPR Project’s contribution to the sustainability of cultures and communities in Nunavut.

18.6 Information Request #6

Directed to: Bathurst Inlet Port and Road Joint Venture Ltd.

Issue: It is unclear which tourism-related groups were included as stakeholders within the consultations.

INAC recommends that Bathurst Inlet Port and Road Joint Venture Ltd. provide a comprehensive listing of all groups / organizations included within the stakeholder consultations and a summary specific to the tourism industry on the nature of the concerns raised with respect to the project’s potential effects on tourism.

Reference: DEIS, Vol. 2, Appendix A-4

Concern: Many communities within the area of influence have identified growth in the tourism industry as a goal for local economic development initiatives. The DEIS does not address the extent to which tourism-related industries were included in the consultation process.

Rationale: In order for INAC to assess the comprehensiveness of the consultation efforts this information is required.

18.7 Information Request #7

Directed to: Bathurst Inlet Port and Road Joint Venture Ltd.

Issue: The current DEIS does not consider the tourism industry in the NWT communities included in the area of influence.

INAC recommends that baseline conditions for the tourism industry in the NWT be included in the DEIS. INAC also recommends that the comprehensiveness of the impacts assessment portion of the DEIS be re-evaluated in the context of this information.

Reference: DEIS, Vol. 7; Appendix F-7;

Concern: That the current baseline report is incomplete because the tourism industry in the NWT is not adequately addressed.

Rationale: Without an understanding of the extent to which the tourism industry is currently operating in the NWT, the potential implications of the proposed project on the tourism industry cannot be determined.

18.8 Information Request #8

Directed to: Bathurst Inlet Port and Road Joint Venture Ltd.

Issue: The DEIS does not provide an analysis of the potential impacts to local and regional transportation patterns resulting from the project.

INAC recommends that Bathurst Inlet Port and Road Joint Venture Ltd. provide an analysis of the potential impacts to local and regional transportation pattern shifts resulting from the project.

Reference: DEIS Section 5.3 “Implications for Regional and Territorial Transportation Networks”. Abridged Feasibility Study, Document A3, Section 3.0 Port and Road Users. Socio-Economic Assessment, Document F2.

Concern: The DEIS and supporting documents do not clearly state the changes to the existing transportation patterns on either the barge service or traffic patterns on the Tibbit to Contwoyto Winter Road that will result from the project or present an analysis of potential impacts to existing transportation systems and patterns. For example, will removal of the majority of fuel and some operating supplies from the bulk cargo of the existing barge service raise the rates for supplies shipped by the existing barge service?

Rationale: Section 5.3 of the DEIS acknowledges difficulties with the Tibbit- Contwoyto Winter Road and benefits provided by the project; however an analysis of transportation pattern shifts is not presented. Tables 3.4-1 and 3.5-1 in the Abridged Feasibility Study appear to indicate that all diesel fuel and operating supplies currently being delivered by existing barge and winter road infrastructure will be delivered through the project. Section 3.5 states that only 10% of operating supplies to Nunavut communities will be delivered through the project with the remainder being transported on the existing barge system.

18.9 Information Request #9

Directed to: Bathurst Inlet Port and Road Joint Venture Ltd.

Issue: Proponent provides insufficient information on the trans-boundary social and economic effects of the Project.

INAC recommends that the Proponent be required to present more detailed information to support its conclusions on the trans-boundary social and economic effects of the proposed BIPR Project. This information must be more clearly linked with the analysis in the Proponent's Social and Economic Impact Assessment of the social and economic impacts of the Project in the Northwest Territories. As it presently stands, the Proponent's analysis does not provide an adequate basis for assessing the trans-boundary impacts of the proposed Project.

EIS Guidelines Reference: 2.1 NIRB Principles, p. 2

DEIS References: Vol.VIII, Appendix G-3, p. 5; Vol. VII. F-2, Sections 4.2.4-4.2.5

Concern: The Proponent's Trans-boundary Effects Analysis devotes three lines to Social and Economic Effects. It simply states that: "Potential trans-boundary effects on the Valued Social and Economic Components (VSEC) for the Project are minimal and positive. In addition to bringing job opportunities in Nunavut, the Project will contribute to GDP growth in the Northwest Territories and all of Canada." No further justification is offered for these conclusions. Also, no reference is made to the relevant sections of the draft Social and Economic Impact Assessment relating to the Project's social and economic impacts in the Northwest Territories.

Rationale: INAC requires further information in order to adequately assess the impacts of the Project on the well-being of Canadians outside of the Nunavut Settlement Area, particularly residents of the Northwest Territories.

18.10 Information Request #10

Directed to: Bathurst Inlet Port and Road Joint Venture Ltd

Issue: Proponent provides an incomplete analysis of the cumulative effects of the project on three key Valued Socio-Economic Components (VSECs).

INAC recommends that the Proponent be required to provide significance ratings and an indication of confidence levels in its analysis of the potential cumulative impacts of its Project on the VSECs of Health and Wellness, Economic Development, and Aboriginal Culture. If it is unable to do so, the Proponent should be required to offer some justification for this.

EIS Guidelines Reference: Sections 4.6.1 p.18; 4.7.1 p. 22-24, 4.7.2 p. 24

DEIS Reference: Vol. VIII, Report G-5, Section 18.

Concern: The Proponent's Cumulative Effects Analysis of the three key Valued Socio-Economic Components (VSECs) lacks key details. The analysis doesn't assign any "Significance" ratings in its assessment of the potential cumulative impacts of the BIPR Project on Health and Wellness, Economic Development and Aboriginal Culture. As well, it fails to offer any indication of the "Confidence Levels" of its assessment of these impacts. This stands in marked contrast to the analysis, for example, of the cumulative impacts on Archaeology and Heritage Resources in Section 17, and of cumulative impacts in the other sections of the Analysis.

Rationale: INAC requires a more complete analysis from the Proponent if it is to adequately assess the cumulative impacts of the proposed BIPR Project on the VSECs identified as crucial in its Cumulative Effects Analysis.

Information Request to NIRB

Issue: It is unclear what consultation methodology NIRB has required throughout the period between BIPR project was initiated until the EIS guidelines were issued.

INAC recommends that NIRB outline any specific requirements with respect to consultation/engagement methodology that existed during the period between the initiation of the project and the finalisation of the 2004 EIS Guidelines.

EIS Guidelines Reference: 4.2

Concerns: Section 4.2 of the BIPAR Final Guidelines December 2004 indicates that the Proponent shall identity all federal and territorial environmental and other related laws, regulations and associated standards that require compliance in respect to the Project and explain how such requirements will be met. The BIPR project has been ongoing for some time, during a time when Nunavut was developing as a territory. Throughout the development of the project, various laws, guidelines and standards were presumably adopted by Nunavut which would guide project proponents. In assessing the engagement process for this project over the years, and to put the engagement process in the proper context, it is important to consider if there were any specific engagement methodology requirements at various points in time with respect to consultation methodology. Section 4 of Appendix 2 attached to A-2, Project Description, outlines general requirements for consultations in terms of results (example the VECS that were identified by consultation) but does not provide details as to specific methodology (i.e. the "how, when, where, who of consultation").

It would be helpful to the reader of the EIS to understand which specific requirements regarding consultation methodology, if any, governed the project prior to the 2004 EIS Guidelines being finalised.

Rationale: This information is required in order for INAC to assess the comprehensiveness and adequacy of the engagement efforts over the course of the entire project.

NATURAL RESOURCES CANADA

Natural Resources Canada | Ressources naturelles Canada

March 20, 2008 NRCan File #NT-004

Leslie Payette
Manager, Environmental Administration
Nunavut Impact Review Board
Cambridge Bay, Nunavut

By email: lpayette@nirb.ca

Subject: Natural Resources Canada Information Requests on the Bathurst Inlet Port and Road Project

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Dear Ms. Payette,

Thank you for your letter of February 19, 2008, requesting any information requests (IRs) from interested parties on the Bathurst Inlet Port and Road (BIPR) Draft Environmental Impact Statement (DEIS).

Natural Resources Canada (NRCan) has reviewed the DEIS within relevant areas of its mandate. Attached is the Department's IRs in a format that the Nunavut Impact Review Board has requested. They are broken down into 2 key areas: marine/coastal environments and processes, and explosives manufacture and storage.

We look forward to the timely responses by the proponent in order to facilitate an effective technical review.

If you have any questions concerning our IRs, please do not hesitate to contact me at (613) 995-3153.

Sincerely,

Andrew McAllister

Senior Environmental Assessment Officer
Science and Policy Integration

cc: Rob Johnstone, Minerals and Metals Sector, NRCan
Margo Burgess, Earth Sciences Sector, NRCan

Canada

Environmental Assessment - Bathurst Inlet Port and Road Project, NU
Draft Environmental Impact Statement (DEIS) Dec. 2007

1. MARINE/COASTAL ENVIRONMENT AND PROCESSES

Comments:
The Bathurst Inlet Port and Road project Draft Environmental Impact statement (DEIS) provides a very complete preliminary overview of physical conditions at the Port site. The report cover photo probably best illustrates the physical environment of the port site yet it was not used to describe the shores and coastal dynamics and other aspects.

The largest omissions deal with the coastal (backshore, foreshore and to a lesser amount the nearshore) environment, its character, dynamics and the marine processes which would affect the project and the impact of the project on shoreline stability.

The following Information Requests (IRs) deal largely with the identification of gaps in the baseline information. All of the IRs are directed to the proponent.

Information Request #1

Issue: Marine processes

Document Reference: Vol VI, E10, 3.4

Request
Please provide an analysis of storm surge potential i.e. extreme water levels and wave run-up at the port site - from planned 2008 deployment which should also confirm tidal regime.

Rationale
Water levels control the plane on which waves impact shoreline and port structures – these only have 1.5m of ship draft clearance.

At the port site detailed bathymetry, some boreholes and some oceanographic aspects such as sediment quality and fish habitat have been addressed. There is no rigorous analysis of oceanographic processes, e.g. waves, tides, surges and currents, and their impact on the project and the impact of the planned structures on those processes. The proponent appears to recognize this shortfall and is planning the deployment of oceanographic instruments at the site in 2008 which is encouraged. Tidal range is small and given the configuration of Bathurst Inlet the wave fetch is severely restricted except to the north and south. Better information on tides, waves and surges should be a priority and the data should be correlated with the meteorological data to determine correlations with oceanographic anomalies observed. Bathurst Inlet is fairly deep so surges may not be a major force nevertheless the port site is at the end of a long inlet which could accentuate water setup.

Information Request #2

Issue: Sea ice action

Document Reference: Vol. VI, E10, 3.32; Vol. 2 A-3, 4.4.2

Request
Potential ice pressures are provided. Will the extension of facilities offshore increase shore ice ride-up and ice piling on the facilities? Please explain.

Rationale
Sea ice scour and pressures onshore are greater at headlands and structures that extend offshore.

Information Request #3

Issue: Shoreline character and dynamics

Document Reference: Vol. VI, E3, 2.3; E7 3.8; E10, 3.5

Request
Please provide an analysis of proposed structures on shore dynamics particularly sediment accretion and erosion at and adjacent to the site.

Rationale
Shoreline character and stability changes alongshore.

The proposed port facilities cross the coastal zone from the land to the ocean making it a critical environment to understand. Yet apart from a description of fish habitat and an attempt at relating shore character to marine processes there is no detailed analysis of the physical beach and backshore character at and adjacent the proposed port site. There is a more complete description of the physical nearshore conditions. From shoreline photos scattered through the volumes and the report cover there is evidence of backshore erosion, ice pits, what appears to be lag coarse deposits on the lower intertidal zone and larger wave-built swash ridges toward the upper beach. What is the sediment mobility and occurrence of these features, i.e. seasonal, decadal, storm driven? What is the beach and backshore stratigraphy? Is the coarse material observed across the lower intertidal zone only a veneer over finer material? Forelands and small spits at sites 1 and 3 and south of site 1 (Vol. 6 E3, Fig 2.2-1) indicate that sediment transport occurs and it is important for their continued building. There is evidence of sediment transport in both north and south directions whereas the reports suggest unidirectional transport. Impacts of the new wharf and jetty structures on local shoreline dynamics and stability are not provided and should be.

Information Request #4

Issue: Thermal condition of marine clays

Document Reference: Vol. II A-3 4.4-1

Request
Please provide further information on the thermal conditions and presence of frozen layers or pockets in the subsea clays where wharf sheet cells are to be established.

Rationale
Subsea permafrost or ice rich deposits could mislead mapping of solid foundations.

The nearshore environment was described in greater detail than the beach and backshore zones. Augering information provided a good first impression of nearshore stratigraphy. Only 3 of 6 auger attempts reached bedrock. No evidence about subsea permafrost was given but the thermal character of the thick clays should be understood before construction of the wharf.

Information Request #5

Issue: Sediment disposal

Document Reference: Vol. II, A-3,

Request
Soft clay material within the sheet pile cells will be excavated and replaced with crushed rock. Where will the fines be disposed?

Rationale
Disposal of marine sediment onshore/offshore.

Information Request #6

Issue: Shoreline mapping

Document Reference: Vol. VI, E6, 3.5.4, Fig 3.5-10

Request
Are there maps of shore types within the area of spill trajectory from the Port site to determine highest shoreline sensitivity areas for cleanup planning and operations? Please clarify/explain.

Rationale
Oils spill trajectories show spills from the Port site would intersect adjacent shores.

One of the major hazards to shipping is the convoluted passage and occurrence of shoals through Bathurst Inlet. An inventory of sensitive shore types within the Inlet is critical for planning response to any marine spill within the inlet.

Information Request #7

Issue: Shipping route bathymetry

Document Reference: Vol. II, a-3, pg 4-12

Request
Are the bathymetric surveys around Breakwater Islands and Quadyuk Island, Bathurst Inlet and the mapping of all shoals adequate for navigation by vessels proposed?

Rationale
There are two locations where shoal patches and winds present navigational hazards.

The port is well situated for proximity to mining sites, providing deeper water depths and terrain for the airstrip but it is at the end of a very complex shipping route. Are the bathymetric surveys sufficiently detailed within Bathurst Inlet and the other shallow waters south of Victoria Island e.g. Jenny Lind Island on route to Bathurst Inlet to provide adequate navigation for the proposed vessels?

2. EXPLOSIVES MANUFACTURE AND STORAGE

Information Request #8

Issue: Lack of information on explosives manufacture and storage

Document Reference: Vol. I, Vol. VIII

Request
Please provide details on the following:

- Specified location (i.e., detailed site plan) for the explosives factory, with distances to vulnerable features such as dwellings, roads, camps, railways, bodies of water, etc. Infrastructures should be identified and include: explosives and detonator magazines, fuel storage, ammonium nitrate storage, maintenance/wash area, process trucks and their parking area, any offices, warehouses, buildings, etc. The proponent needs to demonstrate that safety distances required by the Explosives Regulatory Division (ERD) of NRCan have been considered and met.
- Fuel and ammonium nitrate storage plans. Storage of ammonium nitrate is to be in conformance with ERD guidelines.
- Liquid effluent disposal plans.
- Evaluation of worst case scenario (i.e. accidental explosion).
- Spill contingency plans.
- Any other magazines if required that may be located in quarries, etc.

Rationale
NRCan requires the above information in an EA in support of it subsequent licensing process.

Information Request #9

Issue: Lack of information on explosives storage during road operations

Document Reference: Vol. II, A-3,

Request
Please provide further detail on the planned use and storage of explosives during the operation of the road including permits required.

Rationale
The only apparent reference to explosives during the road operations is in Vol. II, Appendix A-5, Table 5.1.2 stating that magazines will be established in quarries.

NORTH SLAVE MÉTIS ALLIANCE

NORTH SLAVE MÉTIS ALLIANCE

PO Box 2301 Yellowknife, NT X1A 2P7

March 20, 2008

Leslie Payette
Manager of Environmental Administration,
Nunavut Impact Review Board
P.O. Box 1360, Cambridge Bay, NU. X0B 0C0
Phone: (867) 983-2594
Fax: (867) 983-2594
lpayette@nirb.ca

Re: Bathurst Inlet Port and Road Project Draft EIS Information Requests

Although the North Slave Metis Alliance (NSMA) has not yet received any notification regarding the amount of intervernor (participant) funding to expect, with which to conduct their review of the above mentioned document, a cursory review has nevertheless been performed in order to comply with the imposed deadline. Our preliminary information requests are provided below, but please take note that we do reserve our Aboriginal Right to full and honorable Crown Consultation on this project, including adequate information, adequate time, sincere efforts for accomodation, and just and equitable compensation where required.

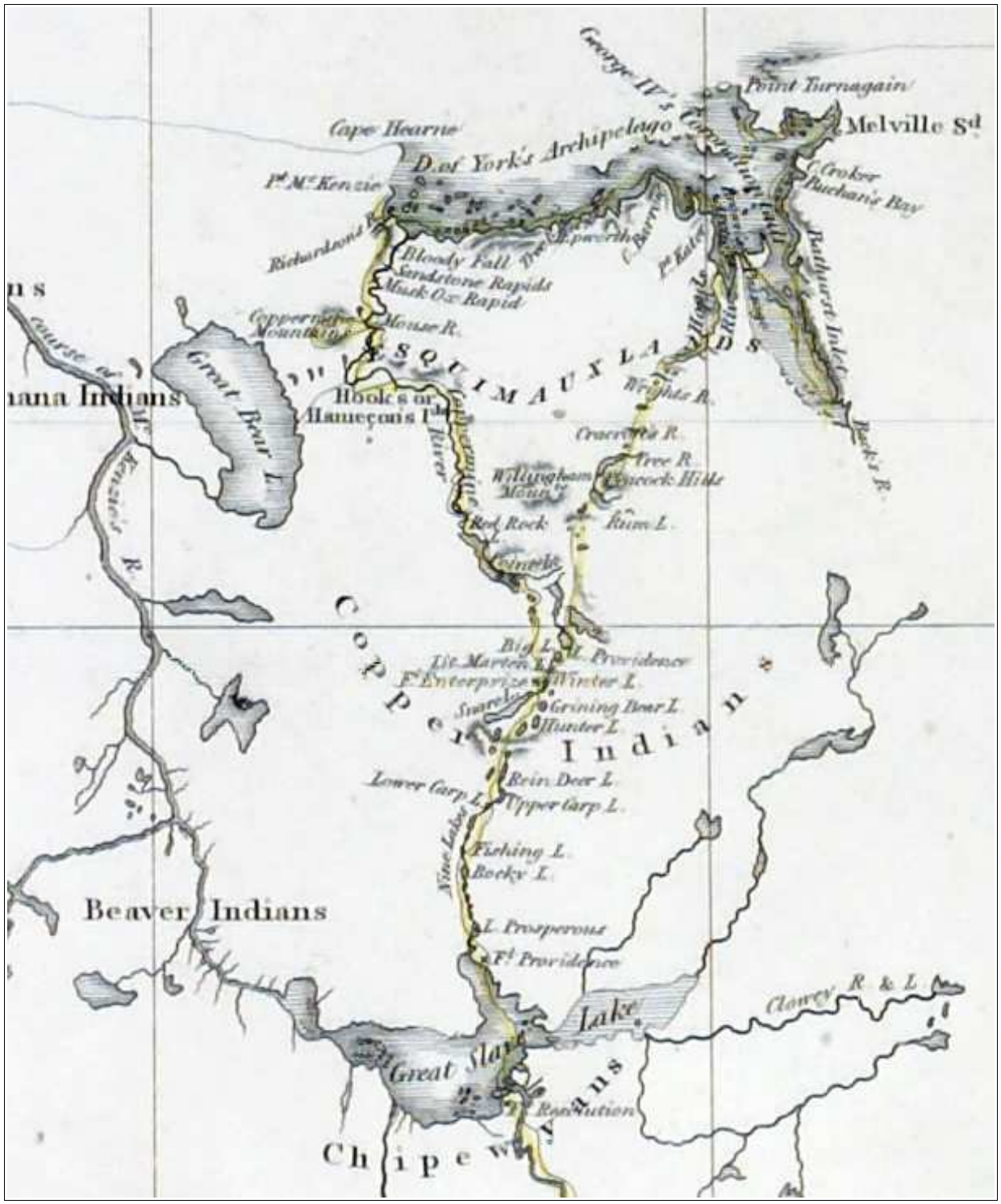
Section F-1 Heritage Resources Effects Assessment

1. Introduction
   a) What is the definition of "heritage resource" contained in the Nunavut Archaeological and Palaeontological Sites Regulations? The introduction is unclear as to what heritage resources are being assessed.
   b) Why is there no mention of the ethnogenesis of the Metis culture in this area during the period between 1600 and present? The introduction gives the erroneous impression that there were no Metis occupants and users of the area before "contact" with Europeans.
   c) Since the Nunavut boundary overlaps with the NSMA's traditional territory, and the Inuit Heritage Trust presumably only deals with Inuit heritage, why is there no explanation in the introduction how the VSEC of heritage sites for the Metis (and presumably also the Yellowknives, Tlicho, Chipewyan, and Cree) will be dealt with?
2. Valued Socioeconomic Components.
3. Boundaries
   a) Where is the map showing the "project area" and "study areas" for heritage resources?

b) Why is there no discussion of the exploration and environmental assessment portions of this project? Socioeconomic impacts are known to begin occurring as soon as a potential project is announced.

4. Environmental Setting
   a) Conflicting information is presented in this section. The indroduction states that the baseline studies enable prediction of effects and inform the design of mitigation measures, yet the introduction acknowledges that understanding may change as new data becomes available, and the methodology section states that only limited literature review was used to provide context, and only the Naonaiyaotit Traditional Knowledge Project (NTKP) was consulted to incorporate traditional knowledge (TK) into the study of heritage sites. Are the baseline heritage resource studies adequate to predict and mitigate effects on Metis heritage values?
   b) What baseline research was done regarding Metis heritage values in the project area, and how was Metis TK incorporated into the research?
   c) Is the researcher knowledgable of the ethical guidelines for conducting research involving Aboriginal People, and were the ethical guidelines followed? The methodology section should describe how the research complied with best practices in conducting traditional knowledge studies, and in conducting research involving Aboriginal Peoples.
   d) In section 4.3.1 where the Interior Barren Grounds chronological period is discussed, why is there no mention of the transition period between the Taltheilei Shale Tradtion to the Athabaskan period, the ethonogenesis of the Metis, and the crucial role that the Metis played in the development of the area's cultural environment between the 1600's and the present?
   e) Why does section 4.4.2 regarding the Historic Contact not mention the Metis (or any of the other Peoples) who occupied and used and still do occupy and use the area, and who were key players in the social, cultural, technoloical, and economic evolution that occurred during that time?
   f) Why was community consultation conducted only in Kugluktuq, Ikaluktuuttiak, and Kingaok regarding the heritage resources and traditional knowledge of Contwoyto Lake area? Is current residency supposed to be a valid indicator of location of social, cultural, or heritage interests and values extending over past centuries?
   g) Shouldn't the Metis (and others) be included in the heritage resource assessment and traditional knowledge studies, given their ethnogenesis in the area, with their hundreds of years of occupation and use?

Please see the image below of a map of the 1820 Franklin trip guided by indigenous Metis. We would of course be extremely interested in any remains of this trip taht may be found, and we would like to know how closely the proposed project comes to this traditional trail and historic route.


Point Turnagain
Melville Sd
Cape Hearne
D. of York's Archipelago
Pt. McKenzie
Richardsons R.
Bloody Fall
Sandstone Rapids
Musk Ox Rapid
Copper Mountains
Mouse R.
ESQUIMAUX LANDS
Great Bear L.
Hooks or Hameçons I.
Great Slave Lake
Beaver Indians
Chipewyan Indians
Copper Indians
Fort Enterprize
Fort Providence
Fort Resolution
Fort Wintering
Lower Carp L.
Upper Carp L.
Rein Deer L.
Fishing L.
Rocky L.
L. Prosperous
Clowey R. & L.
Buchan's Bay
Bathurst Inlet
Back R.
Hearne R.
Coppermine R.
Red Rock R.
Rum L.
Grining Bear L.
Hunter L.
Providence L.
Big L.
Lit. Marten L.
Swan L.
Nine Lakes

5. Effects Assessment
   a) How was the Ethnic value of the various sites assessed with regards to Metis values?
   b) How many of the previously recorded and newly discovered sites might have been of Metis ethnic affiliation?
   c) When you speak of Elders, do you mean only Inuit Elders, or Elders from all the potentially affected communities? (meaning of course cultural communities, not geographic communities).
6. Mitigation and Management Plans
   a) How, when, and where will the Metis be involved?
7. Monitoring and Evaluation
   a) How, when and where, will the Metis be involved?

Section F-2 Socio-Economic Effects Assessment

1.

Section F-3 Heritage Resources Studies 2001

8.
9.

Section F-5 Traditional Knowledge of Wildlife, Fish, and Water Quality

Section F-7 Socio-Economic Baseline Studies 2007

Section F-9 Review of Socio-economic Dimensions of the Bathurst Port and Road Project

Section F-10 The Economic Benefits for Nunavut and Canada

Section G-3 Transboundary Effects Analysis

Section G-5 Cumulative Effecs Assessment

Sincerely,

Sheryl Grieve
Manager, Environment and Resources
North Slave Métis Alliance
lands@nsma.net

CC: Ryan Barry (rbarry@nirb.ca)
Chuck Strahl (riding@chuckstrahl.com)

TRANSPORT CANADA

Transport Canada / Transports Canada

Environmental Affairs - Programs
P.O. Box 8550
3rd Floor, 344 Edmonton Street
Winnipeg, Manitoba
R3C 0P6

March 20, 2008

Your File: 03UN114
Our File: 7184-70-1-BIPR

Ms. Leslie Payette
Manager, Environmental Administration
Nunavut Impact Review Board
P.O. Box 2379
Cambridge Bay, NU X0E 0C0

By email: lpayette@nirb.ca

Dear Ms. Payette:

Subject: Transport Canada Information Requests for the Bathurst Inlet Port and Road Project Draft Environmental Impact Statement

Transport Canada (TC) would like to thank the Nunavut Impact Review Board (NIRB) for the opportunity to provide information requests (IRs) as outlined in the February 19, 2008 NIRB letter pertaining to the Draft Environmental Impact Statement (DEIS) for the Bathurst Inlet Port and Road Project (BIPR).

We have initiated a preliminary review of the BIPR DEIS (Volumes 1-8) and have attached the departments IRs for your consideration. All of the IRs are directed to the Bathurst Inlet Port and Road Joint Venture Ltd. (the proponent) and are relevant to the impact assessment of this proposed project. Our information requests are primarily focused on Marine Security and project financing under a public-private partnership (P3 scenario).

TC looks forward to the continued participation on this environmental assessment and providing additional comments to the NIRB during the technical review period once established. Should you have any questions or concerns with respect to this submission, I can be contacted via email at morrejp@tc.gc.ca or by telephone at 204-983-5857.

Sincerely,

Jim P. Morrell
Environmental Officer

Cc. Doug Soloway, TC – Superintendent of Environment Assessment Program
Joe Buker, TC – Manger of Transportation Security
Clint Toews, TC – Transportation Security Inspector

Canada

Marine Security at the Port Facility

TC IR # 1

This information request is directed to the Bathurst Inlet Port and Road Joint Venture Ltd. (the proponent).

References related to the issue:

Volume I: Draft Environmental Impact Statement, Table of Contents Pg 84 – 85
Volume II: Introductory Documents, A–3 Feasibility Study, Pages 269, 270, 285-289, and 296
Volume VII: Socio - Economic and Heritage resources environment, Pages 92, 101, 124 and 741
Volume VIII: Additional Reports, Pages 119 and 225

Issue:

The proponent has identified that they will have the capability of accepting large vessels in the range of (30,000 – 50, 000 Dead Weight Tons) from Eastern Canada or Europe, how many of these will be foreign flagged? Would any of these foreign flagged vessels using the port facilities be cruise ships carrying 100 or more passengers?

Concern:

Information regarding the number of foreign flagged vessels that potentially could use the port facility is lacking in the DEIS and is required to assess and determine if the Marine Transportation Security Regulations apply.

Rationale:

If the port facility receives more that 10 foreign flagged vessels in a calendar year or 5 foreign-flagged vessels on a fixed schedule then Part 2 of the Marine Transportation Security Regulations (MTSR) would be applicable. If less than 10 foreign flagged vessels interface with the port facilities then the MTSR would apply to a lesser extent.

TC IR # 2

This information request is directed to the Bathurst Inlet Port and Road Joint Venture Ltd. (the proponent).

References related to the issue:

Volume I: Draft Environmental Impact Statement, Several references to Bulk cargo, Pages 4, 20, 40, 84, 96,97, and 199.
Volume II: Introductory Documents, A1 Table of Concordance Pg 5
Volume II: Introductory Documents, A5 Effects of Assessment Mythology Pg 637
Volume VII: Socio - Economic and Heritage resources environment, Pg 741
Volume VIII: Additional Reports, Page 204 other various references in this volume.

Issue:

In the DEIS dangerous goods, such as fuel and ammonium nitrate are identified and will be brought in and stored at the port facility. There is also mention of ice class vessels delivering significant amounts of fuel and bulk cargo on numerous occasions throughout the DEIS documents however there is no specific identification of other dangerous goods. Will the bulk cargo include other dangerous goods as defined in the Marine Transportation Security Regulations (MTSR) by definition as "certain dangerous cargos", and if so will foreign flagged vessels deliver these certain dangerous cargos?

Concern:

Information regarding certain dangerous cargos and their delivery by foreign flagged vessels to the port facility is lacking in the DEIS and is required to assess and determine if the Marine Transportation Security Regulations apply.

Rationale:

The MTSR definition of certain dangerous cargos "means dangerous goods, other than products, substances or organisms identified in Class 3, 4, 8 or 9 of the schedule to the *Transportation of Dangerous Goods Act, 1992*, that are carried in bulk or in such a quantity as to require an emergency response assistance plan under section 7.1 of the *Transportation of Dangerous Goods Regulations*."

Project Financing from the Federal Government

TC IR # 3

This information request is directed to the Bathurst Inlet Port and Road Joint Venture Ltd. (the proponent).

References related to the issue:

Volume I: Draft Environmental Impact Statement, Pages 2, 76, and 84
Volume II: Introductory Documents, Pages 48, and 410

Issue:

The proponent states that, "*the estimated capital construction cost of the Project is $164 million. The Project will be financed and developed as a Public Private Partnership (P3), where the cost and risks of the Project can be shared between the public and private sectors.*
The Project is technically practical, economically sustainable and bankable under a P3 arrangement."

Concern:

Information identified in the DEIS regarding a Public Private Partnership (P3) is vague. It is unclear from the references to a P3 which level of government and specifically which department may enter into a contribution agreement with the proponent and possibly others.

Rationale:

From an environmental assessment perspective it is important to know if another federal department is providing financial assistance to the project in whole or in part. There is the possibility that the potential contributor (a federal department) of such funds isn't currently involved in this environmental review process. Transport Canada isn't aware of the proponent entering into a dialogue with TC officials on the topic of funding under a P3 arrangement.

APPENDIX 3.2-1
WASTE MANAGEMENT PLAN

Waste Management Plan

1.1 Introduction

The BIPR JV is committed to sustainable development and will ensure that the handling, storage, transportation and disposal of all wastes will be conducted in a safe, efficient and environmentally compliant manner. An essential step towards achieving this goal is the preparation and implementation of this Waste Management Plan (WMP).

The fundamental basis of the plan is to achieve safe and healthy management of wastes, incorporating the implementation of a sound waste minimization program. The ideals of the four R's of waste minimization (reduction, reuse, recycling and recovery) are embodied in the Waste Management Plan. In addition, appropriate mitigation measures are identified and discussed.

This plan is intended for implementation during the construction phase of the Project. Since the governing principles are the same, this plan will be adopted for the operations phase of the project with adjustments made to accommodate the changing nature and volume of wastes generated. As a minimum, the WMP will be reviewed on an annual basis an revised accordingly. This Waste Management Plan is a component of the Bathurst Inlet Port and Road Environmental Management Plan for Road, Port, Camp and Shipping.

1.2 Objectives

The main objective of the WMP is to comply with the Federal and Nunavut Governments' legislation with respect to minimization of potentially adverse impacts on the physical and biological environment. Prime objectives of the project's Waste Management Plan are to;

- Establish compliance with applicable legislation of the Government of Canada and the Government of Nunavut including:
  - *Environmental Protection Act (Nunavut);*
  - *Nunavut Public Health Act;*
  - *Nunavut Waters and Nunavut Surface Rights Tribunal Act;*
  - *Canadian Environmental Protection Act (CEPA);*
  - *Canada-Wide Standards (CWS) for Dioxins and Furans;*
  - *Canada-Wide Standards (CWS) for Mercury Emissions;*
  - *Transportation of Dangerous Goods Act and Regulations (TDGA & TDGR);*
  - *Work Site Hazardous Materials Information System (WHMIS) Safety Act;*
  - *Territorial Lands Act;* and
  - *Nunavut Pesticide Regulations.*

- Establish compliance with the American Petroleum Institute (API) and Canadian Standards of Practice viz.:
  - *Design, Construction Operations, Maintenance and Inspection of Terminal and Tank Facilities, API-2610;*
  - *Standard for Aboveground Steel Tanks for Fuel Oil and Lubrication Oil, CAN/ULC-S602M;*
  - *Lining of Above Ground Petroleum Storage Tank Bottoms;* and
  - *Environmental Code of Practice for Aboveground Storage Tank System Containing Petroleum Products* – National Task Force on Storage Tanks for Canadian Council of Ministers of the Environment.
- Prevent and reduce adverse impacts on the environment including wildlife and wildlife habitat.
- Protect the environmental integrity of soil, surface water and groundwater in the immediate area of the project operations.
- Protect the health and safety of site employees and the public.
- Maximize the efficient use of resources.
- Avoid costly clean-up and decontamination during project decommissioning and reclamation.

1.3 General Strategies

Generation of wastes during the construction, operation and decommissioning of the Bathurst Inlet Port and Road Project will be minimized whenever possible by applying the principles of Reduce, Reuse, Recycle and Recover. As a waste generator, the BIPR JV will always be held responsible for how it manages its waste, therefore, the following strategies for minimization and disposal of wastes will be employed:

- **Proactive procurement policy:** BIPR JV will implement a procurement policy that would require potential suppliers to provide information to assess the environmental friendliness of their products and packaging.
- **Pollution prevention:** Pollution prevention methods to eliminate the generation of wastes will be evaluated and feasible methods implemented. This will be achieved by adopting reduction, substitution, segregation, reuse, recycle and recovery methodologies wherever feasible.
- **Strategic material substitution:** At the purchasing stage, the possibility of substituting materials that are hazardous to handle, generate hazardous wastes or create environmental problems with less pollutant varieties, will be examined.
- **Waste segregation:** Segregation of the various waste streams will make it easier to reuse, recycle, recover and dispose of the various wastes generated. As part of the planning

process, all waste categories will be analyzed and the principles of the four R's will be applied.

- **Reduction initiatives:** Reducing the raw material consumption is the first step to reduce waste generation. To practice this principle all processes and materials used will be evaluated on the basis of possible reduction in disposable material usage.
- **Reusing initiatives:** Reuse of the material in other applications and/or by other parties will be encouraged and examined by using the waste materials exchange.
- **Recycling initiatives:** Recycling is the next option considered for the successful management of the waste streams. Wherever feasible recyclable containers will be backshipped to recycling depots or directly to original suppliers.
- **Recovery initiatives:** Recovery of usable material or energy as a by product is a part of the four R's of the waste minimization process. Since the BIPR project does not involve any processing plants this type of initiative will be limited.
- **Disposal:** Disposal becomes the final option when the four R's are no longer applicable or practical. However, hazardous wastes will be stored temporarily on-site and ultimately transported to a licensed hazardous waste handling facility for possible recovery, treatment and disposal**.**

The following sections of the solid waste management plan provide specific information on how the various wastes generated will be handled. This information will be reviewed when significant changes are made to the waste streams and on an annual basis.

1.4 Definition of Wastes

This Waste Management Plan addresses all wastes that will be generated on site. Definitions of the various types that will be generated on site are provided below:

Effluent: This refers to the liquid waste from sewage filtration or from a process plant. It does not include wash water from the maintenance shop or storm-water runoff.

Solid waste: The definition of 'solid waste' means any garbage, refuse, sludge from a sewage treatment or water treatment plant, discarded material, including solid, semi-solid or contained liquid or gaseous materials resulting from industrial, commercial, mining, and community activities, but does not include solid or dissolved materials in irrigation return flows or industrial liquid effluent discharges.

Inert waste: Inert waste is waste which is neither chemically nor biologically reactive and will not decompose. Examples of this are sand, drywall, concrete or used tires.

Hazardous waste: Hazardous waste comprises all toxic chemicals, radioactive materials, and biologic or infectious waste. These materials threaten workers through occupational exposure and the general public in their homes, communities, and general environment. Exposure to these materials can occur near the site of generation, along the path of its transportation, and near their

ultimate disposal sites. The *Guideline for Industrial Discharge in Nunavut* describes hazardous waste as follows:

"A contaminant which is a dangerous good that is no longer used for its original purpose and is intended for storage, recycling, treatment or disposal. A hazardous waste does not include a contaminant that is:

a. household in origin,

b. included in class 1, Explosives or class 7, Radioactive materials of TDGR,

c. exempted as a small quantity,

d. an empty container, or

e. intended for disposal in a sewage system or by land filling that meet the applicable standards set out in schedules I, III or IV of the Guideline for Industrial Waste Discharges in Nunavut."

The considerations for small quantity hazardous wastes which is classified under non hazardous wastes is given below:

Small quantity: Hazardous waste that is generated in an amount that is less than 5 kilograms per month of a solid or 5 litres per month if a liquid; and where the total quantity accumulated at any one time does not exceed 5 kilograms or 5 litres. This does not apply to wastes that are mercury or in classes 2.3, 5.1 or 6.1 of TDGR. These wastes must be generated in an amount less than 1 kilogram per month of a solid or 1litre per month if a liquid; and where the total quantity accumulated at any one time does not exceed 1 kilogram or 1 litre.

1.5 Waste Sources

The sources and types of wastes that will be generated during the construction and operation phases are shown in Table 1.5-1 and Table 1.5-2 respectively.

Table 1.5-1
Sources and Classification of Wastes during Construction

		Estimated Annual Quantities			
				Solid Wastes	
Source	Type	Liquid Wastes	Inert	Non-Hazardous	Hazardous
Domestic wastes from:	Food scraps			100 tonnes	
-Construction Camp	Paper			2 tonnes	
-Administration Offices	Plastic bottles			150 m^3	
-Kitchens/canteens	Cans			10 tonnes	
	Cardboard			5 tonnes	
	Glass bottles			5 tonnes	

(continued)

Table 1.5-1
Sources and Classification of Wastes during Construction (completed)

Source	Type	Estimated Annual Quantities			
			Solid Wastes		
		Liquid Wastes	Inert	Non-Hazardous	Hazardous
Garage and Maintenance Shop	Used batteries				.5 tonnes
	Used oil				20,000 litres
	Air/oil filters				1 tonne
	Solvents				1,500 litres
	Scrap metals			25 tonnes	
	Waste antifreeze				1,000 litres
	Spent battery acid				500 litres
	Used tires			600	
Construction Wastes	Concrete		100 tonnes		
	Sand		200 tonnes		
	Wood			10 tonnes	
	Scrap metal			125 tonnes	
	Scrap pipe			20 tonnes	
	Styrofoam/dry wall		2.5 tonnes		
First Aid Facility	Needles				10 kg
	Soiled Tissue				100kg
Sewage Treatment Plant	Effluent	2000 m^3			
	Sludge				200 tonnes
Incinerators	Ash	500 m^3			

Table 1.5-2
Sources and Classification of Wastes during Operations

Source	Type	Estimated Annual Quantities			
			Solid Wastes		
		Liquid Wastes	Inert	Non-Hazardous	Hazardous
Domestic wastes from:	Food scraps			25tonnes	
-Construction Camp	Paper			1 tonnes	
-Administration Offices	Plastic bottles			30 m^3	
-Kitchens/canteens	Cans			2.5 tonnes	
	Cardboard			1.5 tonnes	
	Glass bottles			1.5 tonnes	
Garage and Maintenance Shop	Used batteries				0.25 tonnes
	Used oil				5,000 litres
	Air/oil filters				0.25 tonne
	Solvents				300 litres
	Scrap metals			2 tonnes	
	Waste antifreeze				250 litres
	Spent battery acid				100 litres
	Used tires			100	

(continued)

Table 1.5-2
Sources and Classification of Wastes during Operations (completed)

Source	Type	Estimated Annual Quantities			
			Solid Wastes		
		Liquid Wastes	Inert	Non-Hazardous	Hazardous
Construction Wastes	Concrete		10 tonnes		
	Sand		20 tonnes		
	Wood			1 tonnes	
	Scrap metal			5 tonnes	
	Scrap pipe			2 tonnes	
	Styrofoam/dry wall		0.5 tonnes		
First Aid Facility	Needles				2 kg
	Soiled Tissue				10 kg
Sewage Treatment Plant	Effluent	2000 m^3			
	Sludge				50 tonnes
Incinerators	Ash		100 m^3		

1.6 Classification and Disposal Plan

The wastes generated during the construction and operation phases of the project will be minimized by following the pollution prevention practices explained earlier. All waste streams will be classified to facilitate segregation of wastes based on the type and ultimate disposal method. Wastes will either be incinerated, buried in the landfill or shipped to a licensed disposal facility off-site. Waste containers will be labeled according to the classification and hazardous wastes signs will be displayed on the appropriate storage/transfer/disposal facilities.

1.6.1 Hazardous Wastes and Hazardous Recyclable Wastes

The hazardous wastes that will be generated during the construction and operation activities will be segregated, stored and transferred to a licensed disposal facility off-site. This section of the plan outlines the methodology for identification classification and storage of such materials. The plan also defines the safety protocols to be followed and records to be maintained by the personnel handling such wastes, including final disposal practices. The Waste Management Plant discusses the generation of solid wastes which also includes hazardous wastes and their storage and final disposal methodologies.

1.6.2 Petroleum Waste Stream

The petroleum wastes generation at the site will generally comprise of used oil, diesel fuel, lubricants and solvents. These waste streams will be segregated in order to render the individual waste streams easier to reuse as is, recycle or permit recovery of any by-products. Special precautions will be exercised when handling these materials since the improper release or disposal of these materials could adversely affect the environment. Personnel handling these products will receive safety training for handling them.

1.6.3 Used Petroleum Products

The used oil that will be generated from servicing vehicles, equipment, and generators will be stored in marked, separate above-ground tanks and drums. The tanks will have double-containment and roof-vent connection for oil removal. All connecting pipes will be above ground, making it easy to inspect for leaks. Spill kits will also be provided in all storage locations. The leak proof drums and tanks will be stored in the bermed and lined storage facility. Regular monitoring will be made as per 'Operation, Maintenance and Inspection of Tank Facilities Guidelines', API-2610 and/or Environmental Code of Practice for Aboveground Storage Tank System Containing Petroleum Products, National Task Force on Storage Tanks for Canadian Council of Ministers of the Environment.

Possible alternative uses of used petroleum products will be explored and implemented wherever possible. All transfers of used petroleum products will be performed in the lined area of the storage facility. Used petroleum products not suitable for reuse or recycling will be ultimately back-hauled to an off-site licensed facility.

1.6.4 Hydraulic Fluid

The segregation of the hydraulic fluid from used petroleum products for easier recycling and better reuse opportunities will be examined. Otherwise the hydraulic fluid will be disposed of along with waste petroleum products to an off-site facility.

1.6.5 Oil Filters

Oil filters will be drained in the lined and bermed area of the storage facilities, using trays to capture the drained oil and transfer it to the proper containers. The drained filters will be contained in drums and transported to recyclers using available back-haul facility. Suppliers who provide a take back and recycle service will be favoured.

1.6.6 Contaminated or Out of Date Fuels

Small quantities of out of date Jet B fuels will be either used in the on site heaters along with regular fuel, as incinerator fuel, or shipped off-site to be used by others as low grade fuels through the waste exchange process.

1.6.7 Soil Contaminated with Petroleum Products

The waste management plan emphasizes and facilitates the reduction of soil contamination through the lining of storage facilities, inspection and maintenance of equipment, use of trays for draining, lining of loading and unloading zones, and using secondary containment like diking the tank farm areas. In spite of these measures, spills can occur and contaminate the soil. This contaminated soil will be spread in a designated section of the landfill for land-farming which will be operative during the summer months. This process is described under section 7.4.

1.7 Chemicals

The port site and Contwoyto Lake Camp will not generate large amounts of chemical wastes during the construction or operating phase of the project. However, processing of the anticipated chemical waste products is described below:

1.7.1 Glycol

Ethylene glycol will be used in vehicles, equipment, and air strip as an anti freeze. If spilled, the sweet smell of the material could attract and affect wildlife and have a negative impact on the environment. The glycol waste stream will be segregated from other wastes and possibly recycled on site with a portable recovery system which will be installed on-site. Until on-site facility is developed, the glycol will be temporarily stored and then back-hauled to an approved recycling facility.

1.7.2 Acids

Acids from the use batteries will be drained into a labeled leak proof container and stored and back-hauled to a licensed facility for recycling/disposal. Consideration will be given to neutralizing the acid on site with lime but this would require importing another hazardous material.

1.7.3 Solvents

Solvents will be used as a degreasing agent. However, non-toxic alternatives will be considered such as organic detergents and steam jets.

1.7.4 Waste Batteries

The type of batteries that will be used during construction and operation phase of the project include lead acid, potassium hydroxide (alkaline) and nickel-cadmium. The rechargeable batteries will be the best example for the waste minimization principle to avoid generating waste after a single use. These batteries will be regularly maintained while in service, and tested prior to disposal to confirm that they are spent. All used batteries liquid content will be drained, segregated by type, and stored in leak proof containers in the secure storage facilities. Both the batteries and the drained liquid will be back-hauled to the licensed recycling/disposal facilities. The possibility of shipping of batteries back to the supplier/manufacturer will be investigated periodically.

1.7.5 Aerosol Cans

The use of aerosol cans on site will be discouraged because of potential damage they represent to the ozone layer. Aerosol cans are also very difficult to handle as a waste because they cannot be incinerated directly for the risk of explosion, they have to be punctured and then drained into special draining apparatus. The cans and liquids are to be collected and back-hauled into approved recycle/disposal facility. To comply with the waste minimization policy the aerosol cans will be substituted wherever possible with refillable type containers..

1.7.6 Paints

Paint waste during construction and operation will not be generated in large volumes because of the reduction in use by utilizing galvanized structural steel, pre-finished cladding, and prefabrication units for the accommodation camps. However, any waste paint will be waste exchanged. Water based paint will replace the toxic oil based paint wherever possible. Containers and paint liquids will be properly stored in drums, and kept in the proper storage facility and back-hauled to approved recycle/disposal facility.

1.8 Medical Wastes

Small amounts of biological hazardous wastes and other materials, such as needles, and blood and tissue contaminated items, will be segregated from the first aid sector. These wastes will be properly contained, labeled, and removed to an approved facility for destruction and disposal.

1.9 Inert Solid Waste

1.9.1 Conveyor Belts and Tires

Conveyor belts and tires have limited life and, when no longer usable, contribute to inert solid waste generation. Hence, purchase of better quality merchandise and the proper operation and maintenance of these products will extend their lives. Therefore, trained maintenance personnel will be required to observe strict maintenance schedules and vehicle operators will be trained to operate the equipment at an optimum performance level.

Arrangements will be pursued for a tire and conveyor exchange program with the vendors. Investigation to find alternative uses of conveyor belts and tires will be initiated. Some alternate uses for tires are to store materials in the parts lay-down area and to protect roads in turning areas. However, unused worn conveyor belts and tires will be temporarily stock piled in the sanitary landfill storage facility described in section 7 and transported to an off-site used-tire shredding facility.

1.9.2 Vehicles

The life of equipment is expanded by initially purchasing quality merchandise and practicing proper operation and maintenance program. Vehicles and equipment will be driven or back-hauled for reuse/recycle when they no longer are useable for the project.

1.9.3 Electrical Equipment and Prefabricated Buildings

All electrical equipment and prefabricated buildings will be salvaged and reused when the temporary camp or any of the equipment needs to be taken out of service. Unusable parts which could not be recycled, will be disposed into the landfill as metal and demolition waste.

1.9.4 Plastics

Plastic wastes will be generated in the construction and operation phases of the project mainly from packaging food products, cleaning products and lubricants. Minimum packaging and a return of plastics to the suppliers is part of the purchasing criteria when selecting vendors. For

instance the lubricant containers could be returned to the supplier or be used for alternate purposes. Plastic containers which originally contained toxic or hazardous materials will be fully drained and triple-rinsed before being sent for recycling or land-filling. The rinse water will be treated in the sewage treatment plant. Plastic waste from food containers will be incinerated.

To reduce the plastic waste generation, in accordance with the waste minimization policy, the use of disposable dishes will be discouraged.

1.9.5 Corrugated Cardboard

Corrugated cardboard waste will be generated during the construction and operation phase of the project from mainly package materials. Reduction in cardboard waste will be achieved by avoiding extensive packaging and it will be segregated and back-hauled for recycling.

1.9.6 Paper

Paper waste will be generated in the construction and operation phase of the project. Office paper, newsprint, packaging, and food packaging will be the major types of paper wastes. Confidential paper will be shredded by a portable shredder. Paper reduction could be achieved by using e-mail, voice message devices, telephone or verbal communication over-written whenever possible and using both sides of paper when photocopying. Paper waste will be segregated by type to preserve quality and assure recycling value. It will be back -hauled to recycling facilities.

1.9.7 Scrap Metal

Scrap metals will be generated during the construction and operation phase. The waste stream consists of ferrous and nonferrous scrap metals of various types which have low recycling price and are very hard to recycle. Scrap metals that could not be recycled will be landfilled. During the construction phase it will be generated from cut-off parts of siding, ends of piping, and other similar items. After the construction phase, quantity and type of the scrap metals will diminish.

Bulky scrap metals such as unusable vehicles or large appliances will be shipped off-site for salvaging and disposal. Reusable scrap metals such as sheets, used drums will be reused as a part of effective waste reduction program. Recoverable/recyclable scrap metals will be sent to the recycling facilities. Good equipment maintenance and the exchange of parts through the supplying vendors will be initiated.

1.10 Solid Domestic Wastes

The solid domestic waste stream consists of food waste, recyclable containers (cans, bottles), inert non-combustible domestic waste, packaging, corrugated cardboard, paper, and paper products. Food waste will be generated in the temporary construction camps and permanent camp kitchen areas and bag lunches.

Two incinerators will be installed on-site for incinerating some of the solid wastes generated with in the plant. The details on the incinerators are discussed in the Incinerator section (Section 7.3).

1.10.1 Food Wastes

All food waste will be collected and incinerated within 12 hours of generation to minimize the attraction of wildlife and the potential negative impact to wildlife. All recyclable cans and bottles will be deposited into specially marked recycling bins. Bag lunch wastes are to be collected from each meal in wildlife-proof bins which will be provided in all work areas. All recyclable wastes will be back-hauled to the off-site recycling facilities. Also waste minimization through reduction in package material like bulk quantity purchase instead of smaller packs will be encouraged. Oil and grease and putrescible wastes from the kitchen/canteen wastes will be collected and incinerated.

1.10.2 General Camp Wastes

Miscellaneous camp wastes include wastes from rooms, leisure, and recreation areas. Because of the isolation and the nature of the mining activity the waste stream generated will be minimal. However, based on the type of the wastes, they will be sorted and either incinerated or land-filled.

1.11 Sewage

The biodegradable materials removed by screening in the sewage treatment plant will be dewatered and incinerated. Non-biodegradable sludge such as chemically precipitated sludge or sludge settled from the water and wastewater treatment plants with the aid of flocculants or coagulants will also be incinerated and the ashes buried in the sanitary landfill.

Liquid sewage from the accommodation facilities will be treated in the sewage treatment plant before being discharged to the sea or Contwoyto Lake.

1.11.1 Miscellaneous Wastes

Various kinds of wastes other than those mentioned earlier will be collected in a centralized facility and segregated based on the type. Potential reuse or recycling possibilities will be evaluated and finally incinerated or land-filled accordingly. All the wastes will be handled and transported by trained personnel.

1.12 Site Facilities

1.12.1 Hazardous Wastes Storage Facility

1.12.1.1 Design and Location

An area adjacent to the maintenance shop will be reserved for the temporary storage of hazardous wastes before transfer to a licensed disposal facility. The storage facility will be fully bermed and lined with an impervious liner to contain any spill or release of materials to protect

the environment. A lockable seacan and auxiliary drums or tanks will be provided as required. The storage site will be secured and a sign will be posted indicating that hazardous materials are stored within. Only trained personnel will be allowed to enter the restricted area. Protective equipment, first aid kits and spill kits for all types of wastes will be labeled and accessible to all trained personnel handling the wastes. The facility will be weather protected. All transfers, drains, loading /unloading operations will be performed in the lined area of the facility to avoid soil contamination. Leak proof devices, overfilling warnings or indicators, and above ground pipes and transferring hoses will be used to avoid/reduce spills.

1.12.2 Waste Streams

The storage facility will be used for used petroleum products as well as other hazardous wastes such as used oil filters, batteries, acids, glycol, paints and chemicals.

1.12.3 Incompatible Wastes and Container Requirements

The risk of mixing of chemical waste that could react to produce heat, gas, fire and explosion, or corrosive and toxic substances will be eliminated by segregating all chemical waste and leaving outdated chemicals in their original containers and well labeled. Chemicals requiring special containers will remain in the containers in which they were purchased and additional appropriate empty containers will be made available for emergency purposes.

1.13 Landfill

1.13.1 Site Selection and Design

A tentative landfill location has been selected approximately 1.5 km south of the site as shown on Drawing No. 300-35-01. When compared to the GNWT recommendations in the *Guidelines for the Planning, Design, Operation and Maintenance of Solid Wastes Modified Landfill Sites in the Northwest Territories,* the selected site satisfies the following stipulations:

- the site is more than 450m from the camp and blocked from view by an interceding ridge top.
- the site is at least 500 m away from natural water bodies.
- The bottom of the active layer (frost table) is two meters deep and, there is no fresh water aquifer used for potable water.
- The area of the landfill is not a water discharge area.
- The location of the disposal site is accessible to vehicular traffic year round and all roads will be well maintained.
- The site is downwind of the camp.

However, because of its proximity of the airstrip and its drainage towards the mouth of No Name Creek a more suitable site will be chosen during detailed design.

The major source of odors, food wastes, will be incinerated and the site is sufficiently distant from the accommodation and operations facilities to mitigate potential odor concerns. Further

geotechnical and hydrogeological information will be required from the site to finalize the landfill design.

The landfill site will be used to dispose of only inert solid waste and ashes from the incinerator. A three to five meter layer will be applied on top of wastes before abandoning the fill so that the contents of the landfill will remain permanently frozen. This will restrict the movement of the waste or any leachate.

There will be no burning in the landfill and the inert materials and ashes from the construction and operation phase will be buried routinely thus eliminating smoke, dust, and odor problems. This covering of the landfill will also eliminate any possible wind problems with the dispersal of incinerator ashes.

By making use of natural barriers, major landforms, and depressions the earthwork required for site preparation, operation, and maintenance will be minimized. Because of waste minimization practices, extensive recycling, and volume reduction from the incineration of food wastes, considerably less area will be required for landfilling purposes. A readily visible sign will be posted to identify the disposal area and the area will be surrounded by a 4m high mesh fence to control wind transportation of any litter and wildlife intrusion.

1.14 Contingency Planning

1.14.1 Improper Disposal.

Any improperly disposed materials will be removed and transferred for proper disposal. Hazardous wastes will not be disposed in the land fill site.

1.14.2 Fire

Since there will not be any open burning in the landfill the fire problem does not arise. Moreover, there will not be any oxidizing, reactive, or flammable materials disposed in the landfill to cause fires. In case of an accidental disposal and consequent fire, the fire will be put off by spreading soil on top or snow to smother the fire or by using portable extinguishers designated to the area. The on-scene coordinator will be notified immediately and the on-site emergency response unit will be dispatched immediately.

1.14.3 Extreme Weather Conditions

If necessary, digging or accumulation of cover materials will be done during the thawing season. During extreme winds and blizzards the disposal of ash will be curtailed. Mitigative procedures such as cover and containment work in landfill will be initiated to shield from the winds or avoid disposal until the weather condition improves.

1.15 Incinerators

Multiple chamber in-line diesel fired incinerators will be installed at the Port and Contwoyto Camps. These incinerators will be used to incinerate domestic wastes including food wastes, sewage sludge, construction wastes such as cardboard, wood planks, combustible scraps and

other general garbage. Hazardous wastes, except for sewage sludge, will not be incinerated on site.

During the construction phase, with up to 270 persons accommodated on site, it is estimated that some 675 to 1125 kg of domestic wastes suitable for incineration may be generated per day. Three multiple chambered, in-line diesel-fired units capable of burning 100 kg of refuse per hour for 6 hours daily will be provided close to the port and mobile construction camps. During operations one incinerator will be located at Contwoyto Lake Camp and another at the port site. The third incinerator may be kept as a spare.

The incinerators will be used to incinerate food wastes, paper, cartons, wood scraps, rubbish, residential garbage, animal & vegetable fat and wastes, dewatered sewage sludge and other general garbage. The incinerated ash will be transported by a closed truck and landfilled in a lined cell within the sanitary landfill.

1.16 Landfarming

The hydrocarbon contaminated soils from spills or other releases will be land-treated in a designated area adjacent to the landfill. The cell to be designed and constructed for this purpose will be bermed and lined with a geomembrane. The geomembrane will be covered with fine soils such as sand or till with boulders and cobbles to provide a cushion between the contaminated soil and the geomembrane. This cushion will protect the geomembrane from being damaged during the mixing and spreading operations.

The goal will be to minimize fuel- (hydrocarbon) contaminated soils by immediate cleanup of spills and the use of liners in dispensing and equipment storage areas. The capacity and technical specifications of the bioremediation facility will be determined based on the volume of material that will be required. These facilities do not require highly technical specifications or specialized equipment, and therefore a long lead time will not be required if it is determined that such a facility is required.

Snow and ice contaminated with petroleum hydrocarbons will be put in drums equipped with an oil/water separator. The hydrocarbons will then be treated in the soil bioremediation facility or taken off-site and disposed of in a regulated facility. Such tanks will be stored within the berm of the tank farm or other lined facility until disposal/treatment is performed.

The hydrocarbon contaminated soil will be placed on top and spread during the summer months to allow for remediation to acceptable levels by using natural micro-biological processes (bioremediation). To enhance the turn around time, fertilizers such as ammonium nitrate may be applied to enhance the bioremediation process and improve the efficiency of the landfarm.

1.17 Sewage Treatment Plant

The Sewage Treatment Plant will be skid mounted and employ membrane bioreactor technology. The membrane bioreactor technology combines the biological step and the solid–liquid separation step into a single process. The membrane modules are submerged in the activated sludge and acts as a barrier to microorganisms and eliminates the secondary clarifier and allows

the activated sludge to be more concentrated. UV disinfection system, if required, will be used prior to effluent discharge. At closure this facility will be decommissioned and removed in accordance with the closure plan.

1.18 Personnel and Training

1.18.1 Training

During construction phase there will be designated operators for handling hazardous materials/wastes. All operation personnel involved in the handling of hazardous wastes will be fully trained for 'Personal Safety and Protection'. They will also be trained in elimination or response to spills/leaks and emergency response plan.

The landfill will be operated only by trained personnel. Inspection and monitoring will be performed regularly. Records will be kept regarding findings and recommendations recorded, evaluated and executed.

Only trained personnel will operate the incinerator.

1.18.2 Monitoring and Reporting

Personnel operating the waste management facilities and equipment will proactively provide notice for required maintenance work and report the need for repairs. A more detailed inspection will be performed twice a week and a record will be kept regarding the maintenance needs, the inventory of wastes, the waste management data sheets, the status of the protective equipment, and the spill kits.

Manifests will accompany the hazardous recyclable or hazardous wastes when they are transported for recycling or treatment and disposal to an approved facility.

Waste audits will be performed on a regular basis and annual reports showing the amount and types of wastes incinerated, recycled, land-filled and back-shipped will be prepared.

Personnel will be trained to sample the air to monitor emissions in the vicinity of the camps.

APPENDIX 5.8-1
RESULTS OF SPECIES SEARCHES FOR NUNAVUT

Appendix 5.8-1
Results of Species Searches for Nunavut

Species	Scientific Name	Species Status/ Designation			Occurrence
		Nunavut	Species at Rick (SARA)	COSEWIC	
CARNIVORES					
Grey Wolf	*Canis lupus*	Secure	Not currently scheduled	Data Deficient	Confirmed
Arctic Fox	*Vulpes lagopus*	Secure	Not currently scheduled	Not assessed	Confirmed
Coloured Fox	*Vulpes vulpes*	Secure	Not currently scheduled	Not assessed	Confirmed
American Black Bear	*Ursus americanus*	Sensitive	Not currently scheduled	Not at Risk	Unlikely
Grizzly Bear	*Ursus arctos*	Sensitive	Not currently scheduled	Special Concern	Confirmed
Polar Bear	*Ursus maritimus*	Sensitive	Not currently scheduled	Special Concern	Shipping
Wolverine	*Gulo gulo*	Secure	Not currently scheduled	Special Concern	Confirmed
Northern River Otter	*Lontra canadensis*	Sensitive	Not currently scheduled	Not assessed	Unlikely
American Marten	*Martes americana*	Secure	Not currently scheduled	Not assessed	Unlikely
Fisher	*Martes pennanti*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Ermine	*Mustela erminea*	Secure	Not currently scheduled	Not assessed	Confirmed
Least Weasel	*Mustela nivalis*	Secure	Not currently scheduled	Not assessed	Likely
American Mink	*Mustela vison*	Undetermined	Not currently scheduled	Not assessed	Possible
Canada Lynx	*Lynx canadensis*	Undetermined	Not currently scheduled	Not at Risk	Possible
UNGULATES					
Moose	*Alces alces*	Secure	Not currently scheduled	Not assessed	Unlikely
Caribou (Peary subspecies)	*Rangifer tarandus pearyi*	unavailable	Not currently scheduled	Endangered	Shipping Route
Caribou (Dolphin and Union H	*Rangifer tarandus groenlandicus*	Sensitive	Not currently scheduled	Special Concern	Shipping Route
Caribou (Bathurst herd)	*Rangifer tarandus groenlandicus*	Secure	Not currently scheduled	Not assessed	Confirmed
Caribou (Ahiak herd)	*Rangifer tarandus groenlandicus*	unavailable	Not currently scheduled	Not assessed	Likely
Muskox	*Ovibos moschatus*	Secure	Not currently scheduled	Not assessed	Confirmed
SMALL MAMMALS					
Masked Shrew	*Sorex cinereus*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Barrenground Shrew	*Sorex ugyunak*	Undetermined	Not currently scheduled	Not assessed	Likely
Hoary Bat	*Lasiurus cinereus*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Little Brown Myotis	*Myotis lucifugus*	Sensitive	Not currently scheduled	Not assessed	Unlikely
Snowshoe Hare	*Lepus americanus*	Sensitive	Not currently scheduled	Not assessed	Unlikely
Arctic Hare	*Lepus arcticus*	Secure	Not currently scheduled	Not assessed	Confirmed
Arctic Ground Squirrel	*Spermophilus parryii*	Secure	Not currently scheduled	Not assessed	Confirmed
Red Squirrel	*Tamiasciurus hudsonicus*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Northern Red-backed Vole	*Clethrionomys rutilus*	Secure	Not currently scheduled	Not assessed	Confirmed
Tundra Vole	*Microtus oeconomus*	Undetermined	Not currently scheduled	Not assessed	Confirmed
Meadow Vole	*Microtus pennsylvanicus*	Secure	Not currently scheduled	Not assessed	Possible
Common Muskrat	*Ondatra zibethicus*	Secure	Not currently scheduled	Not assessed	Unlikely
American Beaver	*Castor canadensis*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Northern Collared Lemming	*Dicrostonyx groenlandicus*	Secure	Not currently scheduled	Not assessed	Confirmed
Victoria Collared Lemming	*icrostonyx groenlandicus kilangmiuta*	Secure	Not currently scheduled	Not assessed	Possible
Richardson's Collared Lemmi	*Dicrostonyx richardsoni*	Secure	Not currently scheduled	Not assessed	Unlikely
Brown Lemming	*Lemmus trimucronatus*	Secure	Not currently scheduled	Not assessed	Confirmed
North American Porcupine	*Erethizon dorsatum*	Undetermined	Not currently scheduled	Not assessed	Unlikely
RAPTORS					
Osprey	*Pandion haliaetus*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Bald Eagle	*Haliaeetus leucocephalus*	Undetermined	Not currently scheduled	Not assessed	Possible
Northern Harrier	*Circus cyaneus*	Undetermined	Not currently scheduled	Not at risk	Possible
Sharp-shinned Hawk	*Accipiter striatus*	Undetermined	Not currently scheduled	Not at risk	Unlikely
Northern Goshawk	*Accipiter gentilis*	Sensitive	Not currently scheduled	Not at risk	Unlikely
Red-tailed Hawk	*Buteo jamaicensis*	Undetermined	Not currently scheduled	Not at risk	Unlikely
Rough-legged Hawk	*Buteo lagopus*	Secure	Not currently scheduled	Not at risk	Confirmed
Golden Eagle	*Aquila chrysaetos*	Sensitive	Not currently scheduled	Not at risk	Confirmed
American Kestrel	*Falco sparverius*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Merlin	*Falco columbarius*	Undetermined	Not currently scheduled	Not at risk	Possible
Peregrine Falcon (tundra)	*Falco peregrinus tundrius*	Secure	Schedule 3	Special Concern	Confirmed
Gyrfalcon	*Falco rusticolus*	Secure	Not currently scheduled	Not at risk	Confirmed
Great Horned Owl	*Bubo virginianus*	Undetermined	Not currently scheduled	Not assessed	Possible
Snowy Owl	*Bubo scandiacus*	Secure	Not currently scheduled	Not at risk	Likely
Northern Hawk Owl	*Surnia ulula*	Undetermined	Not currently scheduled	Not assessed	Possible
Short-eared Owl	*Asio flammeus*	Sensitive	Schedule 3	Special Concern	Confirmed
Common Raven	*Corvus corax*	Secure	Not currently scheduled	Not assessed	Confirmed
WATERFOWL					
Red-throated Loon	*Gavia stellata*	Secure	Not currently scheduled	Not assessed	Confirmed
Pacific Loon	*Gavia pacifica*	Secure	Not currently scheduled	Not assessed	Confirmed

(continued)

Appendix 5.8-1
Results of Species Searches for Nunavut (continued)

Species	Scientific Name	Species Status/ Designation			Occurrence
		Nunavut	Species at Rick (SARA)	COSEWIC	
Common Loon	*Gavia immer*	Secure	Not currently scheduled	Not at risk	Confirmed
Yellow-billed Loon	*Gavia adamsii*	Secure	Not currently scheduled	Not at risk	Confirmed
Horned Grebe	*Podiceps auritus*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Greater White-fronted Goose	*Anser albifrons*	Secure	Not currently scheduled	Not assessed	Confirmed
Snow Goose	*Chen caerulescens*	Secure	Not currently scheduled	Not assessed	Confirmed
Ross's Goose	*Chen rossii*	Secure	Not currently scheduled	Not assessed	Likely
Canada Goose	*Branta canadensis*	Secure	Not currently scheduled	Not assessed	Confirmed
Cackling Goose	*Branta hutchinsii*	Secure	Not currently scheduled	Not assessed	Likely
Brant	*Branta bernicla*	Secure	Not currently scheduled	Not assessed	Likely
Tundra Swan	*Cygnus columbianus*	Secure	Not currently scheduled	Not assessed	Confirmed
American Wigeon	*Anas americana*	Undetermined	Not currently scheduled	Not assessed	Unlikely
American Black Duck	*Anas rubripes*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Mallard	*Anas platyrhynchos*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Northern Shoveler	*Anas clypeata*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Northern Pintail	*Anas acuta*	Secure	Not currently scheduled	Not assessed	Confirmed
Green-winged Teal	*Anas crecca*	Undetermined	Not currently scheduled	Not assessed	Confirmed
Ring-necked Duck	*Aythya collaris*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Greater Scaup	*Aythya marila*	Undetermined	Not currently scheduled	Not assessed	Confirmed
Lesser Scaup	*Aythya affinis*	Undetermined	Not currently scheduled	Not assessed	Unlikely
King Eider	*Somateria spectabilis*	Sensitive	Not currently scheduled	Not assessed	Likely
Common Eider	*Somateria mollissima*	Sensitive	Not currently scheduled	Not assessed	Likely
Harlequin Duck (eastern popu	*Histrionicus histrionicus*	Sensitive	Not currently scheduled	Special Concern	Unlikely
Surf Scoter	*Melanitta perspicillata*	Undetermined	Not currently scheduled	Not assessed	Possible
White-winged Scoter	*Melanitta fusca*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Black Scoter	*Melanitta nigra*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Long-tailed Duck	*Clangula hyemalis*	Secure	Not currently scheduled	Not assessed	Confirmed
Bufflehead	*Bucephala albeola*	Undetermined	Not currently scheduled	Not assessed	Possible
Common Goldeneye	*Bucephala clangula*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Common Merganser	*Mergus merganser*	Undetermined	Not currently scheduled	Not assessed	Confirmed
Red-breasted Merganser	*Mergus serrator*	Secure	Not currently scheduled	Not assessed	Confirmed
Hooded Merganser	*Lophodytes cucullatus*	Undetermined	Not currently scheduled	Not assessed	Very Unlikely
SHOREBIRDS					
American Bittern	*Botaurus lentiginosus*	Undetermined	Not currently scheduled	Not assessed	Very Unlikely
Yellow Rail	*Coturnicops noveboracensis*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Sandhill Crane	*Grus canadensis*	Secure	Not currently scheduled	Not assessed	Confirmed
Black-bellied Plover	*Pluvialis squatarola*	Sensitive	Not currently scheduled	Not assessed	Likely
American Golden-Plover	*Pluvialis dominica*	Sensitive	Not currently scheduled	Not assessed	Confirmed
Semipalmated Plover	*Charadrius semipalmatus*	Secure	Not currently scheduled	Not assessed	Confirmed
Common Ringed Plover	*Charadrius hiaticula*	Secure	Not currently scheduled	Not assessed	Possible
Killdeer	*Charadrius vociferus*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Greater Yellowlegs	*Tringa melanoleuca*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Lesser Yellowlegs	*Tringa flavipes*	Undetermined	Not currently scheduled	Not assessed	Possible
Spotted Sandpiper	*Actitis macularius*	Undetermined	Not currently scheduled	Not assessed	Confirmed
Solitary Sandpiper	*Tringa solitaria*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Whimbrel	*Numenius phaeopus*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Eskimo Curlew	*Numenius borealis*	At Risk	Schedule 1	Endangered	Possible
Hudsonian Godwit	*Limosa haemastica*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Marbled Godwit	*Limosa fedoa*	Undetermined	Not currently scheduled	Not assessed	Very Unlikely
Ruddy Turnstone	*Arenaria interpres*	Sensitive	Not currently scheduled	Not assessed	Shipping Route
Red Knot (*islandica* subspeci	*Calidris canutus islandica*	Sensitive	Not currently scheduled	Special Concern	Shipping Route
Red Knot (*rufa* subspecies)	*Calidris canutus rufa*	Sensitive	Not currently scheduled	Endangered	Shipping Route
Sanderling	*Calidris alba*	Sensitive	Not currently scheduled	Not assessed	Confirmed
Semipalmated Sandpiper	*Calidris pusilla*	Sensitive	Not currently scheduled	Not assessed	Confirmed
Least Sandpiper	*Calidris minutilla*	Secure	Not currently scheduled	Not assessed	Confirmed
White-rumped Sandpiper	*Calidris fuscicollis*	Secure	Not currently scheduled	Not assessed	Likely
Baird's Sandpiper	*Calidris bairdii*	Secure	Not currently scheduled	Not assessed	Confirmed
Pectoral Sandpiper	*Calidris melanotos*	Secure	Not currently scheduled	Not assessed	Likely
Purple Sandpiper	*Calidris maritima*	Secure	Not currently scheduled	Not assessed	Shipping Route
Dunlin	*Calidris alpina*	Secure	Not currently scheduled	Not assessed	Shipping Route
Stilt Sandpiper	*Calidris himantopus*	Secure	Not currently scheduled	Not assessed	Confirmed
Buff-breasted Sandpiper	*Tryngites subruficollis*	Sensitive	Not currently scheduled	Not assessed	Shipping Route
Short-billed Dowitcher	*Limnodromus griseus*	Undetermined	Not currently scheduled	Not assessed	Unlikely

(continued)

Appendix 5.8-1
Results of Species Searches for Nunavut (continued)

Species	Scientific Name	Species Status/ Designation			Occurrence
		Nunavut	Species at Rick (SARA)	COSEWIC	
Wilson's Snipe	*Gallinago delicata*	Sensitive	Not currently scheduled	Not assessed	Possible
Red-necked Phalarope	*Phalaropus lobatus*	Secure	Not currently scheduled	Not assessed	Confirmed
Red Phalarope	*Phalaropus fulicarius*	Sensitive	Not currently scheduled	Not assessed	Shipping Route
SEABIRDS					
Northern Fulmar	*Fulmarus glacialis*	Secure	Not currently scheduled	Not assessed	Shipping Route
Double-crested Cormorant	*Phalacrocorax auritus*	Undetermined	Not currently scheduled	Not assessed	Very Unlikely
Pomarine Jaeger	*Stercorarius pomarinus*	Secure	Not currently scheduled	Not assessed	Confirmed
Parasitic Jaeger	*Stercorarius parasiticus*	Secure	Not currently scheduled	Not assessed	Confirmed
Long-tailed Jaeger	*Stercorarius longicaudus*	Secure	Not currently scheduled	Not assessed	Confirmed
Little Gull	*Larus minutus*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Bonaparte's Gull	*Larus philadelphia*	Undetermined	Not currently scheduled	Not assessed	Possible
Mew Gull	*Larus canus*	Undetermined	Not currently scheduled	Not assessed	Possible
Ring-billed Gull	*Larus delawarensis*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Herring Gull	*Larus argentatus*	Secure	Not currently scheduled	Not assessed	Confirmed
Thayer's Gull	*Larus thayeri*	Secure	Not currently scheduled	Not assessed	Shipping Route
Iceland Gull	*Larus glaucoides*	Secure	Not currently scheduled	Not assessed	Unlikely
Lesser Black-backed Gull	*Larus fuscus*	Undetermined	Not currently scheduled	Not assessed	Very Unlikely
Glaucous Gull	*Larus hyperboreus*	Secure	Not currently scheduled	Not assessed	Confirmed
Great Black-backed Gull	*Larus marinus*	Undetermined	Not currently scheduled	Not assessed	Very Unlikely
Black-legged Kittiwake	*Rissa tridactyla*	Secure	Not currently scheduled	Not assessed	Shipping Route
Ross's Gull	*Rhodostethia rosea*	At Risk	Schedule 1	Threatened	Shipping Route
Sabine's Gull	*Xema sabini*	Secure	Not currently scheduled	Not assessed	Shipping Route
Ivory Gull	*Pagophila eburnea*	May be at Risk	Schedule 1	Endangered	Shipping Route
Caspian Tern	*Sterna caspia*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Common Tern	*Sterna hirundo*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Arctic Tern	*Sterna paradisaea*	Secure	Not currently scheduled	Not assessed	Confirmed
Black Tern	*Chlidonias niger*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Dovekie	*Alle alle*	Sensitive	Not currently scheduled	Not assessed	Unlikely
Thick-billed Murre	*Uria lomvia*	Secure	Not currently scheduled	Not assessed	Shipping Route
Razorbill	*Alca torda*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Black Guillemot	*Cepphus grylle*	Secure	Not currently scheduled	Not assessed	Shipping Route
Atlantic Puffin	*Fratercula arctica*	Sensitive	Not currently scheduled	Not assessed	Unlikely
GAME BIRDS					
Spruce Grouse	*Falcipennis canadensis*	Undetermined	Not currently scheduled	Not assessed	Possible
Willow Ptarmigan	*Lagopus lagopus*	Secure	Not currently scheduled	Not assessed	Confirmed
Rock Ptarmigan	*Lagopus muta*	Secure	Not currently scheduled	Not assessed	Confirmed
Sharp-tailed Grouse	*Tympanuchus phasianellus*	Undetermined	Not currently scheduled	Not assessed	Unlikely
LANDBIRDS & PASSERINES					
Hairy Woodpecker	*Picoides villosus*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Northern Flicker	*Colaptes auratus*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Northern Shrike	*Lanius excubitor*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Gray Jay	*Perisoreus canadensis*	Secure	Not currently scheduled	Not assessed	Possible
Horned Lark	*Eremophila alpestris*	Secure	Not currently scheduled	Not assessed	Confirmed
Cliff Swallow	*Petrochelidon pyrrhonota*	Undetermined	Not currently scheduled	Not assessed	Possible
Barn Swallow	*Hirundo rustica*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Boreal Chickadee	*Poecile hudsonica*	Undetermined	Not currently scheduled	Not assessed	Possible
American Pipit	*Anthus rubescens*	Secure	Not currently scheduled	Not assessed	Confirmed
Northern Wheatear	*Oenanthe oenanthe*	Undetermined	Not currently scheduled	Not assessed	Shipping Route
Gray-cheeked Thrush	*Catharus minimus*	Undetermined	Not currently scheduled	Not assessed	Confirmed
American Robin	*Turdus migratorius*	Secure	Not currently scheduled	Not assessed	Likely
Yellow Warbler	*Dendroica petechia*	Undetermined	Not currently scheduled	Not assessed	Confirmed
Cape May Warbler	*Dendroica tigrina*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Yellow-rumped Warbler	*Dendroica coronata*	Undetermined	Not currently scheduled	Not assessed	Possible
Blackpoll Warbler	*Dendroica striata*	Undetermined	Not currently scheduled	Not assessed	Possible
Wilson's Warbler	*Wilsonia pusilla*	Undetermined	Not currently scheduled	Not assessed	Likely
American Tree Sparrow	*Spizella arborea*	Sensitive	Not currently scheduled	Not assessed	Possible
Savannah Sparrow	*Passerculus sandwichensis*	Secure	Not currently scheduled	Not assessed	Confirmed
Fox Sparrow	*Passerella iliaca*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Lincoln's Sparrow	*Melospiza lincolnii*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Swamp Sparrow	*Melospiza georgiana*	Undetermined	Not currently scheduled	Not assessed	Possible
White-throated Sparrow	*Zonotrichia albicollis*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Harris's Sparrow	*Zonotrichia querula*	Sensitive	Not currently scheduled	Not assessed	Confirmed

(continued)

Appendix 5.8-1
Results of Species Searches for Nunavut (completed)

Species	Scientific Name	Species Status/ Designation			Occurrence
		Nunavut	Species at Rick (SARA)	COSEWIC	
White-crowned Sparrow	*Zonotrichia leucophrys*	Sensitive	Not currently scheduled	Not assessed	Confirmed
Dark-eyed Junco	*Junco hyemalis*	Undetermined	Not currently scheduled	Not assessed	Possible
Lapland Longspur	*Calcarius lapponicus*	Secure	Not currently scheduled	Not assessed	Confirmed
Smith's Longspur	*Calcarius pictus*	Secure	Not currently scheduled	Not assessed	Likely
Snow Bunting	*Plectrophenax nivalis*	Sensitive	Not currently scheduled	Not assessed	Likely
Rusty Blackbird	*Euphagus carolinus*	Undetermined	Not currently scheduled	Special Concern	Unlikely
Common Redpoll	*Carduelis flammea*	Secure	Not currently scheduled	Not assessed	Confirmed
Hoary Redpoll	*Carduelis hornemanni*	Secure	Not currently scheduled	Not assessed	Confirmed
AMPHIBIANS/REPTILES					
Boreal Chorus Frog	*Pseudacris maculata*	Undetermined	Not currently scheduled	Not assessed	Very Unlikely
Wood Frog	*Rana sylvatica*	Undetermined	Not currently scheduled	Not assessed	Unlikely
Northern Leopard Frog	*Rana pipiens*	Not assessed	Not currently scheduled	Not assessed	Very Unlikely
Common Gartersnake	*Thamnophis sirtalis*	Not assessed	Not currently scheduled	Not assessed	Very Unlikely

Nunavut Ranking (www.wildspecies.ca)

At Risk - Species for which a formal, detailed risk assessment (COSEWIC status assessment or provincial or territorial equivalent) has been completed and that have been determined to be at risk of extirpation or extinction (i.e. Endangered or Threatened).

A COSEWIC designation of Endangered or Threatened automatically results in a Canada General Status Rank (Canada rank) of At Risk.

May be at Risk - Species that may be at risk of extirpation or extinction and are therefore candidates for a detailed risk assessment by COSEWIC, or provincial or territorial equivalents.

Sensitive - Species that are not believed to be at risk of immediate extirpation or extinction but may require special attention or protection to prevent them from becoming at risk.

Secure - Species that are not believed to belong in the categories Extirpated, Extinct, At Risk, May Be At Risk, Sensitive,

Undetermined - Species for which insufficient data, information, or knowledge is available with which to reliably evaluate their general status.

SARA Designation (www.speciesatrisk.gc.ca)

Schedule 1

Species listed in Schedule 1 are protected under SARA as of proclamation in June 2003. These species were assessed by COSEWIC using the revised assessment criteria. The list classifies the species as being either extirpated, endangered, threatened, or a special concern.

Schedules 2 and 3

Species listed in these schedules were assessed prior to October 1999, and require re-assessment using the revised criteria, following which the Governor in Council may, on the recommendation of the Minister, add the species to the Federal List of Wildlife Species at Risk.

COSEWIC Ranking (www.cosewic.gc.ca)

Endangered - A wildlife species facing imminent extirpation or extinction.

Threatened - A wildlife species likely to become endangered if limiting factors are not reversed.

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

Data Deficient - A category that applies when the available information is insufficient (a) to resolve a wildlife species' eligibility for assessment or (b) to permit an assessment of the wildlife species' risk of extinction.

Not At Risk - A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.

Occurrence Rank

Confirmed - Species observation confrimed from baseline studies

Likely - Occurs in project area but not detected during baseline studies

Possible - Range occurs within 200km buffer of project area

Shipping Route - Range occurs along marine shipping route

Unlikely - Spcies is listed in Nunavut wild species database, but range does not occur within 200km buffer

Very Unlikely - Range does not typically extend into Nunavut

APPENDIX 5.13-1
THE ROLE OF THE TRADITIONAL ECONOMY IN NUNAVUT COMMUNITIES: AN OVERVIEW

1. The Role of the Traditional Economy in Nunavut Communities: An Overview

1.1 The Land-based/traditional economy – a holistic perspective

"Traditional foods and traditional means of obtaining and preparing them are part of a cultural heritage. Thus, food is holistically entwined with culture and personal identity, as well as with physical health" (INAC, 1996a).

From social, cultural, and economic perspectives, harvesting traditional foods is an integral component of the Inuit way of life. It must be understood from a holistic perspective as an intrinsic part of the Inuit identity along with its connection to Inuit Qaujimajatuqangit (traditional Inuit knowledge). The traditional or land-based economy refers to economic activity that is non-wage based and includes fishing, hunting, and local production of food and clothing. The biggest sectors are food processing, hunting, fishing, and arts and crafts. The land-based economy is dependent on maintenance and transmission of traditional Inuit skills and knowledge and is interconnected to the wage-based economy in Nunavut.

Predominant country foods during the summer in the Kitikmeot region include caribou, arctic char, ringed seal, musk ox, trout, and white fish. Arctic char and caribou are the two most frequently consumed foods during the winter (Wolfden, 2007). Research suggests a decline in the consumption of traditional foods in the Kitikmeot and an accompanying increase in the consumption of market foods with less nutritional value and no cultural significance.

1.2 Significance of traditional/country food and its role in sustaining Inuit culture

There is an abundance of literature documenting the importance of traditional foods to Canadian Inuit communities (Klinoch *et al.*, 1992; Kuhnlein and Soueida, 1992; Wein and Freeman, 1992; Moffat *et al.*, 1994; Chan *et al.*, 1995; Kuhnlein, 1995; Kuhnlein *et al.*, 1995a; Kuhnlein *et al.*, 1995b; Wein, 1995; Kuhnlein *et al.*, 1996; Wein *et al.*, 1996). Traditional foods are an essential part of Inuit identity with significant social and cultural relevance (Freeman, 1996; Wein *et al.*, 1996) and can be seen as "the embodiment of the connection Inuit have to the land and its bounty" (National Aboriginal Health Organization, 2004). Inuit identity can be understood in terms if living off the land, accessing, producing, sharing, and consuming food from lands and waters (Myers *et al.*, 2005). Inuit foods are essential for health and well-being and are the product of a social system and spiritual relationship connected with being on the land and hunting, (Usher *et al.*, 1995; Thompson, 2005). The capture, sharing, and consumption of country foods enables the integration of the body and the soul (Borre, 1994; Thompson, 2005). The harvesting of country food, such as caribou, arctic char, shellfish, and berries benefit Inuit in

terms of both culture and economics. It elicits behaviour consistent with the values of cooperation, sharing and generosity (Pauktuutit Inuit Women of Canada, 2006; Tait, 2006).

The annual, cyclical repetition of activities on the land, from whaling to gathering berries, contributes to transferring Inuit traditional knowledge, ethics, values and cultural identity from one generation to the next. Concerns over the potential loss of resources and impacts to the environment can be viewed in terms of the tremendous risk to Inuit culture that could occur if the social relations of production, transmission of stewardship ethics, and traditional knowledge are threatened (Freeman, 1996). Food sharing, for example, is a tradition that maintains family and community ties. In 2001, 96% of Inuit households reported sharing harvested food outside of the home (Tait, 2006), demonstrating the ongoing vital role of harvesting to culture, social relations and the economy.

1.3 Role of household and extended family in structuring harvesting activities

"The social relations underlying the production of food in the traditional economy, and the sharing of food within the household and through the extended family and community are the primary means of reinforcing those social relations" (INAC, 1996b).

Harvesting is a collective activity whereby the division of resources among the community emphasizes the significance of family, individual, and community well-being (Tait, 2006). It provides opportunities for household, extended family, and community interaction and sharing of values and culture, and serves to reinforce cohesiveness and familial ties.

As the basic unit of production and consumption in the traditional economy, the household is essential to the structuring of harvesting activities and can be considered a "micro-enterprise" (Usher *et al.*, 2003). Data for 2001 suggest that more than 80% of Inuit households in Nunavut participated in harvesting activities, with participation rates at 80% for men (90% for those aged 45-54) and 63% for women (Tait, 2006). Lower rates among those aged 15-24 may be due to the high cost of supplies and equipment such as snowmobiles, rifles, and gas, lower earnings, and participation in the education system (Tait, 2006).

The importance of the traditional economy for women in Nunavut has been well documented in studies on food security in the north and Inuit women's health and nutrition. Lambden *et. al.* (2007) notes that Inuit women consider traditional activities important for good health, a connection to nature, an essential part of Inuit culture, and, in terms of relevance to the household, as opportunities to impart knowledge and values, and transfer/acquire skills in food preparation, survival, and the environment.

1.4 Income and benefits from subsistence harvesting

Despite its essential role in the economy of Nunavut, it is difficult to accurately represent the economic benefits of the land-based economy. Estimates by the Canadian Arctic Resources

Committee (2004) suggest that Inuit in Nunavut harvest approximately $40-60 million of country food per year. In 2001, 70% of Inuit adults were involved in harvesting activities in Nunavut, (Statistics Canada, 2001; Tait, 2006). Factors such as the high cost of store-bought food and unemployment in Nunavut suggest significant economic benefits associated with the traditional economy.

Participation in both the wage economy and in harvesting is manageable and can provide benefits on a variety of levels to participants. In the 1999 Nunavut Community Labour Force Survey 78% of employed Inuit males reported continuing to participate in harvesting activities (Wolfden, 2007).

1.5 Commercial harvesting

Commercial harvesting includes the sale of furs, hides, meat, fish and arts and crafts derived from harvested animal by-products. It has been estimated that the commercialized harvesting industry represents approximately $30-40 million in revenue (Nunavut Economic Outlook, 2001), with caribou and muskox yielding close to $1.5 million dollars for 80 to 100 hunters (Environment Canada, 2006). Despite the challenges associated with the marketing and sale of country foods imposed by the federal government's legislation and health regulations, through the Kitikmeot Foods Corporation, Nunavut Development Corporation has focused on commercialized harvested products such as arctic char and Inuit arts and crafts. With the arts and crafts industry accounting for $30 million in revenue for Nunavut in 2005 with an estimated 30% of Inuit relying on this activity for their income, the economic significance to the individual, families, communities and to Nunavut is clear (Wolfden, 2007).

Support for the commercialization of renewable resources has led to the development of numerous programs and grants for individuals, Hunters and Trappers Organizations and businesses involved in fish harvesting and trapping activities. In addition to funding through Nunavut Tunngavik Incorporated, the GN Department of the Environment has implemented programs such as the fur pricing program and the community harvesters assistance program (Wolfden, 2007).

2. The viability of the traditional economy

Traditional foods are a nutritional necessity for many Inuit communities in Nunavut, given the high cost and scarcity of fresh and nutritious store-bought food imported from the south (Thompson, 2005). Offering the best source of omega 3 fatty acids, key vitamins, minerals, and protein, traditional foods are the most nutritious foods available to northern communities. From a dietary health perspective, there are significant concerns around possible declines in consumption and an increase in the reliance on non-traditional foods that are high in refined carbohydrates and sugar (Myers *et al.*, 2005).

The Role of the Traditional Economy in Nunavut Communities: An Overview

Since the 1960s there have been significant changes to the modes of production related to harvest and consumption of traditional foods. Among the changes that Myers *et. al.* (2005) note is a reduction of family involvement in harvesting and decreased on-the-land learning, which may be a result of the centralization of settlements. Other changes include: the adoption of mechanized transportation and the related need for money to purchase equipment and fuel; individualized hunting in place of communal activities with obvious impacts on transmission of traditional knowledge, learning, and socialization; commercialization or de-commercialization of resources such as the creation of commercial hunts, cultural tourism, and ecotourism; new knowledge about contaminants in resources, availability, and accessibility of market foods, and reaffirmation of desirability of traditional foods; and the need for sustainable income (Myers *et al.*, 2005). The last five to seven decades have seen a rapid transition in Canada's north (Healey and Meadows, 2007). This period of transition has resulted in significant changes to the traditional way of life for many in Nunavut, such as the increased involvement of Inuit in formal economy jobs such as mining and tourism) and the integration of harvesting as part of a mixed economy (Myers *et al.*, 2005).

Research by the Centre for Indigenous People's Nutrition and Environment suggests possible factors influencing the frequency of harvesting activities may be reduced density of species and available harvesting areas, restricted harvesting in accessible areas, time and energy limitations for traditional harvesting, interruption of knowledge transfer to youth due to adult employment and youth school attendance, availability of new food products, acceptability of new products due to media, social contact and education, and concerns over the presence of contaminants in traditional food (CINE, 2008).

The traditional economy in Nunavut is essential to the Inuit way of life. It is also subject to numerous influential factors including social and cultural significance, access to wildlife, high cost of store-brought goods, and availability of disposal income for enhanced participation through purchasing of fuel and equipment.

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APPENDIX 5.13-2
REVISED REFERENCE LIST FOR APPENDIX F-7 OF THE DEIS

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APPENDIX 6.2-1
PRELIMINARY BATHURST INLET PORT AND ROAD PROJECT
COUNTRY FOODS BASELINE, 2008

the BATHURST INLET PORT AND ROAD PROJECT

Bathurst Inlet Port and Road Project

Nunavut, Canada

Preliminary
Bathurst Inlet Port and Road Project
Country Foods Baseline, 2008

Prepared by:

Rescan™ Environmental Services Ltd.
Vancouver, British Columbia

June 2008

EXECUTIVE SUMMARY

Executive Summary

This report presents the preliminary country foods baseline assessment conducted by Rescan Environmental Services Ltd. (Rescan) for the Bathurst Inlet Port and Road Project in Nunavut, Canada as part of the Environmental Assessment (EA) process.

Inuit of the central Kitikmeot region, formerly known as Copper Eskimos, have traditionally harvested country foods within the study area of the proposed port in Bathurst Inlet and winter road. The primary groups of Inuit in the study boundary are the Nunamuit (Inlanders) and the Bathurst / Perry / Ellice. These country food harvesters were the human receptors evaluated in this study.

The country foods evaluated were caribou (*Rangifer tarandus*), arctic hare (*Lepus arcticus*), Canada goose (*Branta canadensis*), lake trout (*Salvelinus namaycush*), and blueberry species (*Vaccinium* sp.). Ringed seal was also identified as a relevant country food but was not evaluated in this preliminary baseline because empirical data and a relevant marine mammal tissue model were not available.

This assessment evaluated metals in the selected country foods. Metals were the focus of this assessment because the Project is adjacent to base metal deposits, which suggest the potential for naturally elevated background levels of metals in the environmental media such as soil, water, plant and animal tissue. Five metals were evaluated and selected based on their baseline concentrations. These metals were: aluminum, cadmium, chromium, copper and iron.

The results from this assessment indicate there is no unacceptable risk to human receptors for both toddler and adults from the consumption of the selected country foods. Based on the predicted levels of metals in these foods, the amounts currently consumed by country food harvesters are within the recommended maximum weekly intakes (RMWIs). Thus, people may safely continue to eat these foods at the quantities and rates they are accustomed to.

Despite the above conclusions, there are some uncertainties associated with this preliminary baseline line assessment (*i.e.*, consumption rates and environmental media concentrations). Although these uncertainties will not effect the overall conclusions of the Environmental Impact Statement, reducing the uncertainties will provide for a more accurate comparison of pre-project conditions if the project is approved. Subsequently, additional field studies will be conducted in the summer of 2008. Once these field studies are complete, this report will be amended.

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Bathurst Inlet Port and Road Project

Kitikmeot Inuit Association
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the BATHURST INLET PORT AND ROAD PROJECT

Rescan™

Dated June 3, 2008

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ACRONYMS

Acronyms

BAF	Bioaccumulation Factor
BIPR	Bathurst Inlet Port and Road
BTF	Biotransfer Factor
CCME	Canadian Council of Ministers of the Environment
COPC	Contaminant of Potential Concern
DEIS	Draft Environmental Impact Statement
EA	Environmental Assessment
EDI	Estimated Daily Intake
INAC	Indian and Northern Affairs Canada
LOAEL	Lowest Observable Adverse Effects Level
IRIS	Integrated Risk Information Service Database
JECFA	Joint Expert Committee on Food Additives and Contaminants
NOAEL	No Observed Adverse Effects
NTKP	Naonaiyaotit Traditional Knowledge Project
POP	Persistent Organic Pollutants
PTWI	Provisional Tolerable Weekly Intake
Rfd	Reference Dose
RMWI	Recommended Maximum Weekly Intake
TDI	Tolerable Daily Intake
TRV	Toxicity Reference Value

1. INTRODUCTION

1. Introduction

1.1 Overview

The Bathurst Inlet Port and Road (BIPR) Project (the Project), is located in the Kitikmeot region of Nunavut, Canada (Figure 1.1-1). The proposed project includes a port in Bathurst Inlet to serve vessels delivering fuel and cargo, a 220 million litre diesel fuel tank farm, and a 211 km road, which passes over 82 km of Inuit owned land and 129 km of Crown Land. The proposed road runs southwest from the Bathurst Inlet port, and merges with an existing winter road at Contwoyto Lake.

An Environmental Assessment (EA) was submitted and reviewed by Health Canada. As part of the EA process, Health Canada requires an assessment of the potential for country food impacts associated with the development of the port infrastructure and road. This assessment was conducted in order to meet the information requests from Health Canada.

This report presents the country food baseline assessment, which evaluates the current levels of metals in country foods and estimates the current consumption of metals by country food harvesters. It also presents the baseline recommended maximum weekly intakes (RMWI) of country foods, following Health Canada's guidance on health impact assessments (Health Canada, 2004a).

This baseline assessment will be used to assess potential effects of the Project on country foods. The concentration of metals in country foods are directly related to the surrounding environmental media such as soil, water and vegetation. The country food assessment will evaluate the metal concentration in these media to identify any metals of potential concern. It also assesses potential baseline health risks to human receptors based on current rates and frequencies of consumption of locally harvested country foods.

1.2 Background

The quality of country foods has been of increasing concern over the last decade. Studies have shown the presence of potential pollutants in pristine, undeveloped Canadian Arctic lands such as persistent organic pollutants (POP) and heavy metals (INAC, 2003). POPs are anthropogenic in nature, which in gaseous phase, can transport over large distances and across oceans. Heavy metals are dense in comparison, and concentrations are either natural background levels, or produced locally by anthropogenic activities.

The Draft Environmental Impact Statement (DEIS), which addresses expected and accidental impacts associated with all aspects of the proposed Project, indicates a low potential for impact at both the port and Contwoyto Lake. A moderate potential was assessed for the road based on the risk of contamination from accidental spills, road development and traffic dust. The degree of impact to country foods depends on the substance spilled and the quantity released. All potential impacts are expected to be localized within 500 metres of either side of the road (Rescan, 2007a).

Metals were selected for evaluation because the geology of the area is highly mineralized. Base metal deposits exist near the Project road presented in Figure 1.1-1, indicating that background

metal concentrations in the environmental media may be naturally high. Therefore, baseline studies are required to distinguish naturally occurring metal concentrations from anthropogenic impact.

1.3 Study Area and Land Use

The study area for the country foods baseline assessment includes the port, located in the Bathurst Inlet and the proposed road leading to Contwoyto Lake (Figure 1.3-1). The study area along the proposed road extends 500 meters from its center line.

The Naonaiyaotit Traditional Knowledge Project (NTKP) is a detailed Geographical Information System database of the traditional knowledge of the Inuit that live in the Kitikmeot region of Nunavut (KIA, 2006). The NTKP report series was published by Rescan Environmental Services Ltd. (Rescan); however, the report and data are owned by the Inuit, who are represented by the Kitikmeot Inuit Association (Rescan, 2006). These reports are based on the knowledge gathered through interviews with NTKP consultants. They present hunting and gathering areas for various country foods, wildlife migration routes, wildlife habitat locations, and wildlife species that are commonly consumed. Land use information from the NTKP report series was used in this country foods baseline assessment.

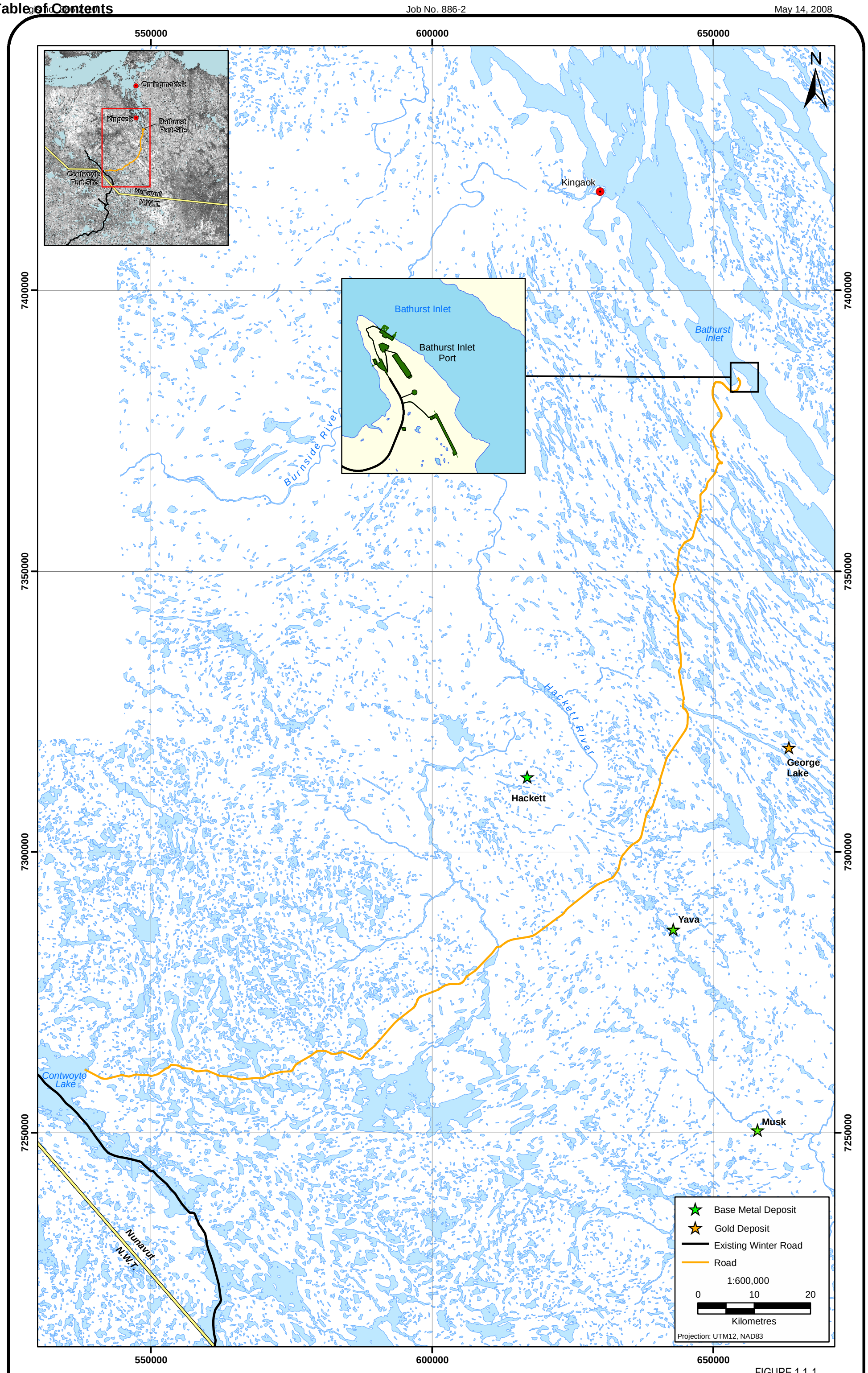
The NTKP report series is based on the traditional knowledge of 52 NTKP consultants, who are members of the Inuit. The reports were developed as a land-use planning tool based on interview questions that are relevant to current or future planned land uses. The data from these reports do not completely portray all of the traditional knowledge of the Inuit.

The NTKP report classified Inuit families based on their primary living and travelling areas presented in Figure 1.3-2:

- Inlanders (Nunamuit) – Inuit who primarily lived inland near Contwoyto, Pellatt and Kapaktolik lakes.
- Bathurst / Perry / Ellice – Inuit who lived adjacent to Bathurst Inlet and along the Perry and Ellice river.
- Victoria Island and Mainland Coast – Inuit who lived on Victoria Island, the Coronation Gulf Coast and on the sea ice in the winter.

The primary distinction of these Inuit groups, related to country foods, is related to their primary country food and where people lived during the winter. Caribou meat is the preferred food for all Inuit, while seals are hunted by Inuit along the marine coastline. The Nunamuit and Bathurst / Perry / Ellice groups of Inuit are the primary country food harvesters in the Project study area.

These two groups use the entire Kitikmeot region for country food harvesting as indicated by the hunting grounds for various country foods, described in detail in Section 3. However, few individuals are expected to hunt within the boundaries of the Project study area of 211 km^2. In 2006, the population of the Kitikmeot region was 5,361 with a population density of 0.012/km^2 (Statistics Canada, 2006). The closest community is Kingaok, located 40 km northwest of the port along Bathurst Inlet, and is mainly occupied only during the summer when the road is not in use.



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Bathurst Inlet Port and Road Project, Nunavut, Canada

FIGURE 1.1-1

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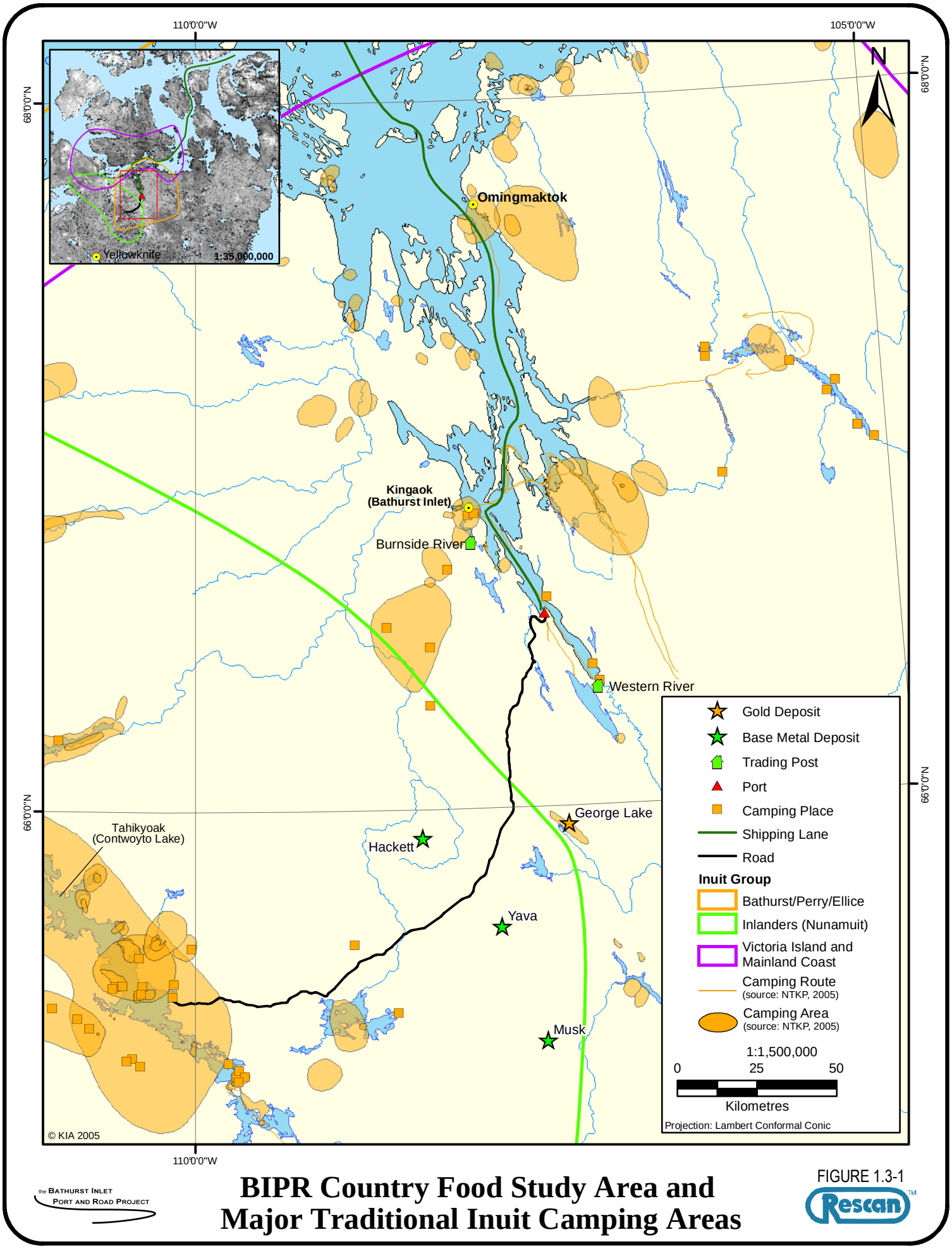

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BIPR Country Food Study Area and Major Traditional Inuit Camping Areas

FIGURE 1.3-1

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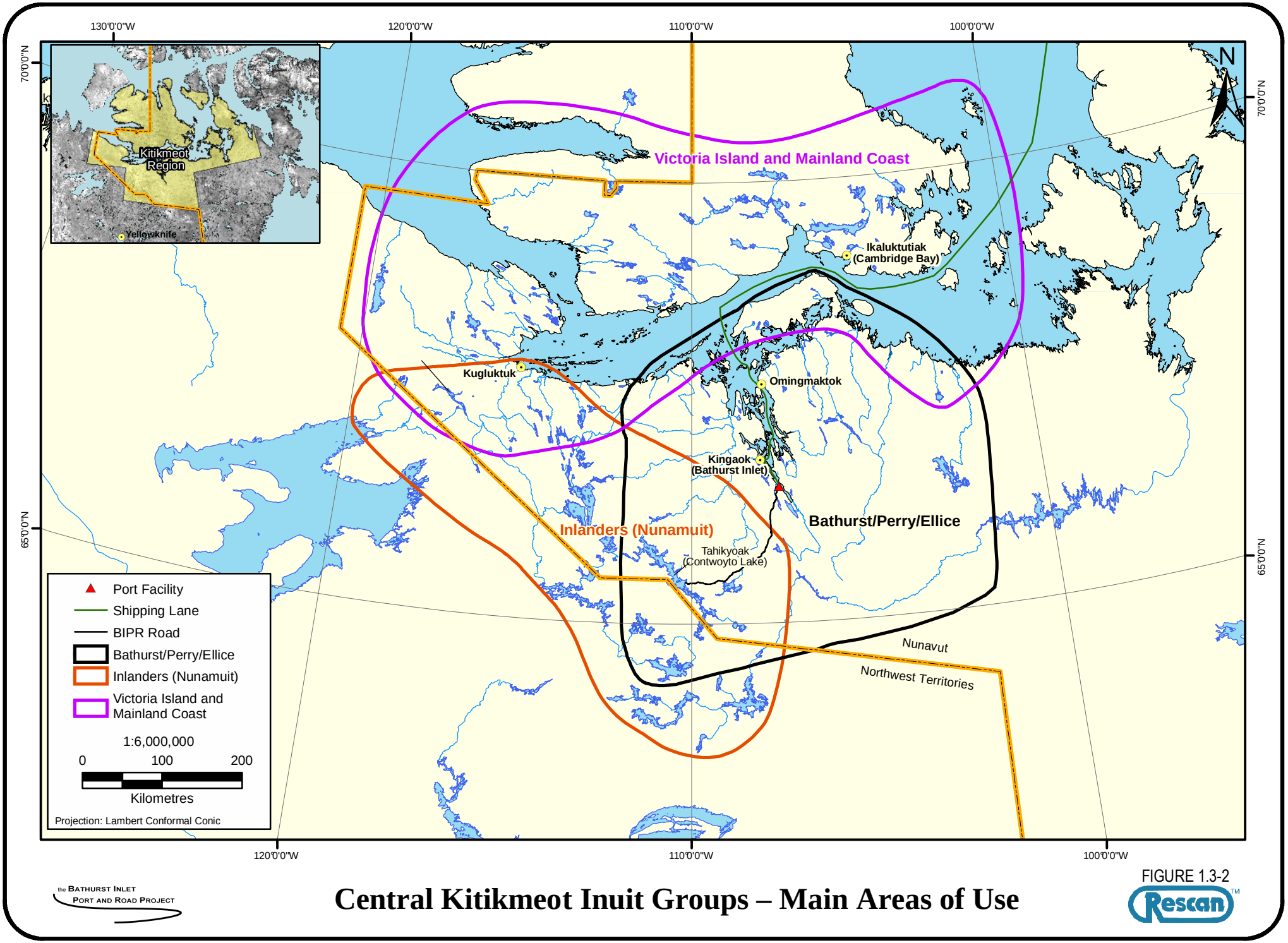

the Bathurst Inlet Port and Road Project

Central Kitikmeot Inuit Groups – Main Areas of Use

FIGURE 1.3-2

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The NTKP reports and land use studies show that the Inuit have traditionally harvested country foods within the study area. Freshwater fish and waterfowl are harvested at Contwoyto Lake, marine mammals in Bathurst Inlet and terrestrial mammals and vegetation along the proposed road (Rescan, 2007h). Overall, the study area is remote and infrequently used by non-Inuit for recreational uses. However, a larger proportion of the Inuit diet is from country foods compared to non-Inuit. Therefore, they are the most relevant group of country food harvesters in this baseline report. Within the study area, the majority of country foods harvested are at the proposed port location in Bathurst Inlet, and the end of the proposed road at Contwoyto Lake.

1.4 Country Foods Harvesters

The country food harvesters identified in the study area are based selected based on their living and travelling ranges to the vicinity of the Project area. These groups include:

- The Inlander (Nunamuit) group of the Inuit.
- The Bathurst / Perry / Ellice group of the Inuit.

2. METHODOLOGY

2. Methodology

The methodology for the country foods baseline assessment was based on Health Canada's guidelines for health impact assessment (Health Canada, 2004a).

The country foods assessment was divided into the following five stages:

1. **Problem Formulation:** The conceptual model for conducting the country foods assessment was developed. This included the identification of the country foods, contaminants of potential concern (COPCs), and human receptors.
2. **Exposure Assessment:** The extent to which human receptors might be exposed to the COPCs was assessed. This included identifying the receptor specific characteristics (*i.e.*, consumption amounts and consumption frequencies) and calculating the estimated daily intakes (EDIs).
3. **Effects Assessment (Toxicity Reference Value Assessment):** The tolerable daily intakes (TDIs) - levels of daily exposure that can be taken into the body without appreciable health risk were identified.
4. **Risk Characterization:** The exposure and effects assessments were integrated to produce quantitative risk estimates and recommended maximum weekly intakes (RMWIs).
5. **Uncertainty Analysis and Data Gaps:** The assumptions made throughout the assessment and their effects on the conclusions were evaluated. Data gaps were identified and addressed.

The baseline assessment will describe the current quality of country foods, and be used to predict potential effects of the Project as part of the Environmental Impact Statement. It also identifies the need (if any) for future monitoring programs.

3. PROBLEM FORMULATION

3. Problem Formulation

3.1 Introduction

The purpose of the problem formulation stage is to create a conceptual model for the country food assessment. This requires the identification of the most relevant country foods to evaluate, COPCs, and human receptors that harvest foods from the Project study area.

3.2 Country Foods Selected for Evaluation

Country foods include a wide range of animal, plant and fungi species that are harvested for medicinal or nutritional use. The primary objective when selecting country foods is to identify the most relevant foods to evaluate. Key considerations when selecting the country foods to evaluate include:

- which country foods are currently collected in the Project study area.
- how is the country food used (*i.e.*, food, medicine, or both).
- what part of the country food is consumed (*i.e.*, specific organs, plant leaves or roots).
- what quantities of each country food are consumed.
- what are the consumption frequencies of each food.

For populations whose main food source is from harvesting, it is not always feasible to assess all country foods. This is due to the large number of species that are harvested and also seasonal availability due to migration patterns or accessibility to hunting grounds (*i.e.* lack of sea ice for seal hunting during the summer). For such populations, the foods selected for evaluation are those that result in the highest exposure to the COPCs (*i.e.*, foods that are eaten the most frequently and in the largest amounts). For instance, foods that are consumed every day are generally selected. However, country foods that are consumed seasonally or infrequently may not be selected as they may not be a major exposure source of COPCs. These factors are considered when selecting the most relevant country food to evaluate.

For the country foods evaluation, consumption rates are based primarily on a study of the Inuit community which summarizes the average consumption from a wide range of published literature, published government reports and unpublished government data as well as private databases (Chan and Ing, 1998). This methodology minimizes the variation and uncertainty associated selecting consumption rates for each harvested food from different studies.

The following sections present the country foods that are harvested from the study area and the foods that were selected for evaluation.

3.2.1 Aquatic Species

There are 15 fish and 3 marine mammal species, which are harvested from the project area and consumed by country food harvesters (KIA, 2006b) (Table 3.2-1).

Table 3.2-1
Aquatic Species Harvested for Country Foods

Category	Common Name	Species Name
Salmonids	Lake trout	*Salvelinus namaycush*
	Arctic char	*Salvelinus alpinus*
	Arctic grayling	*Thymallus arcticus*
	Cisco whitefish	*Coregonus autumnalis*
	Lake whitefish	*Coregonus clupeaformis*
	Broad whitefish	*Coregonus nasus*
Cods and Burbots	Tomcod	*Gadus* sp.
	Arctic cod	*Boregadus saida*
	Saffron cod	*Eleginus gracilis*
	Polar cod	*Arctogadus glacialis*
Smelts	Capelin smelt	*Mallotus villosus*
	Rainbow smelt	*Osmerus mordax*
Pikes	Northern Pike	*Esox lucius*
Flounders	Arctic flounder	*Pleuronectes glacialis*
	Starry flounder	*Platichythys stellatus*
Seals	Ringed seal	*Phoca hispida*
	Bearded seal	*Erignathus barbatus*
	Spotted seal	*Phoca largha*

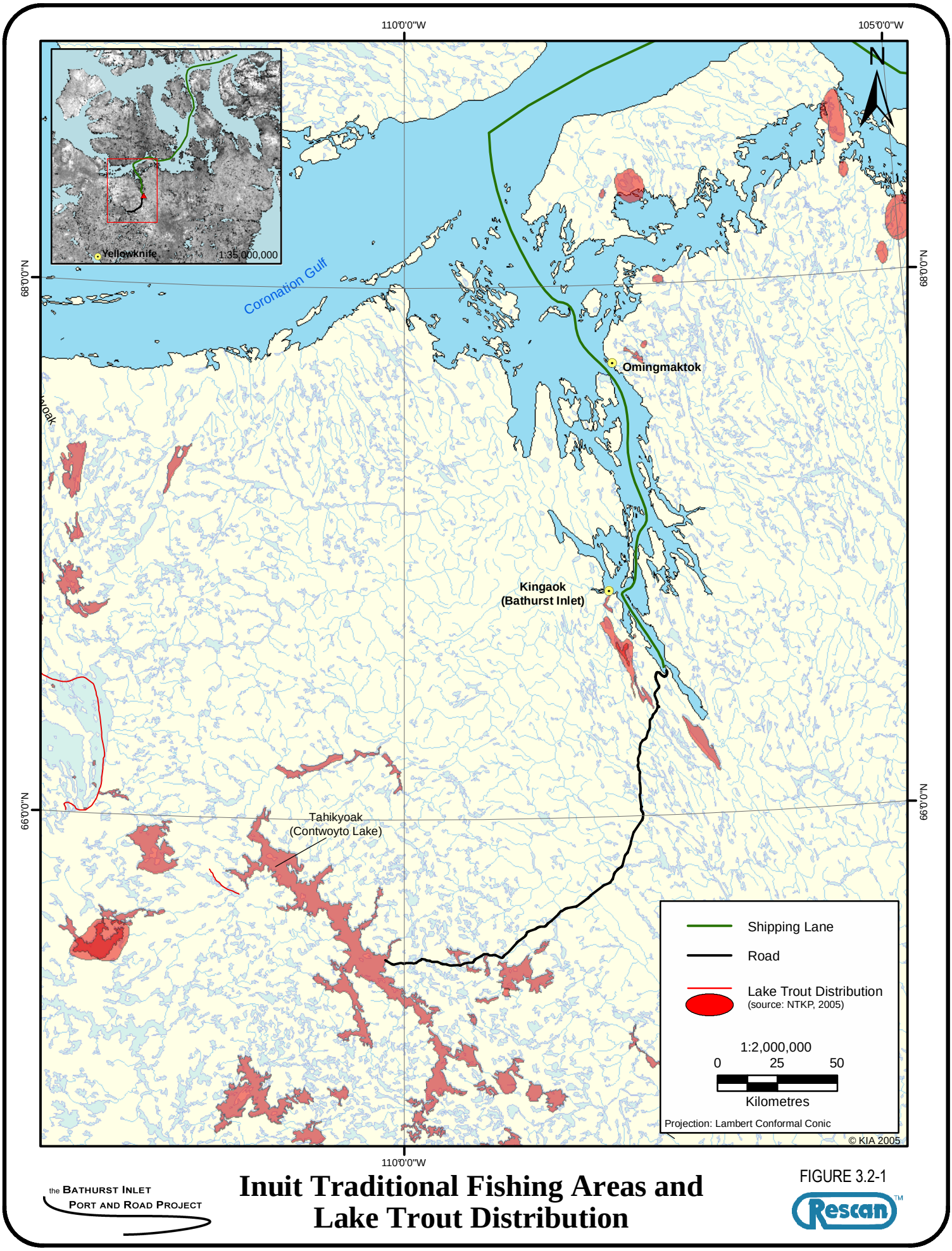
Fish Species

The most commonly consumed fish species are Arctic char (*Salvelinus alpinus*), lake trout (*Salvelinus namaycush*) and whitefish (*Coregonus*). NTKP consultants indicated that the most important fish to the Inuit from harvesting are lake trout and whitefish species (KIA, 2006b).

Although Arctic char is commonly consumed by the Inuit, Nunamuit reported that Arctic char is frequently purchased from markets, rather than harvested within the study area (KIA, 2006b). Arctic char are generally not harvested from the inland waterbodies, due to their small size. Arctic char that are harvested for consumption are generally harvested from marine waters.

Baseline studies on freshwater environments describe whitefish inhabiting shallow lakes, while lake trout inhabit deeper lakes such as Contwoyto Lake. Fish captured in Contwoyto Lake also resulted in a larger number of lake trout (51) relative to whitefish (12) (Rescan, 2007b). The Inuit also identified areas where lake trout is found and harvested, with Contwoyto Lake as a major fishing area (Figure 3.2-1).

The primary fishing areas identified by the Inuit are in Contwoyto Lake, which provides deeper water habitat to lake trout. This is consistent with catch frequencies of lake trout relative to whitefish species. Although it was not established which fish species are most often consumed, the most relevant species within the Project study area is the lake trout.



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Inuit Traditional Fishing Areas and Lake Trout Distribution

FIGURE 3.2-1

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Overall, fish are consumed by Inuit in moderate quantities relative to the total consumption of country foods, with a daily consumption rate of 42 grams/day. Specific fish species were not identified during this food consumption survey (Chan and Ing, 1998). As a conservative approach, this baseline assumed all fish tissue consumed was lake trout. Lake trout are the largest piscivorous fish species identified in the study area resulting in increased metal bioaccumulation in tissues relative to non-piscivorous fish.

Marine Mammal Species

The main marine mammal harvested by coastal Inuit groups is the ringed seals, because other marine mammals such as whales are not present in the Project area. Figure 3.2-2 presents the seal population distribution that overlaps on the hunting ranges of the Inuit. Seals, typically ringed seals, are harvested in some areas of Bathurst Inlet.

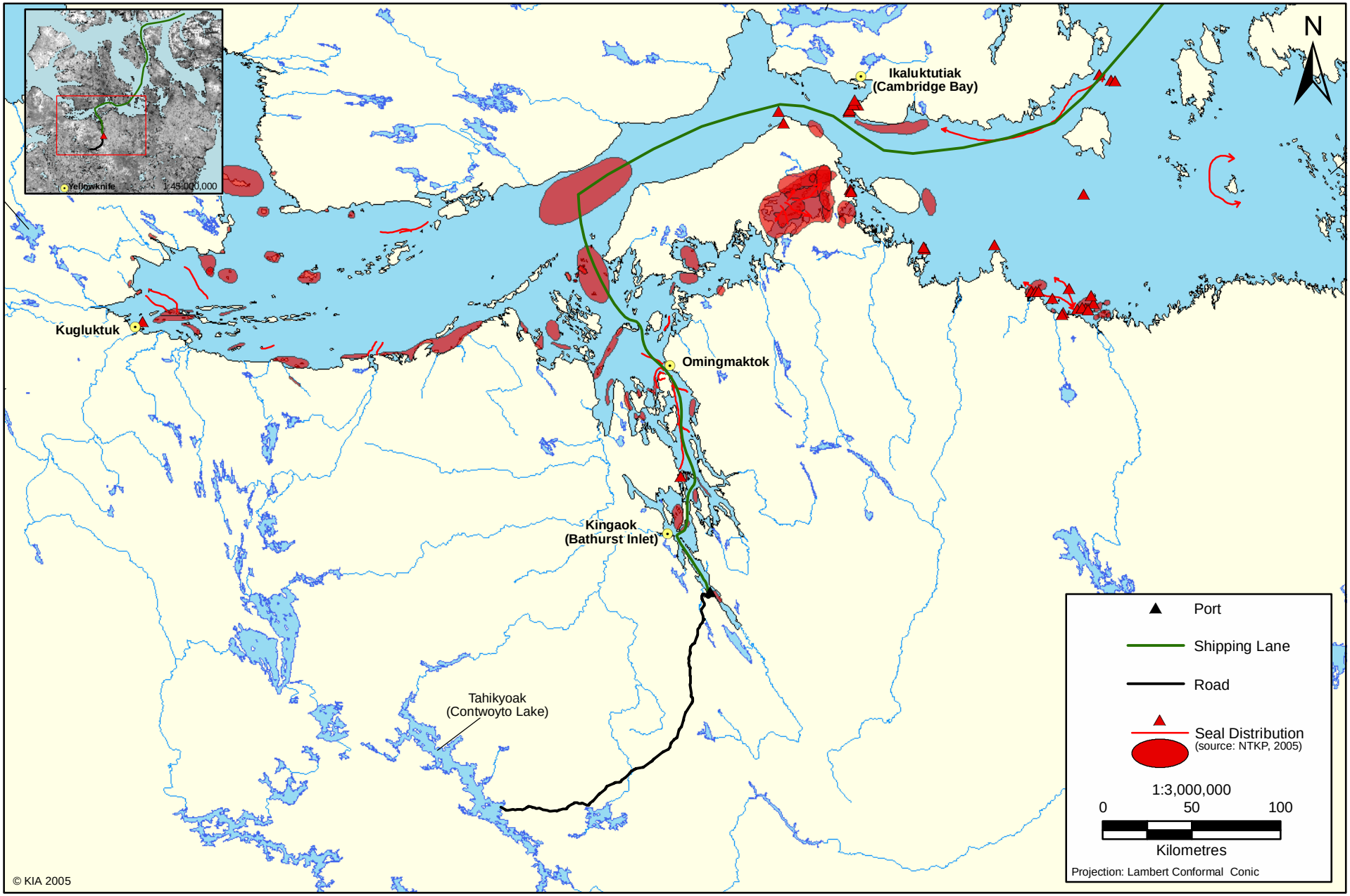
Walruses and various whale species are harvested less frequently and were not identified within the limited marine waters of the Project study area. Therefore, walruses and whales were not relevant to the country foods assessment.

In total, there are 3 seal species harvested by the Inuit: ringed seal (*Phoca hispida*), bearded seal (genus species) and spotted seal (genus species). Of these species, the ringed seal (*Phoca hispida*) was the most frequently harvested. Seals are harvested throughout the year, although spring and winter are the most typical harvesting seasons on the sea ice. The bearded seal and spotted seal are also hunted when encountered; however, encounters are comparatively less frequent. Therefore, the ringed seal is the most relevant marine mammal and thus was selected for evaluation.

Overall, seals are consumed in large quantities and composed the largest proportion of country food consumption in coastal Inuit diets. The blubber and muscle are the main tissues consumed. The estimation of daily marine mammal consumption assumes the entire amount is from seals and overestimates the actual amount of seal tissue consumed. Ringed seal consumption data was unavailable for the Inuit. Subsequently, the assumed average quantity of seal muscle and blubber consumed is 199 and 30 grams/day, respectively (Chan and Ing, 1998).

3.2.2 Terrestrial Species

Terrestrial species include large and small mammalian species as well as avian species. Table 3.2-2 presents a list of terrestrial animals that are reported within the study area (Rescan, 2007f) which are also consumed by country foods harvesters (KIA 2006c, KIA 2006f, KIA 2006g).



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Distribution and Traditional Seasonal Hunting Areas of Seals

FIGURE 3.2-2

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Table 3.2-2
Terrestrial Species Harvested for Country Foods

Category	Common Name	Species Name
Large Mammals	Caribou	*Rangifer tarandus*
	Muskox	*Ovibos moschatus*
	Grizzly bear	*Ursus arctos*
	Moose	*Alces alces*
Small Mammals	Arctic hare	*Lepus arcticus*
	Ground squirrels	*Spermophilus parryii*
Birds	Canada goose	*Branta canadensis*
	Rock ptarmigan	*Lagopus mutus*
	Long-tailed duck	*Clangula hyemalis*

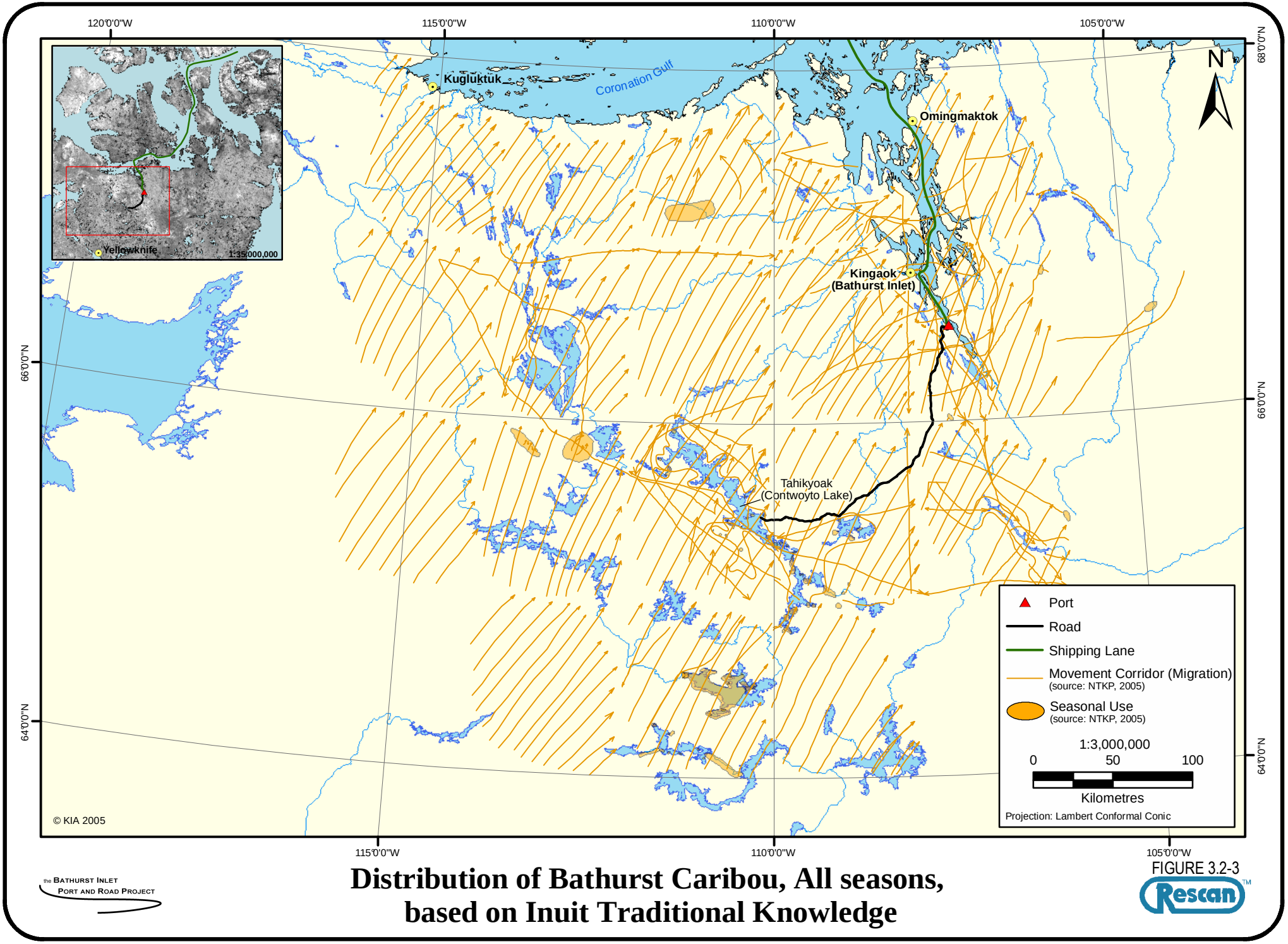
Large Terrestrial Mammals

Caribou was the most commonly consumed large terrestrial mammal by the Inuit. As such caribou was selected for evaluation in this study. The country food harvesters rely on caribou throughout the year. However, typical harvesting periods are during the spring and fall migration, when the winter road is not in use. The caribou herds are widespread in the Kitikmeot region (Figure 3.2-3). They have overlapping herding grounds and migration corridors within the study area, where Inuit groups follow the migration routes of caribou herds.

Other large mammals, such as moose (*Alces alces*), occur infrequently in the northern Kitikmeot region. Many country food harvesters reported that they had never seen a moose in their lifetime (KIA, 2006d). Muskox and grizzly bears are harvested less frequently compared to caribou. Country food harvesters reported a wide historical use of muskox. However, current harvesting practices are strictly regulated, and the interviews suggested that the license requirements for muskox are a strong harvesting deterrent (KIA, 2006d).

Grizzly bears (*Ursus arctos*) are also less frequently harvested as a country food. Country food harvesters indicated that a combination of licensing requirements and personal safety concerns are strong deterrents from regular harvesting of grizzly bears (KIA, 2006e).

Based on the identification of important large terrestrial mammals by country food harvesters, caribou were identified as the selected country food to evaluate. The average consumption rate of terrestrial animal tissue was 147 grams/day. This quantity was the cumulative consumption of all terrestrial mammals including small mammals. Since individual species were not distinguished, and caribou was the primary terrestrial animal consumed, a conservative approach was applied, which assumed that all consumed terrestrial mammal tissue was from caribou (Chan and Ing, 1998).



Distribution of Bathurst Caribou, All seasons, based on Inuit Traditional Knowledge

the Bathurst Inlet Port and Road Project

FIGURE 3.2-3

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Small Terrestrial Mammals

Ground squirrels (*Spermophilus parryii*) and arctic hares (*Lepus arcticus*) are an important food source for country food harvesters. Both ground squirrels and arctic hares are distributed along coastal and inland regions. Ground squirrel distribution is generally in the vicinity of larger freshwater sources, whereas arctic hare distribution is more widespread and distant from freshwater sources (KIA, 2006g). Based on the hunting grounds for ground squirrel and arctic hare identified by the Inuit, the Project study area overlaps arctic hare hunting grounds more frequently. Consequently, the arctic hare is the small terrestrial mammal selected for evaluation.

Figure 3.2-4 presents the distribution and hunting areas of arctic hares. The overlapping species distribution and the proposed Project road indicate that the arctic hare is a suitable country food for selection (KIA, 2006g).

Birds

The harvested coastal birds include various species of ducks, geese and ptarmigans. Over 20 different species of waterfowl and ptarmigans were identified as country foods. Nesting areas for these birds occur along the coastline and inland lakes. Figure 3.2-5 presents the major waterfowl hunting grounds in the study area. Although birds may nest along the shores in the study area, none of the major hunting areas were in the study area boundaries. At the proposed port location in Bathurst Inlet, the nearest hunting area was approximately 10 km away. Contwoyto Lake is used for hunting ducks, geese and ptarmigans, with the nearest hunting area approximately 2 km away (KIA, 2006f).

Human health impacts from the consumption of waterfowl are not expected to be significant. The migratory nature of the indicated bird species makes assessment difficult, due to immigration and emigration around Contwoyto Lake. Birds do not spend a significant proportion of their lives along the 1 km stretch of the shoreline of the study area at Contwoyto Lake. As a conservative measure, the country foods assessment assumes harvested birds spend their entire life eating and drinking the water in the study area.

Birds are not hunted along the coastal region surrounding the proposed port, and do not live inland along the proposed road. In addition, no significant infrastructure is at the end of the proposed road, which merges with an existing winter road.

Rescan (2007c) reported that the most frequently observed birds in the study area that are consumed by country food harvesters are (in decreasing observation frequency): rock ptarmigan, Canada goose, and long-tailed duck. Country food harvesters report the most commonly consumed waterfowl are ducks and geese, with seasonal consumption of rock ptarmigans in the spring. There is no specification on the most commonly consumed duck or goose species although long-tailed ducks and Canada geese are known to be hunted.

Based on the observation frequencies of shorebirds along the proposed Project road, and the most commonly consumed waterfowl by country food harvesters, the Canada goose has been selected as the country food to evaluate. The average consumption rate of birds was 2 grams/day as a result of infrequent harvesting frequencies (Chan and Ing, 1998). The country foods assessment assumes this consumption amount is only from Canada goose.

3.2.3 Vegetation Species

The study area along the proposed road is composed primarily of arctic tundra. Local vegetative ecosystem mapping shows the presence of low-lying plant communities such as: sedge grasses, riparian shrubs, and saxifrage-blueberry communities (Rescan, 2007e).

Dietary studies describe the Inuit as primarily carnivorous, because vegetation such as grains and vegetables generally do not grow in the area. Inuit ecological knowledge collected specifically from the Bathurst / Perry / Ellice group also describe similar carnivorous diets where many individuals cannot distinguish between different species or groups of tundra vegetation due to their lack of importance as a country food (Thorpe, 2000). The most significant vegetation were various species of berries.

Inuit ecological knowledge from Bathurst / Perry / Ellice elders shows some Inuit consume various berry species such as: blueberries (*Vaccinium* sp.), crowberries (*Empetrum* sp.), cloudberries (*Rubus chamaemorus*) and salmonberries (*Rubus* sp.) during the short summers (Thorpe, 2000). Vegetation ecosystem mapping showed the presence of blueberries in the study area (Rescan, 2007e). Crowberries and salmon berries were specifically identified in the vegetation ecosystem mapping report (Rescan, 2007e). As a result, blueberries were selected as a country food to evaluate. It should be noted that no literature information or ecological knowledge has confirmed that blueberry harvesting actually occurs along the Project road area. However, it was felt that an evaluation of vegetation should be included in this assessment. This was primarily because harvesting of vegetation from the Project area may increase as access to the study area become more readily available (*i.e.*, due to the road being built).

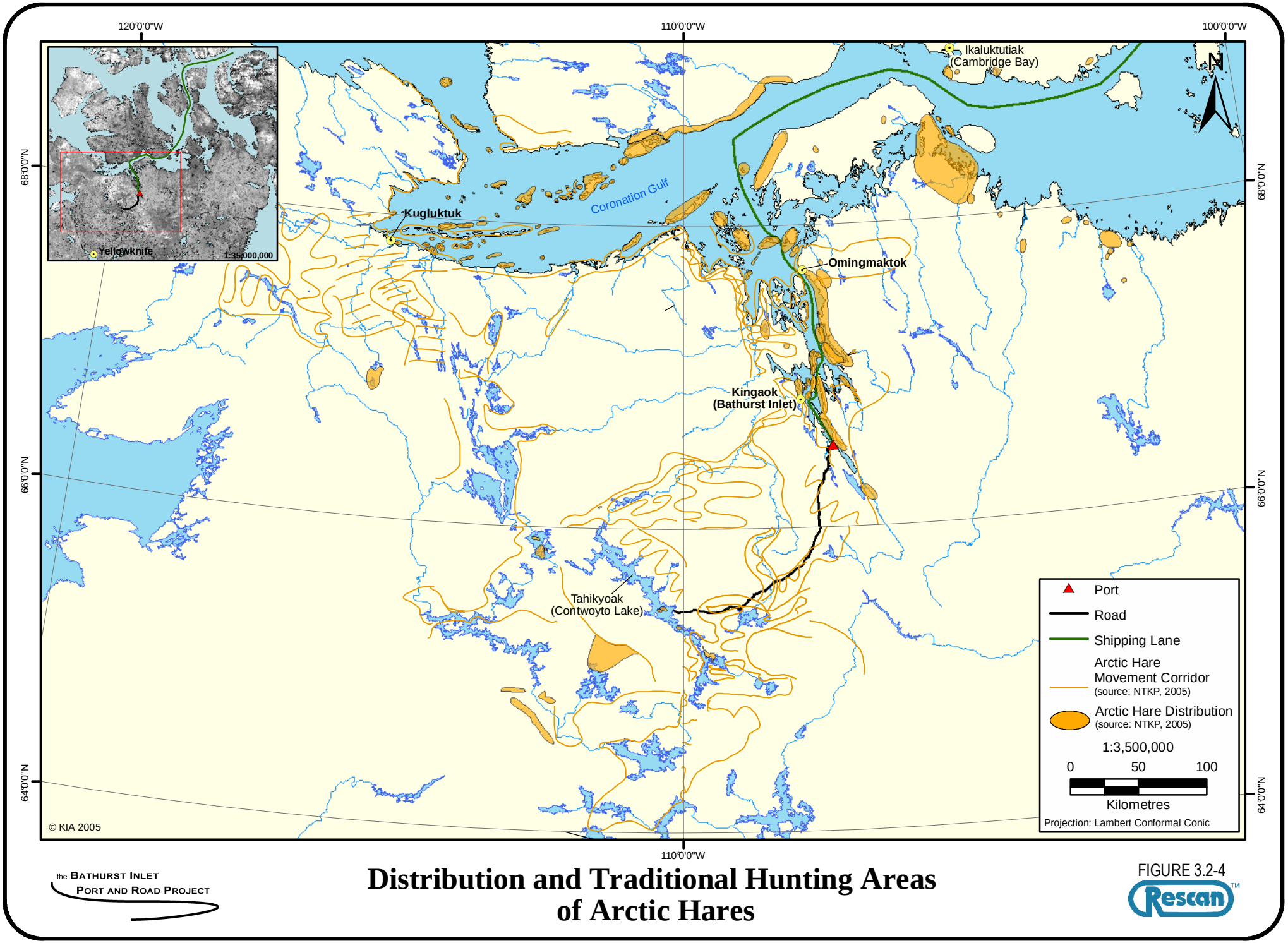
The estimated blueberry consumption rate, assuming a daily consumption frequency throughout the year, was 2 grams/day (Chan and Ing, 1998). The low estimate is based on infrequent consumption and seasonal availability of berries among the Inuit. Food surveys that assess average weekly consumption rates have decreased accuracy when foods are seldom consumed. Therefore, total annual consumption was assessed and converted to an average daily consumption rate.

3.2.4 Summary

A summary of the country foods selected for assessment is presented in Table 3.2-3.

Table 3.2-3
Country Foods Selected for Evaluation

Category	Country Food	Species Name	Parts Consumed
Wildlife	Caribou	*Rangifer tarandus*	Muscle
	Arctic hare	*Lepus arcticus*	Muscle
	Canada goose	*Branta canadensis*	Muscle
Aquatic	Lake trout	*Salvelinus namaycush*	Muscle
	Ringed seal	*Phoca hispida*	Blubber, Muscle
Plants	Blueberry	*Vaccinium* sp.	Fruit



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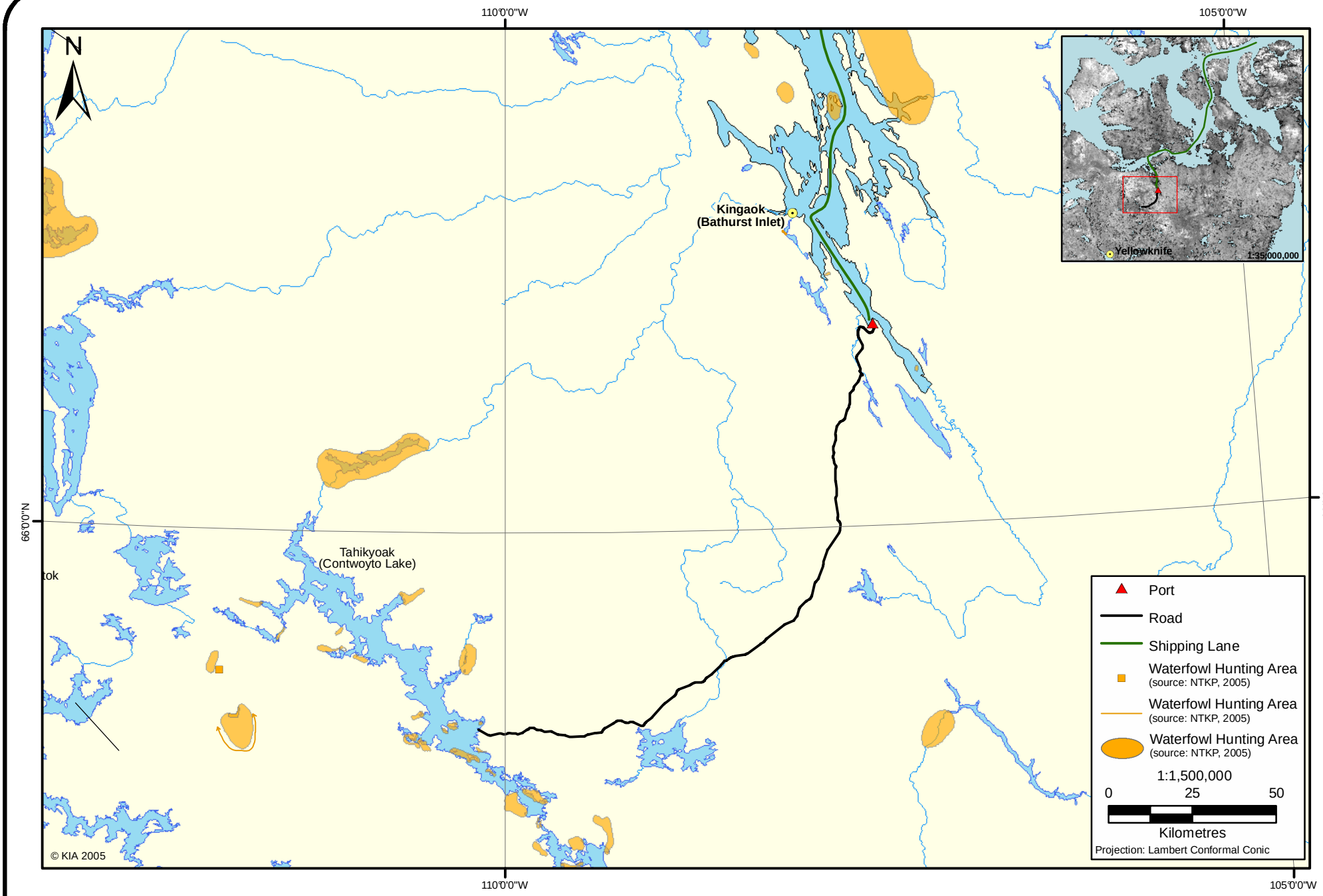
Distribution and Traditional Hunting Areas of Arctic Hares

FIGURE 3.2-4

Rescan™



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Major Traditional Waterfowl Hunting Areas

FIGURE 3.2-5

Rescan™

3.3 COPCs Selected for Evaluation

The COPCs selected for this assessment were metals, which naturally occur in environmental media (*i.e.*, soil, water and plant and animal tissue) under baseline conditions and may be associated with project activities. Other contaminants also occur at detectable concentrations under baseline conditions (*i.e.*, persistent organic pollutants and radionuclides); however, these substances will be not associated with the proposed road development. Therefore, the Project will have no effect on existing baseline concentrations of these substances, and thus they were not selected for evaluation. Other chemicals that may be associated with project development (*i.e.*, petroleum hydrocarbons) were not selected for evaluation in the baseline assessment because they do not occur under baseline conditions. Chemicals not present under baseline conditions that may be associated with the project will be considered in the EIS.

Specific metals were selected as COPCs if the maximum metal concentration in surface waters, measured during the 2007 baseline studies, exceeded the Canadian Council of Ministers of the Environment (CCME) guidelines for the protection of aquatic life (CCME, 2007 and Rescan, 2007c). It is noted that selection criteria for the COPCs would normally also consider baseline metals concentrations. However, no soils were collected for analysis within the Project area. This is considered a data gap in this assessment and is discussed in the uncertainty section of this report (Section 7).

Table 3.3-1 presents the summary of metals that were selected for evaluation. Appendix A1 and A2 presents the analytical data for the surface waters from the 2001 and 2007 surface water baseline studies, respectively.

Table 3.3-1
Metals Selected for Evaluation

Metal Evaluated	Maximum Water Concentrations Exceed CCME
Aluminum	Yes
Cadmium	Yes
Chromium	Yes
Copper	Yes
Iron	Yes

3.4 Human Receptors

All food consumed is comprised of a mixture of chemicals. Many of these chemicals occur naturally in food and are required for people to stay healthy including essential nutrients, vitamins, and minerals. Many metals are essential at low doses, however, as with any chemical substance, high doses may lead to undesired health effects.

Health effects from chemicals are generally divided into two categories: threshold (*i.e.*, non-carcinogenic) and non-threshold (*i.e.*, carcinogenic) response chemicals. These two types of chemicals are evaluated differently and independently. Therefore, when selecting the human receptors to evaluate, the types of chemicals that people may be exposed to must be considered.

Only threshold chemicals were selected for evaluation; subsequently, the human receptors selected were: a toddler (six months to four years of age) and an adult (greater than 19 years of age). Toddlers are most susceptible to threshold response chemicals due to their ratio of body size to ingestion rates (IRs) relative to other life-stages (Health Canada, 2004b). Therefore, if an evaluation finds acceptable levels of threshold metals for the toddler life-stage, all other life-stages would also be considered safe. An adult receptor was also selected based on Health Canada guidance (Health Canada, 2004b).

3.5 Human Exposure Pathways

The purpose of the exposure pathway screening process is to determine the primary route that people in the Project area may come into contact with metals. Some examples of exposure pathways are skin contact, inhalation of dust, and drinking water. However, these exposure pathways are not relevant to country food exposures. The exposure pathway that was selected for the country food assessment was the ingestion of:

- aquatic species that have taken up metals from their diet and surface water;
- terrestrial animals that have taken up metals through the ingestion of soil, vegetation and surface water; and
- plants that have taken up metals from the soil and water.

The exposure pathways are shown in Figure 3.5-1. This figure presents the source of the metal, residency media (*i.e.,* fish, plants and animals), exposure routes and receptors. The conceptual model for this assessment is presented in Figure 3.5-2.

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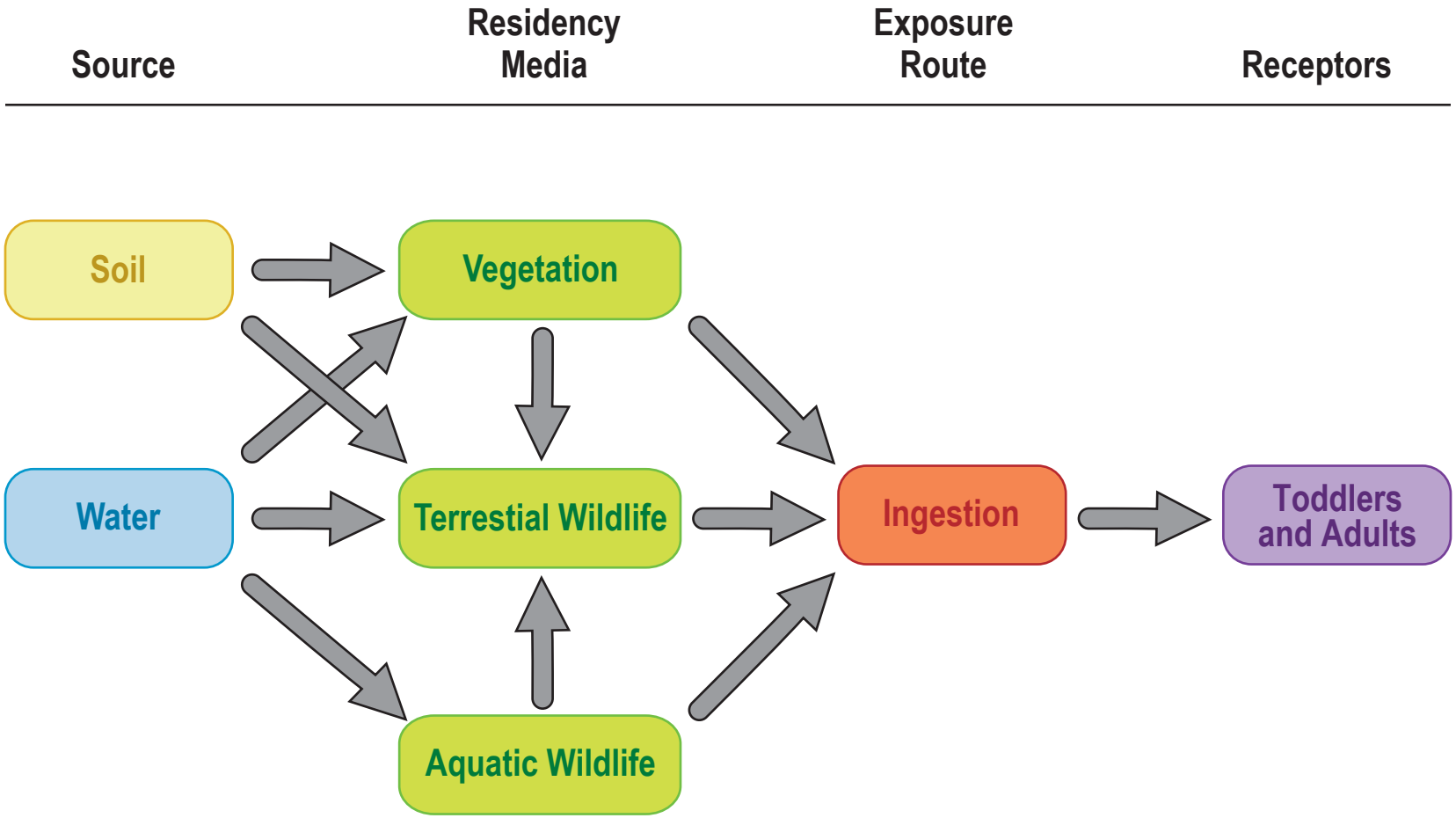

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FIGURE 3.5-1

Human Exposure Pathways

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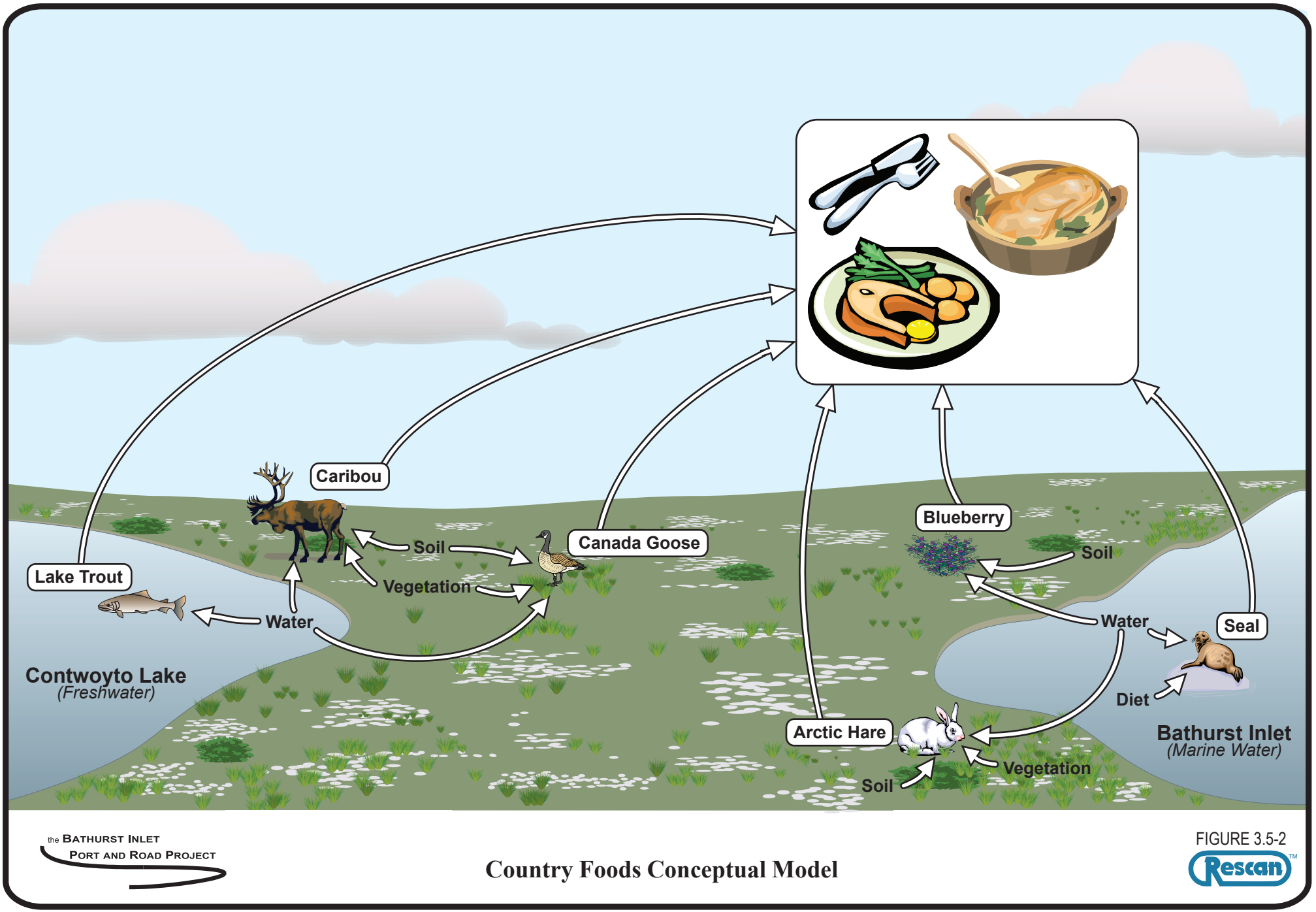

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Country Foods Conceptual Model

FIGURE 3.5-2

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4. EXPOSURE ASSESSMENT

4. Exposure Assessment

4.1 Introduction

The amount of metals that people are exposed to from the selected country foods was determined for the ingestion pathway. The total amount of exposure depends on:

- the concentration of metals in aquatic species resulting from their uptake of metals in the water and diet (lake trout, ringed seal);
- the concentration of metals in terrestrial wildlife (caribou, arctic hare, Canada goose) resulting from their ingestion of environmental media (vegetation, water and soil);
- the concentration of metals in vegetation resulting from their uptake of metals in soil and water (blueberry); and
- human receptor characteristics (*i.e.*, consumption amount, frequency, age).

These parameters are included in the exposure estimate equations to determine the estimated daily intake (EDI) of each metal through the consumption of the selected country food. EDIs are based on the current concentrations in country foods, or modelled estimates based on metal concentrations in the environmental media.

4.2 Aquatic Species Tissue Concentrations

Metal concentrations were analyzed from 10 lake trout collected from Contwoyto Lake in August 2001. In total, 51 lake trout were caught, with an average fork length of 509 mm (range 165 to 943 mm) and average weight of 2,272 g (range 46 to 10,775 g). The laboratory data report, presenting the lake trout tissue concentrations, is presented in Appendix B1. The maximum and average concentrations of the metals of potential concern are presented in Table 4.2-1. All metals that were selected for country foods assessment were below the laboratory detection limits except for copper. Iron was not analyzed in tissues.

Table 4.2-1
Metal Concentrations in Lake Trout, Contwoyto Lake
(mg/kg wet weight)

Parameter	# of Samples	Average	Maximum
Aluminum	10	<7.54	<7.54
Cadmium	10	<0.023	<0.023
Chromium	10	<0.38	<0.38
Copper	10	1.21	2.13
Iron	10	N/A	N/A

Notes: Wet weight concentrations were derived from dry weight measurements and an average moisture content of 75.4% as calculated from the laboratory data report.
Notes: Lake trout tissue concentrations of iron were not measured.

Tissue samples were not collected for seals during the baseline studies. There are no relevant food chain models to predict seal tissue concentrations, as a result of water exposure and food consumption. Therefore, no seal tissue concentrations were predicted.

4.3 Terrestrial Species Tissue Concentrations

No animal tissue samples were collected from the Project study area. The country foods baseline was initiated after the 2007 field season. Caribou tissue concentrations were modelled based on a food chain model. The model uses established baseline concentrations of water and vegetation, animal specific ingestion rates and metal-specific biotransfer factors (BTF). This model generally over-predicts the concentrations in animal tissue and is considered a conservative approach.

Canada goose and arctic hare tissue concentrations were also modelled. The primary consumed terrestrial country food was caribou, with less than 0.5% of total country food consumption coming from Canada goose or arctic hare based on country food consumption rates (Chan and Ing, 1998). As a result, exposure to metals from the consumption of Canada goose and arctic hare would be negligible compared to the exposure to metals consumed from other food sources such as caribou.

Table 4.3-1 presents the modelled mean and maximum caribou, arctic hare and Canada goose muscle tissue concentrations for COPCs. Appendix C describes the food chain model used to predict caribou muscle tissue concentrations.

Table 4.3-1
Predicted Metal Concentrations in Terrestrial Species from Exposure to Water and Vegetation (mg/kg wet weight)

Parameter	Caribou		Arctic Hare		Canadian Goose	
	Mean	Maximum	Mean	Maximum	Mean	Maximum
Aluminum	2.16E-01	1.03E+00	2.29E-03	1.10E-02	6.10E-03	2.93E-02
Cadmium	1.14E-03	4.11E-03	1.24E-05	4.44E-05	6.64E-03	2.38E-02
Chromium	3.40E-03	1.64E-02	3.62E-05	1.74E-04	2.28E-04	1.10E-03
Copper	3.36E-01	7.26E-01	3.63E-03	7.84E-03	5.42E-02	1.17E-01
Iron	8.98E+00	1.94E+01	9.64E-02	2.06E-01	6.64E-01	1.47E+00

4.4 Vegetation Tissue Concentrations

No blueberry samples were collected for metal concentration analysis during the vegetation baseline study (Rescan, 2007g). Plant species that were collected and analysed for metals concentrations were: willows, sedges and cottongrass (*Salix, Carex,* and *Eriophorum*, respectively). These genera of plants are commonly consumed by wildlife in the area, but not by human receptors. However, in the absence of other useable data, the data from these species were used as surrogate in this assessment. The average and maximum plant tissue concentrations are presented in Table 4.4-1.

Table 4.4-1
Metal Concentrations in Plants in the Study Area (mg/kg wet weight)

Parameter	Willow (15 samples)		Sedge (10 samples)		Cottongrass (2 samples)		Total Average	Total Maximum
	Mean	Maximum	Mean	Maximum	Mean	Maximum		
Aluminum	9.8	22.2	10.2	45.4	3.7	5.0	9.5	45.4
Cadmium	0.300	0.690	0.064	0.188	0.017	0.019	0.192	0.69
Chromium	0.050	0.120	0.050	0.050	0.050	0.050	0.050	0.120
Copper	1.96	2.57	3.53	5.41	1.45	1.58	2.50	5.41
Iron	17	29.9	42.3	64	65	19.2	29.93	64

Note: Analytical results in Appendix B2

4.5 Human Receptor Characteristics

Human receptor consumption characteristics are based on studies on the Inuit as well as general human characteristics outlined by Health Canada (Chan and Ing, 1998 and Health Canada, 2004b). Consumption quantities are based on database information collected from Inuit communities between 1986 and 1996. Consumption of country foods was assumed to be daily for all foods, rather than assessing consumption frequencies of seasonal or infrequently harvested foods (Chan and Ing, 1998).

Although the Inuit are the primary harvesters of country foods in the study area, less than half of the total food energy consumed comes from country foods. An estimated 6% to 40% of total food energy comes from country foods, depending on the degree of urbanization or remoteness of the community (INAC, 2003).

These same estimates are based on 24-hour recall data of the Inuit which show that the average country foods consumption for male adults (20 to 40 years of age) to be 245 g/day, and (40+ years of age) 440 g/day (INAC, 2003). Generally, older individuals had a higher consumption rate of traditional country foods (Kuhnlein and Receveur, 2001). No data was collected on the serving sizes of toddlers. It was assumed that a toddler would eat the country foods at the same frequency as adults, with a serving size of 43% of the adult serving size as described by Richardson (1997). It is anticipated that this assumption overestimates the actual toddler serving size.

Estimates of country food daily intake of Inuit was collected from commercial, private and government databases from 1986 to 1995, which gives a daily country food consumption rate of 423 g/day (Chan and Ing, 1998). This consumption rate is similar to the conservative estimate of the highest average consumption rate of 440 g/day.

The similarities between the estimated consumption rates from Chan and Ing, and INAC studies suggest there has been little change in country foods consumption between 1986 and 1998. It is recognized that younger generations of Inuit are more urbanized and rely less on country foods, therefore, these consumption rates are likely to overestimate the true consumption for toddlers and younger adults (18 to 40 years old). The current population of individuals over 40 years old

in the Kitikmeot region is 1,300, or 24% of the total population (Statistics Canada, 2006). However, there is no estimate of the proportion of these individuals that harvest country foods, or are members of the Inuit.

Vegetation is not considered a staple of the Inuit diet. Subsequently, most country food surveys of the Inuit in the Canadian Arctic do not address locally harvested vegetation as a food. A country foods 24 hour recall survey of 1,092 individuals in Nunavut indicated only 5 people or <0.5% indicated that they consume blueberries (Kuhnlein *et al.*, 2002). Although fruits and vegetables are becoming increasingly consumed, many are imported and purchased from markets.

Human receptor characteristics for toddler and adult body weights are based on guidance provided by Health Canada (2004b). Toddler consumption rates were not available in the literature and were calculated as 43% of the adult consumption, as per Richardson (1997). Table 4.5-1 summarizes the human receptor characteristics for various country foods for the Nunamuit and Kitikmeot groups of Inuit based on literature data.

Table 4.5-1
Human Receptor Characteristics

Parameter	Toddler	Adult	Data Source
Body Weight (kg)	16.5	70.7	Health Canada, 2004b
Consumption Rate (kg/day):			
Seal muscle	0.086	0.199	Chan and Ing, 1998
Seal blubber	0.013	0.03	Chan and Ing, 1998
Caribou	0.063	0.147	Chan and Ing, 1998
Arctic hare	0.00086	0.002	Chan and Ing, 1998
Lake trout	0.018	0.042	Chan and Ing, 1998
Canada goose	0.00086	0.002	Chan and Ing, 1998
Blueberry	0.00086	0.002	Chan and Ing, 1998

4.6 Estimated Daily Intake

The estimated daily intake (EDI) of each metal for the toddler and adult receptors are based on predicted (mean and maximum) and (mean and maximum) tissue concentrations as well as the receptor characteristics.

The following equation was used to estimate the exposure from country foods ingestion:

$$EDI_{food} = \frac{IR \times C_{food} \times F_s}{BW}$$

Where:

EDI_{food} = estimated daily intake of country food (in mg metal/kg body weight/day)
IR = ingestion rate (in kg/day)
C_{food} = metal concentration in food (in mg/kg)
F_s = fraction of year consuming (unitless), assumed to be 1
BW = body weight (in kg)

Appendix D provides a sample calculation of the EDI of aluminum for toddlers consuming caribou muscle tissue.

For this assessment, it was conservatively assumed that 100% of the country foods consumed are collected from the Project study area. It was also conservatively assumed that each of the metals evaluated are 100% bioavailable.

Table 4.6-1
Estimated Daily Intake Based on Predicted and Measured Tissue Concentrations (µg/kg body weight/day)

	Caribou				Arctic Hare			
	Toddler		Adult		Toddler		Adult	
Parameter	Mean EDI	Max EDI	Mean EDI	Max EDI	Mean EDI	Max EDI	Mean EDI	Max EDI
Aluminum	1.76E-01	8.44E-01	4.11E-01	1.97E+00	5.12E-06	2.45E-05	1.19E-05	5.69E-05
Cadmium	9.35E-04	3.36E-03	2.18E-03	7.84E-03	2.76E-08	9.91E-08	6.41E-08	2.31E-07
Chromium	2.78E-03	1.34E-02	6.49E-03	3.12E-02	8.08E-08	3.88E-07	1.88E-07	9.02E-07
Copper	2.74E-01	5.93E-01	6.40E-01	1.38E+00	8.09E-06	1.75E-05	1.88E-05	4.07E-05
Iron	7.34E+00	1.58E+01	1.71E+01	3.70E+01	2.15E-04	4.60E-04	5.00E-04	1.07E-03

	Canada Goose				Lake Trout			
	Toddler		Adult		Toddler		Adult	
Parameter	Mean EDI	Max EDI	Mean EDI	Max EDI	Mean EDI	Max EDI	Mean EDI	Max EDI
Aluminum	9.10E-06	4.37E-05	2.12E-05	1.02E-04	1.76E-01	1.76E-01	4.11E-01	4.11E-01
Cadmium	9.89E-06	3.56E-05	2.30E-05	8.27E-05	5.60E-04	5.60E-04	1.31E-03	1.31E-03
Chromium	3.40E-07	1.64E-06	7.92E-07	3.81E-06	8.87E-03	8.87E-03	2.07E-02	2.07E-02
Copper	8.08E-05	1.75E-04	1.88E-04E	4.06E-04	5.65E-02	9.95E-02	1.32E-01	2.32E-01
Iron	9.90E-04	2.19E-03	2.30E-03	5.09E-03	N/A	N/A	N/A	N/A

	Blueberry			
	Toddler		Adult	
Parameter	Mean EDI	Max EDI	Mean EDI	Max EDI
Aluminum	7.06E-03	3.38E-02	1.64E-02	7.86E-02
Cadmium	1.43E-04	5.14E-04	3.32E-04	1.19E-03
Chromium	3.72E-05	8.93E-05	8.65E-05	2.08E-04
Copper	1.86E-03	4.03E-03	4.33E-03	9.36E-03
Iron	2.23E-02	4.76E-02	5.18E-02	1.11E-01

Notes:
N/A = not available due to lack of measured tissue concentrations
Due to a lack of empirical data and relevant food chain models for aquatic mammals, seal tissue concentrations were not modeled.

5. TOXICITY REFERENCE VALUE ASSESSMENT

5. Toxicity Reference Value Assessment

5.1 Introduction

The toxicity reference value (TRV) assessment involves determining the amount of COPCs that can be taken into the human body without experiencing adverse health effects. TRVs are safe levels below which there is minimal risk of adverse health effects. The TRVs used in the country foods assessment were obtained from Health Canada (2006 and 2004c). The TRVs were derived by Health Canada's Bureau of Chemical Safety, Chemical Health Hazard Division or were adopted by Health Canada from various other regulatory agencies such as the US EPA's Integrated Risk Information Service Database (IRIS), and the Food and Agriculture Organization/World Health Organization's Joint Expert Committee on Food Additives and Contaminants (JECFA).

Toxicity information comes from human studies where health effects resulting from exposures to substances have been documented. Such documented health effects can result from exposures in the workplace or through food or water.

Toxicity information also comes from animal studies, where animal dose-response information is extrapolated to humans by applying uncertainty factors. In most cases, uncertainty factors of 100 to 1,000 are applied to laboratory-derived no observable adverse effect levels (NOAELs; the highest concentration in a toxicity test where no chronic health effects were observed or measured) to account for interspecies extrapolation and protection of the most susceptible portion of the population (*i.e.*, children and the elderly). Therefore, TRVs based on animal studies generally have large margins of safety to ensure that the toxicity or risk of a substance to people is not underestimated. Lowest observable adverse effects levels (LOAEL) from human studies have smaller uncertainty factors because no extrapolation from animal to humans is required.

The TRVs in this assessment are presented as tolerable daily intakes (TDIs). The TDI is defined as the amount of metal per unit body weight that can be taken into the body each day with no risk of adverse health effects. The TDIs used in this baseline assessment are presented in Table 5.1-1. It is noted that the US EPA uses the term reference dose (RfD) rather than TDI. Toxicity studies that the TDIs are based on and the rational for their selection are briefly summarized in Section 5.2.

Table 5.1-1
Toxicity Reference Values for Metals of Potential Concern

Metal	TDI (µg/kg body weight/day)
Aluminum	1,000
Cadmium	0.8
Chromium	1,500
Copper	125
Iron	800

5.2 Toxicity Reference Values

5.2.1 Aluminum

Health Canada (2006) provides a TDI of 1,000 µg/kg body weight/day for aluminum. This TDI is based on the provisional tolerable weekly intake (PTWI) of 7 mg/kg body weight recommended by the JECFA (2006). Current estimates by the World Health Organization (WHO) found that aluminum intake ranges from about 2 to 6 mg/day for children and 6 to 14 mg/day for teenagers and adults. Low total body burdens of aluminum, coupled with urinary excretion, suggests that only a small amount of aluminum is absorbed, despite the levels of consumption. Aluminum that is absorbed at these concentrations is located primarily in the heart, spleen, and bone but its presence in these sites was without histopathologic lesions (*i.e.*, abnormalities in the tissue).

5.2.2 Cadmium

Health Canada (2004d) provides a TDI of 0.8 ug/kg body weight/day. This TDI was based on the WHO's recommendation that the permissible intake of cadmium should not exceed 0.4 to 0.5 mg/week or 0.057 to 0.071 mg/day (WHO, 1972). If body weight (70.7 kg) is taken into account for the 0.057 mg/day value, the TDI is 0.8 µg/kg body weight/day.

5.2.3 Chromium

Health Canada (2006) provides a TDI of 1,500 µg/kg body weight/day for chromium III. This TDI is based on the IRIS RfD which was derived from a chronic toxicity study conducted by Ivankovic and Preussman (US EPA, 2006). Groups of rats (12 to 19 per group) were exposed to 0, 2 or 5 percent chromic oxide in bread five days per week for 18 weeks. Food consumption and body weight were monitored. Toxicological endpoints (measures of effect) included serum protein, urine analysis, organ weights and microscopic examination. The only effects observed were reductions (12% to 37%) in liver and spleen weights of animals in the high-dose group. The NOAEL was 1,468 mg/kg body weight/day. An uncertainty factor of 1,000 was applied to the NOAEL; 10 for interspecies extrapolation, 10 for protection of the most susceptible receptor and 10 for a lack of chronic and reproductive toxicity studies (US EPA, 2006). It is noted that the TDI for chromium III was selected for use because chromium VI is generally not present in animal or plant tissue. After its absorption, hexavalent chromium is rapidly reduced to the trivalent form which is the main form found in biological material (Leonard and Lauwerys, 1980; Kerger *et al.*, 1996; Shrivastava *et al.*, 2003).

5.2.4 Copper

Health Canada (2006) provides a TDI of 125 µg/kg body weight/day for copper. Health Canada does not provide a rationale for the derivation of this TDI.

5.2.5 Iron

Iron is an essential metal and occurs naturally in all plants and animals. The TDI for iron remains unchanged since 1983 at 800 µg/kg body weight/day (JECFA, 1983). Iron has not been evaluated for a maximum TDI due to its inherent low toxicity and its essential nature to all life.

6. RISK CHARACTERIZATION

6. Risk Characterization

6.1 Introduction

Using the results of the exposure and effects assessment, human health risks from consumption of country foods were quantified. This chapter provides the methods and results of the estimates of human health risks. In addition, the recommended maximum weekly intakes (RMWIs) were determined for each country food evaluated.

6.2 Estimation of Non-Carcinogenic Risks

Human health risk estimates were calculated based on the following formula:

$$\text{Exposure Ratio} = \frac{\text{Estimated Exposure}}{\text{Tolerable Daily Intake}}$$

For non-carcinogenic metals, an exposure ratio (ER) of less than 0.2 represents exposure that does not pose a significant health risk to human receptors (Health Canada, 2004b). Health Canada considers an ER value of 0.2 appropriate because only one exposure pathway is evaluated for human health and it is assumed that people are exposed to COPCs from multiple sources such as other food groups, soil, air, water, cigarettes and cigarette second hand smoke.

ER values greater than 0.2 do not necessarily indicate that adverse health effects will occur, due to the conservatism employed in their estimation (*e.g.*, the TRVs are conservative and protective of human health). Thus, an ER value of greater than 0.2 is not conclusive evidence that a human health risk exists. However, it does suggest potential risk that may require a more detailed evaluation. For instance, when evaluating country foods where the country food comprises the main component of the diet (*i.e.*, moose meat) an ER of 0.2 may be over protective because exposure from other food groups would be minimal. Table 6.2-1 presents the calculated ERs based the predicted and measured tissue concentrations.

The level of risk associated with the ERs based on the predicted tissue concentrations are all within the acceptable levels.

The highest ER was 0.02 for caribou muscle based on current consumption rates. This is 10 times lower than the ER limit of 0.2, indicating that the current quality of country foods is high. The maximum predicted amount consumed by toddlers and adults, 16 and 37 µg/kg bw/day respectively, is not considered a health risk. Based on the toddler and adult average mass of 16.5 and 70.7 kg, the maximum total iron ingestion from caribou muscle is 264 µg and 2,616 µg. In comparison, an adult daily vitamin tablet contains 14 mg, or 14,000 µg of iron.

Many of the exposure ratios for lake trout, arctic hare and Canada goose were very low. Country food interviews that assessed the weekly consumption rate of these foods indicated that these were infrequently consumed, and were based primarily on seasonal migration periods. Consequently, the low consumption rate of seasonal foods is reflected by the low EDI and subsequent ER values.

Table 6.2-1
Human Exposure Ratios Based on Predicted and Measured Tissue Concentrations

Parameter	Caribou				Arctic Hare			
	Toddler		Adult		Toddler		Adult	
	Mean ER	Max ER	Mean ER	Max ER	Mean ER	Max ER	Mean ER	Max ER
Aluminum	1.76E-04	8.44E-04	4.11E-04	1.97E-03	5.12E-09	2.45E-08	1.19E-08	5.69E-08
Cadmium	9.35E-04	3.36E-03	2.18E-03	7.84E-03	2.76E-08	9.91E-08	6.41E-08	2.31E-07
Chromium	1.85E-06	8.91E-06	4.33E-06	2.08E-05	5.39E-11	2.59E-10	1.25E-10	6.01E-10
Copper	2.20E-03	4.74E-03	5.12E-03	1.11E-02	6.48E-08	1.40E-07	1.51E-07	3.25E-07
Iron	9.17E-03	1.98E-02	2.14E-02	4.62E-02	2.69E-07	5.75E-07	6.25E-07	1.34E-06

Parameter	Canada Goose				Lake Trout			
	Toddler		Adult		Toddler		Adult	
	Mean ER	Max ER	Mean ER	Max ER	Mean ER	Max ER	Mean ER	Max ER
Aluminum	9.10E-09	4.37E-08	2.12E-08	1.02E-07	1.76E-04	1.76E-04	4.11E-04	4.11E-04
Cadmium	9.89E-06	3.56E-05	2.30E-05	8.27E-05	5.60E-04	5.60E-04	1.31E-03	1.31E-03
Chromium	2.27E-10	1.09E-09	5.28E-10	2.54E-09	5.91E-06	5.91E-06	1.38E-05	1.38E-05
Copper	6.46E-07	1.40E-06	1.50E-06	3.25E-06	4.52E-04	7.96E-04	1.05E-03	1.86E-03
Iron	1.24E-06	2.73E-06	2.88E-06	6.36E-06	N/A	N/A	N/A	N/A

Parameter	Blueberry			
	Toddler		Adult	
	Mean ER	Max ER	Mean ER	Max ER
Aluminum	7.06E-06	3.38E-05	1.64E-05	7.86E-05
Cadmium	1.43E-04	5.14E-04	3.32E-04	1.19E-03
Chromium	2.48E-08	5.95E-08	5.77E-08	1.38E-07
Copper	1.49E-05	3.22E-05	3.47E-05	7.49E-05
Iron	2.78E-05	5.95E-05	6.47E-05	1.38E-04

N/A = not available due to lack of measured tissue concentrations.

6.3 Recommended Maximum Weekly Intakes (RMWIs)

The RMWIs were calculated as described by Health Canada's guidance, using the following equation:

$$RMWI = \frac{TRV \times BW \times 7}{C_{food}}$$

Where:
RMWI = recommended maximum weekly intake of food (g/week)
TRV = toxicological reference value (ug/kg bw/day)
BW = receptor body weight
7 = days/week
C_{food} = maximum metal concentration in food (ug/g)

This equation was applied to each metal and receptor scenario (Appendix E). The metal that had the lowest RMWI for each receptor was selected as the overall RMWI because the lowest metal-specific RMWI is the driver of potential risk. Table 6.3-1 presents the RMWIs as the maximum servings per week.

Table 6.3-1
Recommended Maximum Weekly Number of Servings

Country Food	Human Receptor	Recommended Maximum Number of Servings Per Week
Caribou	Adult	89
	Toddler	49
Arctic Hare	Adult	960,598
	Toddler	521,360
Canada Goose	Adult	10,376
	Toddler	5,631
Lake Trout	Adult	692
	Toddler	377
Blueberry	Adult	359
	Toddler	195

All RMWIs are greater than the current country foods harvester consumption rates for all country foods evaluated. The high values for arctic hare, Canada goose and lake trout are the result of using average daily consumptions rather than actual serving sizes and annual consumption frequencies. Consequently, for seasonal or infrequently consumed foods, the serving sizes used for calculating the RMWIs is very small.

Country foods which are consumed throughout the year such as caribou, more accurately reflect the true RMWIs due to the accuracy of the daily serving sizes. It should be noted that although the RMWIs for some foods are high, it also reflects the low consumption rates of these foods in general, and do not constitute the majority of metals consumed from the diet.

This means that the predicted levels of the metals evaluated in these foods harvested from the Project area do not pose a health risk to toddlers or adults that consume them. Country foods can continue to be consumed at rates and frequencies which country foods harvesters are accustomed to.

7. UNCERTAINTY ANALYSIS

7. Uncertainty Analysis

7.1 Introduction

The process of evaluating human health risks from exposure to environmental media involves multiple steps. Inherent in each step of the health risk assessment are uncertainties that ultimately affect the final risk estimates. Uncertainties may exist in numerous areas, including the collection of samples used to identify contaminant concentrations, laboratory analysis of samples, lack of environmental media empirical data, estimation of potential exposures and derivation of TRVs. These uncertainties may result in an over- or underestimation of risk. However, for this assessment, where uncertainties existed, a conservative approach was taken, where appropriate, in order to overestimate rather than underestimate potential risks.

Some of the uncertainties have been mentioned in the preceding sections. The following uncertainty analysis is a qualitative discussion of the significant sources of uncertainty and/or data gaps in this assessment. Where appropriate, information required to fill the data gaps is presented.

7.2 Contaminants of Potential Concern (COPCs)

The COPCs for the baseline assessment were metals. The metals selected were based on a comparison of the existing surface water data collected in August of 2001 and 2007 to the applicable CCME guidelines. Metals that exceed the guidelines were selected for evaluation. Waters in Nunavut are generally oligotrophic with low nutrient and metals concentrations and little seasonal variation, subsequently there is high certainty that the metals selected, despite the small sample size, were based on data that is reflective of area wide water quality.

Soil samples were not collected from the study area. The current baseline for soils did not examine metal concentrations. Therefore, metals could not be selected for evaluation based on soil chemistry. In general, soil contains higher concentrations of metals by weight and volume compared to water at baseline conditions. Therefore it is important to have soil data for the purposes of COPC selection. In addition, soil data is required for modelling and prediction of animal tissue concentrations. Consequently, soil sampling should be conducted within the study area. Such data is required to select the COPCS and to predict tissue concentrations in country foods.

7.3 Tissue Concentrations

There are some uncertainties associated with the tissue concentrations used in this assessment. A description of these uncertainties is provided for terrestrial species, fish and plants.

7.3.1 Terrestrial Species

Concentrations in the tissue of caribou, arctic hare and goose grouse were predicted using an uptake model. As with all modelled data, the results are highly dependent on the accuracy of literature-based input parameters and the quality of the model itself.

The main uncertainty in this model was the biotransfer factors (BTFs) and bioaccumulation factors (BAFs) used. For all animal exposure routes, BTFs from soil-to-tissue were used. However, it is unlikely that the BTFs from plant-to-tissue and water-to-tissue are the same as soil-to-tissue. In addition, the caribou BTF was based on values for beef, as caribou BTFs were not available. Similarly, values for arctic hare were derived from Alaskan jackrabbit values and Canada goose BTFs were based on available avian species which was chicken. Notwithstanding, this method is the accepted way to model uptake of COPCs into animals when empirical data is not available or samples sizes are too small to make conclusions about population tissue concentrations.

Other uncertainties associated with the predicted animal tissue concentrations include the following:

- Diets of caribou, arctic hare and Canada goose were assumed to be comprised of the plant three plant species collected, which were primarily leaves and stems, and may not be representative of the actual foods that these animals eat.
- Tissue concentrations were estimated based on a limited sample size of water and vegetation, which may not be representative of the overall ingestion of metals by these species.
- No soil data was available as an input parameter to the model. Soils tend to have higher metals concentrations than vegetation and water and soil comprises a part the diet of these animals.

The predicted animal tissue concentrations were one of the largest sources of uncertainty in this assessment. Overall, empirical tissue data would be preferred as it would increase the certainty of the assessment.

7.3.2 Aquatic Species

Lake trout tissue was collected from Contwoyto Lake, which is the most common freshwater harvesting area within the Project area. The current EDI is based on 10 tissue samples, although there was very little variability in metal concentrations in the tissue. Appendix B1 presents the analytical results. For aluminum, cadmium and chromium, lake trout concentrations of metals were all below detection limits. Copper concentrations ranged from 0.97 to 2.0 mg/kg dry weight.

No tissue concentration data was available for seals and thus human exposure to metals from the consumption of the ringed seal could not be calculated. One possibility was to predict the tissue concentrations using a food chain model. However, a number of input parameters that were required were not readily available (*i.e.*, quality of the seals diets and other dietary input parameters, water quality, uptake rates, constant marine water exposure and marine water consumption, biotransfer factors, *etc.*). Even if these parameters were available there would be significant uncertainties associated with them, which would be similar to those discussed for the terrestrial food chain model. Subsequently, no formal evaluation of the baseline quality of seals was completed. In order to fill this data gap and reduce the uncertainty in the assessment empirical tissue data for the ringed seal is required. It may be possible to obtain samples from the country foods harvesters who have already harvested the animal for consumptive purposes.

7.3.3 Plant Species

Blueberry tissue concentrations were estimated using data from surrogate species of willow, sedges and cottongrass. There is uncertainty in assuming that the surrogate data is reflective of the quality of blueberries within the Project area. This is evidenced by the high degree of variation in metals concentrations between three plant species. Subsequently, using the surrogate data may have overestimated or underestimated the average concentrations in blueberry and resulting EDI's. Overall, plants are rarely harvested in the Project study area. The impact of vegetation on total consumed metals is likely to be insignificant compared to animal consumption. However, sampling of blueberries can be conducted in the summer of 2008 to reduce this uncertainty.

7.4 Consumption Quantity and Frequency

Consumption quantities used for human characteristics were reported as daily consumption averages. These values are calculated by assessing the annual consumption quantity divided by the number of days in a year. This methodology is useful, particularly to assess country foods that are seasonally or infrequently consumed.

Responses to food consumption surveys are known to vary considerably depending on when foods are assessed. For example, blueberry harvesting occurs during the short summer months. A 24-hour recall interview in the summer, during blueberry harvesting would likely yield higher reported consumption frequencies compared to the same interview during winter months.

For the purpose of calculating EDIs, it also assumes that individuals are consuming each food on a daily basis, with infrequently consumed foods reported as very low daily serving sizes. Consequently, the RMWIs are also calculated using these low serving sizes, resulting in high RMWI values.

Similar uncertainties also exist for foods such as arctic hare and lake trout, which may be available throughout the year, but not harvested as often. Canada goose is unavailable throughout the year, and migrates into the area in the summer, when the proposed winter road is not in use. Accurate reporting would be dependent on the ability of an individual to recollect past consumption patterns.

Overall, food consumption surveys often lead to overestimations of actual intake (Institute of Risk Research, 1999). Therefore, any uncertainties associated with consumption quantities and frequencies provide conservatism in the risk evaluation and RMWIs.

This assessment does not consider seasonal differences in the way that food is prepared (it is based on fresh weight and not dried or preserved weight), nor does it consider variability in a person's diet over time.

7.5 Toxicity Reference Values

There is uncertainty associated with estimating toxicity benchmarks by extrapolating potential effects on humans from animal studies in the laboratory. Thus, for human health risk

assessments, it is a standard practice to assume that people are more sensitive to the toxic effects of a substance than laboratory animals. Therefore, the toxicity benchmarks for human health are set at much lower levels than the animal benchmarks (typically 100 to 1,000 times lower). This large margin ensures that doses less than the toxicity benchmarks are safe and that minor exceedances of these benchmarks are unlikely to cause adverse health effects.

The TRVs are derived for individual contaminants. However, it is recognized that within any traditional food resource from the natural environment, multiple chemicals may be present and interactions between compounds may result in antagonism, additivity or synergism. As the scientific understanding of the effects of multiple contaminants is still in its infancy, interactions were not evaluated in this assessment.

7.6 Definition of Health

This country foods assessment is a science-based approach recommended by Health Canada. It evaluates the baseline potential for adverse health effects from exposure to the selected metals in country foods. The country foods assessor recognizes that health is more than just physical health. For instance: social, cultural, nutritional, economic factors, *etc.*, also play a role in a persons overall health status. Thus, this science-based assessment does not take into account all aspects of human health.

The Inuit perspective on food and health are strongly integrated. The social, cultural, spiritual, nutritional and economic benefits of country foods all play a role in how the Inuit, and Aboriginal groups in general perceive country foods. The hunting, fishing and gathering of country foods, and subsequent sharing of these foods with others throughout the community are social activities that bring individuals and families together (INAC, 2003). In this way, country foods are an important role in the Inuit perspective of health and well-being that cannot be assessed scientifically in the same manner as this baseline report.

8. CONCLUSIONS

8. Conclusions

This country foods assessment integrated the results of NTKP traditional knowledge, literature based country foods consumption and frequency patterns, the environmental media baseline studies and regulatory based toxicity reference values. The quality of country foods has been estimated prior to development of the Project and thus is reflective of baseline levels of metals. It also evaluated current potential health risks associated from the ingestion of baseline metals concentrations in the country foods.

This baseline assessment will be used to predict potential effects of the Project on country foods as part of the Environmental Impact Statement. Below presents a summary of the findings of the study, the main data gaps, and presents an overview of how the results of this study will be used to evaluate potential Project related effects on the quality of country foods.

8.1 Baseline Country Foods Quality

The Inuit are the primary harvesters of country foods in the BIPR Project area.

The country foods evaluated were caribou (*Rangifer tarandus*), arctic hare (*Lepus arcticus*), Canada goose (*Branta canadensis*), lake trout (*Salvelinus namaycush*), and blueberry (*Vaccinium* sp.). Ringed seals (*Phoca hispida*), were also identified as a major country food, but seal not formally assessed due to a lack empirical tissue data and model input parameters for the prediction of tissue concentrations.

Metals were the focus of this assessment because metals occur under baseline conditions in environmental media (*i.e.*, soil, water and plant and animal tissue). Furthermore, the proximity of base metal deposits to the Project area indicates the geology of the land is highly mineralized and may contain naturally elevated concentrations of metals in the environmental media. Five metals were evaluated: aluminum, cadmium, chromium, copper and iron. Concentrations of these metals in caribou, arctic hare and Canada goose were predicted using a food chain model, recommended by Health Canada. For blueberry, surrogate data was used and for lake trout measured metal concentrations in fish collected from Contwoyto Lake was used.

Based on the consumption patterns described, the exposure ratios of all metals are below Health Canada's recommended upper limit of 0.2. The highest ER value was for iron at 0.0214 for caribou muscle. For comparative purposes, the total maximum iron consumption from caribou in an adult is to 2,616 µg of iron daily. In comparison, an adult daily vitamin tablet contains 14,000 µg or iron. Iron is an essential metal, required for proper health. The total iron consumed as a result of country foods and vitamin consumption is not significant enough to pose a health risk.

Caribou meat was the most frequently consumed country food and comprised the majority of the total country foods consumed. Since no exposure ratios exceeded Health Canada's recommended limit, current consumption rates of caribou meat should not be a health concern. Baseline exposure ratios of all other metals and tissues are within acceptable limits.

This preliminary country foods study predicts no unacceptable risk to people from the consumption of caribou, arctic hare, Canada goose, lake trout and blueberry. Based on the measured and predicted levels of metals in these foods, the amounts currently consumed by the country foods harvesters are within the RMWIs. Thus, country foods harvesters may safely continue to eat these country foods.

8.2 Data Gaps

Despite the conclusions above, there are uncertainties and data gaps in this preliminary assessment. In order to reduce these certainties, additional field investigations will be conducted in the summer of 2008. These include:

- Collecting soil samples from along the proposed road route for COPC selection purposes and food chain model purposes.
- Sampling of blueberries along the proposed road route;
- Working with the Inuit to obtain caribou, arctic hare, Canada goose and ringed seal samples from animals that have already been harvested; and
- Further evaluating the season differences in consumption rates and frequencies among the Inuit; this may involve a more detailed literature search and or obtaining this information directly from the Inuit.

Once these data gaps are filled the country foods assessment will be amended to include any new data. Once the country foods assessment is finalized there will be more certainty in the health risk predictions from future Project development.

8.3 Future Country Foods Quality

The quality of country foods is directly related to the environmental media (*i.e.* water, soil and vegetation) concentrations. Thus, if there is a change in the environmental media concentrations, there may be a subsequent change in the quality of country foods. The potential contaminants to the Project area, as they affect soil, freshwater, and marine environments is discussed in the Draft Environmental Impact Statement (DEIS), Volume 1. The following summarises the DEIS predictions for changes in the quality of environmental media and subsequent potential changes to the quality of country foods.

Water

Road development is expected to have a negligible short and long-term effect on freshwater ecosystems. Increased road traffic may increase the risk of accidents such as fuel and supply spills. The impact would be dependent on the type of spill, the quantity and the location along the road. It is anticipated that any reportable sized spill would be remediated immediately following the incident. Port use impacts are also negligible to freshwater systems (Rescan, 2007a).

Marine environments were assessed for potential impact due to oil spills along the port of shipping route. Impacts from small oil spills ranging up to a few tenths of a tonne were

negligible. Large spills were determined to be highly unlikely, with the impact from such spills assessed to be moderate to high. There is negligible impact to marine waters from the road (Rescan, 2007a).

Thus, no change is predicted in the quality of fish or seals that are harvested from the Bathurst Inlet and freshwater bodies. However, in the event of a spill the water (both freshwater and marine) will be monitored throughout project and if there are changes in the water quality, a re-evaluation of the quality of country foods may be considered warranted.

Soils

For soils, the project would cause direct disturbance to terrestrial ecosystems along the proposed road route. The continuous use of the road may result in roadbed contamination from lubricants, oils, greases and metals from trucks deposited as dust or road runoff. The overall effects on soils and vegetation will be localized and limited. The impact assessment from this factor was low. Soil impacts from the port are assessed to be moderate, from the risk of accidentals fuel spills (Rescan, 2007a).

Vegetation

The quality of vegetation is directly related to soil and freshwater quality. Although the DEIS assesses the ecological impact to be moderate, due to the slow recovery of arctic plant ecosystems, the impacts to the quality of vegetation is negligible as a result of the same assessment to freshwater and soil (Rescan, 2007a).

There were no significant effects predicted to the environmental media from the development and use of the port at Bathurst Inlet and the winter road. The area has no significant sources of hydrocarbon release and road traffic, which is restricted to winter use, is expected to have a low impact on soil quality in the vicinity of the port. Subsequently there should be negligible effects on country foods.

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APPENDIX A1
SURFACE WATER METAL CONCENTRATIONS, 2001

Appendix A1
Analytical Results for Physical Variables, Dissolved Anions, Nutrients and Metals in Stream Surface Waters, August 2001

Variable	Units	km 206.9 Rep A 21/08/2001	km 206.9 Rep B 21/08/2001	km 192.4a Rep A 21/08/2001	km 192.4a Rep B 21/08/2001	km 134.6 Rep A 21/08/2001	km 134.6 Rep B 21/08/2001	km 84.2 Rep A 22/08/2001	km 84.2 Rep B 22/08/2001	km 72.2 Rep A 20/08/2001	km 72.2 Rep B 20/08/2001	km 2.2 Rep A 22/08/2001	km 2.2 Rep B 22/08/2001
Physical Tests													
Conductivity	µmhos/cm	10	9	8	8	10	10	21	20	59	61	491	489
Total Dissolved Solids	mg/L	<10	<10	<10	<10	10	<10	<10	<10	32	40	275	278.0
Hardness	mg $CaCO_3$/L	3.5	3.7	3.8	3.6	3.7	3.7	6.8	7.1	25.2	24.8	102.0	101.0
pH	pH units	7.26	7.13	7.36	7.21	7.21	7.19	7.47	7.23	7.77	7.59	7.99	7.89
Total Suspended Solids	mg/L	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	3	<3
Turbidity	NTU	1.2	1.2	0.7	0.6	0.8	0.9	0.3	0.4	0.6	0.7	7.5	7.4
Total Organic Carbon	mg/L	5.9	5.8	3.6	3.7	3.8	3.8	3.4	3.3	6.9	7.1	5.7	6.3
Dissolved Anions													
Acidity (to pH 8.3) ($CaCO_3$)	mg/L	2	2	2	2	2	2	2	2	2	2	2	2
Alkalinity-Total ($CaCO_3$)	mg/L	1	1	3	3	2	2	2	2	13	13	57	63
Bromide	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloride	mg/L	<0.5	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	<0.5	1.0	1.0	104.0	103.0
Fluoride	mg/L	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.04	0.04
Silicate	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	3	3
Sulphate	mg/L	2	1	1	1	2	2	5	5	11	10	16	16
Nutrients	mg/L												
Ammonia Nitrogen	mg/L	0.011	0.013	0.015	0.016	0.018	0.015	<0.005	0.009	0.010	0.007	0.006	<0.005
Total Kjeldahl Nitrogen	mg/L	0.19	0.19	0.17	0.17	0.15	0.15	0.13	0.12	0.38	0.38	0.16	0.15
Nitrate Nitrogen	mg/L	0.007	0.006	0.012	0.015	0.017	0.013	0.016	0.016	0.015	0.014	0.025	0.031
Nitrite Nitrogen	mg/L	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Ortho-Phosphate	mg/L	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.002	<0.001	0.002	0.002
Total Phosphorous	mg/L	0.002	0.008	0.007	0.006	0.005	0.012	0.004	0.004	0.002	0.005	0.013	0.016
Total Metals													
Aluminum	mg/L	0.073	0.075	0.017	0.02	0.02	0.046	0.013	0.013	0.026	0.033	0.281	0.315
Antimony	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Arsenic	mg/L	0.0004	0.0004	0.0003	0.0004	0.0001	0.0002	0.0002	0.0002	0.0005	0.0005	0.0008	0.0008
Barium	mg/L	0.00282	0.00287	0.0022	0.0022	0.00195	0.00265	0.00254	0.00249	0.00453	0.00479	0.0298	0.0305
Beryllium	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Bismuth	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Boron	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	0.03
Cadmium	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Calcium	mg/L	0.8	0.69	0.73	0.74	0.59	0.66	1.11	1.09	4.72	4.81	17.6	17.5
Chromium	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	0.0006
Cobalt	mg/L	0.0001	0.0001	0.0002	0.0002	0.0002	0.001	0.0001	0.0001	0.0004	0.0004	0.0002	0.0002
Copper	mg/L	0.0014	0.0014	0.0007	0.0007	0.0014	0.0016	0.0018	0.0017	0.0032	0.0032	0.0032	0.0033
Iron	mg/L	0.19	0.18	0.26	0.27	0.08	0.22	0.07	0.07	0.3	0.3	0.35	0.34
Lead	mg/L	0.00007	0.00006	<0.00005	0.00006	<0.00005	0.00006	<0.00005	<0.00005	<0.00005	0.00007	0.00023	0.00022
Lithium	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Magnesium	mg/L	0.4	0.4	0.4	0.4	0.5	0.6	1	1	3.1	3.1	12.9	12.8
Manganese	mg/L	0.00218	0.0022	0.00623	0.00598	0.00973	0.0428	0.00301	0.00274	0.00432	0.00442	0.022	0.0226
Mercury	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Molybdenum	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00006	<0.00005	0.0003	0.0003
Nickel	mg/L	0.0011	0.0011	0.0006	0.0006	0.0009	0.0014	0.0021	0.002	0.0061	0.0062	0.0009	0.0009
Phosphorus	mg/L	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Potassium	mg/L	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	3	2
Selenium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.002
Silicon	mg/L	0.11	0.11	0.18	0.18	0.13	0.13	0.11	0.1	0.15	0.16	2.04	1.84
Silver	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Sodium	mg/L	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	53	53
Strontium	mg/L	0.0052	0.0052	0.0052	0.0052	0.004	0.0042	0.0049	0.0048	0.0137	0.0139	0.071	0.0727
Thallium	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	<0.002	<0.0007	<0.002	<0.0001	<0.002	<0.0005	<0.0001	<0.002	<0.0001	<0.0001	<0.002	<0.0006
Titanium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01
Uranium	mg/L	0.00003	0.00003	<0.00001	<0.00001	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00066	0.00067
Vanadium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	0.001	0.002	<0.001	<0.001	<0.001	0.002	0.002	0.002	0.003	0.004	<0.001	0.001

APPENDIX A2
SURFACE WATER METAL CONCENTRATIONS, 2007

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Appendix A2
Analytical Results for Water Quality

RESULTS OF ANALYSIS									
Sample ID		**B1-203.6**	**B2-189.8**	**B3-132.0**	**B4-82.1**	**B5-70.4**	**B6-2.5**	**TRAVEL BLANK**	**FIELD BLANK**
Date Sampled		**24-JUN-07**	**24-JUN-07**	**24-JUN-07**	**24-JUN-07**	**24-JUN-07**	**24-JUN-07**	**24-JUN-07**	**24-JUN-07**
ALS Sample ID	**Available**	**L522538-1**	**L522538-2**	**L522538-3**	**L522538-4**	**L522538-5**	**L522538-6**	**L522538-7**	**L522538-8**
Matrix	**CCME Guideline**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**
Physical Tests									
Anion Sum		<0.1	<0.1	<0.1	0.1	0.2	0.7	<0.1	<0.1
Cation Sum		0.1	0.1	0.1	0.2	0.2	0.7	<0.1	<0.1
Cation - Anion Balance		13.7	15.3	16.3	10.2	9.8	3.3	0	0
Hardness (as $CaCO_3$)		3.27	3.99	3.96	5.77	7.86	19	<0.50	<0.50
Conductivity		9.2	26.3	11.5	14.9	17.9	76.5	<2.0	<2.0
pH	6.5 - 9	6.18	6.70	6.35	6.54	6.37	6.74	5.57	5.58
Total Dissolved Solids		12.3	12.8	12.3	13.7	15.5	44.9	<1.0	<1.0
Total Suspended Solids		<3.0	<3.0	<3.0	<3.0	3.4	427	<3.0	<3.0
Turbidity		1.65	0.89	1.25	1.20	1.45	32.4	<0.10	<0.10
Anions and Nutrients									
Ammonia as N		0.0326	0.0278	0.0206	0.0249	0.0275	<0.0050	<0.0050	<0.0050
Alkalinity, Bicarbonate (as $CaCO_3$)		2.9	2.7	2.7	3.6	4.8	17.7	<2.0	<2.0
Alkalinity, Carbonate (as $CaCO_3$)		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as $CaCO_3$)		2.9	2.7	2.7	3.6	4.8	17.7	<2.0	<2.0
Bromide (Br)		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl)		<0.50	<0.50	<0.50	<0.50	<0.50	11.6	<0.50	<0.50
Fluoride (F)		<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Sulfate (SO_4)		1.10	1.75	1.55	2.56	2.78	0.97	<0.50	<0.50
Nitrate (as N)	2.93	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen		0.352	0.348	0.319	0.545	0.331	0.422	<0.050	<0.050
Total Nitrogen		-	-	-	-	-	-	-	-
Ortho Phosphate as P		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate as P		0.0075	0.0070	0.0076	0.0058	0.0068	0.106	<0.0020	<0.0020
Available Phosphate-P		-	-	-	-	-	-	-	-
Total Metals									
Aluminum (Al)-Total	0.10*	0.0787	0.0672	0.0675	0.0476	0.0619	1.75	<0.0010	<0.0010
Antimony (Sb)-Total		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-total	0.005	0.000272	0.000244	0.000137	0.000209	0.000281	0.000857	<0.000030	<0.000030
Barium (Ba)-Total		0.00338	0.00365	0.00345	0.00322	0.00276	0.0472	<0.000050	<0.000050
Beryllium (Be)-total		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Boron (B)-total		<0.0010	<0.0010	<0.0010	<0.0010	0.0011	0.0133	<0.0010	<0.0010
Cadmium (Cd)-Total	A	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	0.000042	<0.000017	<0.000017
Calcium (Ca)-Total		0.683	0.814	0.703	1.03	1.68	4.92	<0.020	<0.020
Chromium (Cr)-Total	0.001	0.00020	0.00018	0.00011	0.00015	0.00019	0.00412	<0.00010	<0.00010
Cobalt (Co)-Total		0.00033	<0.00010	0.00060	0.00050	0.00060	0.00125	<0.00010	<0.00010
Copper (Cu)-Total	B	0.00117	0.00106	0.00163	0.00197	0.00252	0.00598	<0.00050	<0.00050
Iron (Fe)-Total	0.30	0.130	0.064	0.093	0.111	0.132	2.27	<0.010	<0.010
Lead (Pb)-Total	0.002*	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00145	<0.000050	<0.000050
Magnesium (Mg)-Total		0.364	0.455	0.501	0.745	0.910	3.19	<0.010	<0.010
Manganese (Mn)-Total		0.00886	0.00142	0.0200	0.0164	0.00611	0.0283	<0.000050	<0.000050
Mercury (Hg)-Total	0.000026	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Molybdenum (Mo)-Total		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000097	<0.000050	<0.000050
Nickel (Ni)-Total	0.025*	0.00115	0.00095	0.00200	0.00300	0.00360	0.00305	<0.00010	<0.00010
Potassium (K)-Total		0.326	0.437	0.451	0.511	0.399	1.44	<0.050	<0.050
Selenium (Se)-Total	0.001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00025	<0.00010	<0.00010
Silicon (Si)-Total		0.376	0.422	0.381	0.273	0.356	3.31	<0.050	<0.050
Silver (Ag)-Total	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Sodium (Na)-Total		0.490	0.525	0.471	0.432	0.346	7.95	<0.010	<0.010
Strontium (Sr)-Total		0.00481	0.00565	0.00467	0.00437	0.00489	0.0154	<0.00010	<0.00010
Uranium (U)-Total		0.000027	0.000019	0.000019	0.000028	0.000020	0.000340	<0.000010	<0.000010
Vanadium (V)-Total		0.000169	0.000137	0.000082	0.000099	0.000158	0.00538	<0.000050	<0.000050
Zinc (Zn)-Total	0.03	0.0017	0.0014	0.0017	0.0047	0.0035	0.0077	<0.0010	<0.0010
Dissolved Metals									
Aluminum (Al)-Dissolved		0.0693	0.0613	0.0603	0.0373	0.0396	0.0716	-	-
Antimony (Sb)-Dissolved		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-	-
Arsenic (As)-Dissolved		0.000274	0.000242	0.000129	0.000190	0.000257	0.000148	-	-
Barium (Ba)-Dissolved		0.00332	0.00353	0.00346	0.00319	0.00251	0.0187	-	-
Beryllium (Be)-Dissolved		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	-	-
Boron (B)-Dissolved		<0.0010	<0.0010	<0.0010	0.0011	0.0010	0.0112	-	-
Cadmium (Cd)-Dissolved		<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	-	-
Calcium (Ca)-Dissolved		0.709	0.837	0.735	1.05	1.68	3.90	-	-
Chromium (Cr)-Dissolved		0.00019	0.00015	<0.00010	<0.00010	<0.00010	<0.00010	-	-
Cobalt (Co)-Dissolved		0.00022	<0.00010	0.00012	0.00010	<0.00010	<0.00010	-	-
Copper (Cu)-Dissolved		0.00115	0.00104	0.00162	0.00182	0.00228	0.00180	-	-
Iron (Fe)-Dissolved		0.032	0.035	0.026	0.030	0.035	0.062	-	-
Lead (Pb)-Dissolved		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000062	-	-
Magnesium (Mg)-Dissolved		0.364	0.461	0.517	0.764	0.889	2.26	-	-
Manganese (Mn)-Dissolved		0.00662	0.000834	0.00616	0.00683	0.000388	0.000310	-	-
Mercury (Hg)-Dissolved		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	-	-
Molybdenum (Mo)-Dissolved		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000068	-	-
Nickel (Ni)-Dissolved		0.00118	0.00099	0.00206	0.00290	0.00337	0.00067	-	-
Potassium (K)-Dissolved		0.335	0.440	0.471	0.525	0.390	0.853	-	-
Selenium (Se)-Dissolved		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-	-
Silicon (Si)-Dissolved		0.377	0.425	0.340	0.267	0.319	0.677	-	-
Silver (Ag)-Dissolved		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-	-
Sodium (Na)-Dissolved		0.499	0.530	0.495	0.449	0.341	7.73	-	-
Strontium (Sr)-Dissolved		0.00493	0.00574	0.00486	0.00447	0.00484	0.0104	-	-
Uranium (U)-Dissolved		0.000024	0.000019	0.000017	0.000025	0.000013	0.000082	-	-
Vanadium (V)-Dissolved		0.000138	0.000139	0.000082	0.000062	0.000103	0.000276	-	-
Zinc (Zn)-Dissolved		0.0021	0.0017	0.0020	0.0043	0.0031	<0.0010	-	-
Organic Parameters									
Total Organic Carbon		7.42	7.10	6.81	6.13	6.44	6.81	<0.50	<0.50

(continued)

< = Less than the detection limit indicated.

Results are expressed as milligrams per dry kilogram except where noted.

Shaded values indicate CCME guideline exceeded.

A - for cadium guideline = 0.001 *10$^{(0.86[\log(\text{hardness})] - 3.2)}$ mg/L

B - for copper: CCME = 0.002 mg/L at 0-120 mg/L [CaCO3], 0.003mg/L at 120 - 180 mg/L [CaCO3], 0.004 mg/L at >180 mg/L [CaCO3]

***for aluminum: pH>6.5**

***for nickel: CCME guideline = 0.025 mg/L at 0-60 mg/L [CaCO3], 0.065mg/L at 60 - 120 mg/L [CaCO3], 0.110 mg/L at 120 - 180 mg/L [CaCO3], 0.150 mg/L at > 180 mg/L [CaCO3]**

***for lead: 0.002 for hardness between 0-60 [CaCO3]**

Appendix A2
Analytical Results for Water Quality, 2007 (completed)

RESULTS OF ANALYSIS										
Sample ID		**B3 DUPLICATE**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B6 REP2**	**FIELD BLANK**
Date Sampled		**24-JUN-07**	**18-AUG-07**	**18-AUG-07**	**18-AUG-07**	**18-AUG-07**	**18-AUG-07**	**18-AUG-07**	**18-AUG-07**	**18-AUG-07**
ALS Sample ID	**Available**	**L522538-9**	**L544578-1**	**L544578-2**	**L544578-3**	**L544578-4**	**L544578-5**	**L544578-6**	**L544578-7**	**L544578-8**
Matrix	**CCME Guideline**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**
Physical Tests										
Anion Sum		<0.1	<0.1	<0.1	<0.1	0.1	0.5	2.4	2.4	<0.1
Cation Sum		0.1	0.1	0.1	0.1	0.1	0.5	2.5	2.5	<0.1
Cation - Anion Balance		21.4	18.9	11.1	15.9	9.6	2.7	1.1	2.4	66.2
Hardness (as $CaCO_3$)		4.19	3.68	3.35	3.6	4.98	22.7	56	55.9	-
Conductivity		11.2	10.7	9.9	10.7	14.2	54.0	265	265	<2.0
pH	6.5 - 9	6.12	6.37	6.44	6.43	6.34	6.94	7.56	7.63	5.67
Total Dissolved Solids		12.4	9.1	7.8	8.1	9.6	34	139	138	<1.0
Total Suspended Solids		<3.0	<3.0	5.3	<3.0	<3.0	<3.0	15.3	16.7	<3.0
Turbidity		1.29	0.67	0.73	0.37	0.46	0.92	23.8	24.3	<0.10
Anions and Nutrients										
Ammonia as N		0.0200	0.0120	0.0182	0.0092	0.0166	0.0250	<0.0050	<0.0050	<0.0050
Alkalinity, Bicarbonate (as $CaCO_3$)		2.6	3.6	3.0	2.2	2.0	11.8	37.9	37.6	<2.0
Alkalinity, Carbonate (as $CaCO_3$)		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Hydroxide (as $CaCO_3$)		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Alkalinity, Total (as $CaCO_3$)		2.6	3.6	3.0	2.2	2.0	11.8	37.9	37.6	<2.0
Bromide (Br)		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.079	0.078	<0.050
Chloride (Cl)		<0.50	<0.50	<0.50	<0.50	<0.50	1.25	52.6	51.6	<0.50
Fluoride (F)		<0.020	0.025	0.020	<0.020	0.020	0.022	0.033	0.032	<0.020
Sulfate (SO_4)		1.48	0.58	0.94	1.53	3.06	10.3	7.52	7.35	<0.50
Nitrate (as N)	2.93	<0.0050	<0.0050	0.0247	0.0346	0.0095	0.0084	0.0096	0.0133	0.0061
Nitrite (as N)		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen		0.326	0.237	0.211	0.194	0.208	0.410	0.291	0.271	<0.050
Total Nitrogen		-	0.237	0.235	0.229	0.218	0.419	0.301	0.284	<0.060
Ortho Phosphate as P		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0016	0.0012	<0.0010
Total Phosphate as P		0.0096	0.0051	0.0068	0.0046	0.0053	0.0075	0.0221	0.0210	<0.0020
Available Phosphate-P		-	-	-	-	-	-	-	-	-
Total Metals										
Aluminum (Al)-Total	0.10*	0.0714	0.0382	0.0169	0.0159	0.0189	0.0258	0.751	0.690	<0.0010
Antimony (Sb)-Total		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-total	0.005	0.000149	0.000671	0.000272	0.000100	0.000211	0.000471	<0.0010	0.00061	<0.000030
Barium (Ba)-Total		0.00367	0.00302	0.00221	0.00240	0.00198	0.00426	0.0257	0.0250	<0.000050
Beryllium (Be)-total		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Boron (B)-total		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0177	0.0182	<0.0010
Cadmium (Cd)-Total	A	<0.000017	<0.000017	0.000019	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017
Calcium (Ca)-Total		0.730	0.784	0.664	0.617	0.830	4.40	11.2	11.4	<0.060
Chromium (Cr)-Total	0.001	0.00011	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	0.00148	0.00138	<0.00010
Cobalt (Co)-Total		0.00063	0.00020	0.00012	0.00011	0.00015	0.00030	0.00037	0.00036	<0.00010
Copper (Cu)-Total	B	0.00174	0.00075	0.00059	0.00112	0.00159	0.00279	0.00346	0.00357	<0.00050
Iron (Fe)-Total	0.30	0.090	0.396	0.205	0.053	0.127	0.273	0.686	0.598	<0.010
Lead (Pb)-Total	0.002*	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000342	0.000328	<0.000050
Magnesium (Mg)-Total		0.523	0.435	0.404	0.491	0.717	2.85	7.74	7.84	<0.010
Manganese (Mn)-Total		0.0213	0.00291	0.00412	0.00427	0.00432	0.00393	0.0139	0.0142	<0.000050
Mercury (Hg)-Total	0.000026	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Molybdenum (Mo)-Total		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000183	0.000166	<0.000050
Nickel (Ni)-Total	0.025*	0.00211	0.00090	0.00048	0.00084	0.00157	0.00444	0.00185	0.00173	<0.00010
Potassium (K)-Total		0.489	0.258	0.350	0.389	0.337	0.500	1.81	1.81	<0.050
Selenium (Se)-Total	0.001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	<0.00010
Silicon (Si)-Total		0.400	0.380	0.186	0.179	0.098	0.128	2.81	2.50	<0.050
Silver (Ag)-Total	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Sodium (Na)-Total		0.492	0.655	0.457	0.516	0.384	0.933	29.5	29.2	<0.070
Strontium (Sr)-Total		0.00496	0.00528	0.00483	0.00422	0.00369	0.0123	0.0357	0.0358	<0.00010
Uranium (U)-Total		0.000019	0.000013	<0.000010	<0.000010	0.000013	0.000013	0.000315	0.000318	<0.000010
Vanadium (V)-Total		0.000076	0.000214	0.000054	<0.000050	<0.000050	0.000166	0.0015	0.0017	<0.000050
Zinc (Zn)-Total	0.03	0.0019	0.0013	0.0010	<0.0010	0.0020	0.0020	0.0034	0.0041	<0.0020
Dissolved Metals										
Aluminum (Al)-Dissolved		0.0614	0.0244	0.0088	0.0109	0.0057	0.0090	0.577	0.556	-
Antimony (Sb)-Dissolved		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Arsenic (As)-Dissolved		0.000144	0.000666	0.000248	0.000108	0.000169	0.000419	0.00058	0.00057	-
Barium (Ba)-Dissolved		0.00357	0.00295	0.00215	0.00240	0.00183	0.00415	0.0224	0.0222	-
Beryllium (Be)-Dissolved		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	-
Boron (B)-Dissolved		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0181	0.0174	-
Cadmium (Cd)-Dissolved		<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	<0.000017	-
Calcium (Ca)-Dissolved		0.790	0.741	0.669	0.618	0.817	4.38	10.2	10.3	-
Chromium (Cr)-Dissolved		<0.00010	0.00011	<0.00010	<0.00010	<0.00010	0.00024	0.00123	0.00119	-
Cobalt (Co)-Dissolved		<0.00010	<0.00010	<0.00010	0.00021	<0.00010	<0.00010	0.00012	0.00011	-
Copper (Cu)-Dissolved		0.00165	<0.00050	<0.00050	0.00088	0.00117	0.00219	0.00258	0.00253	-
Iron (Fe)-Dissolved		0.025	0.278	0.138	0.027	0.032	0.133	0.395	0.321	-
Lead (Pb)-Dissolved		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000145	0.000130	-
Magnesium (Mg)-Dissolved		0.539	0.444	0.409	0.500	0.714	2.85	7.39	7.31	-
Manganese (Mn)-Dissolved		0.00595	0.00116	0.000266	0.000739	0.000721	0.000140	0.00223	0.00229	-
Mercury (Hg)-Dissolved		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	-
Molybdenum (Mo)-Dissolved		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000158	0.000150	-
Nickel (Ni)-Dissolved		0.00208	0.00087	0.00040	0.00078	0.00141	0.00414	0.00099	0.00096	-
Potassium (K)-Dissolved		0.505	0.269	0.346	0.405	0.326	0.508	1.65	1.66	-
Selenium (Se)-Dissolved		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.0010	-
Silicon (Si)-Dissolved		0.338	0.409	0.186	0.192	0.109	0.123	3.13	2.83	-
Silver (Ag)-Dissolved		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-
Sodium (Na)-Dissolved		0.500	0.678	0.460	0.526	0.384	0.945	28.0	28.7	-
Strontium (Sr)-Dissolved		0.00509	0.00533	0.00481	0.00427	0.00365	0.0124	0.0335	0.0339	-
Uranium (U)-Dissolved		0.000015	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000235	0.000246	-
Vanadium (V)-Dissolved		0.000080	0.000133	<0.000050	<0.000050	<0.000050	<0.000050	<0.0010	<0.0010	-
Zinc (Zn)-Dissolved		0.0018	0.0020	<0.0010	<0.0010	0.0019	0.0013	<0.0010	<0.0010	-
Organic Parameters										
Total Organic Carbon		6.99	3.95	2.91	3.01	3.02	6.46	7.66	7.75	<0.50

< = Less than the detection limit indicated.

Results are expressed as milligrams per dry kilogram except where noted.

Shaded values indicate CCME guideline exceeded.

A - for cadium guideline = 0.001 *10$^{(0.86[\log(\text{hardness})] - 3.2)}$ mg/L

B - for copper: CCME = 0.002 mg/L at 0-120 mg/L [CaCO3], 0.003mg/L at 120 - 180 mg/L [CaCO3], 0.004 mg/L at >180 mg/L [CaCO3]

***for aluminum: pH>6.5**

***for nickel: CCME guideline = 0.025 mg/L at 0-60 mg/L [CaCO3], 0.065mg/L at 60 - 120 mg/L [CaCO3], 0.110 mg/L at 120 - 180 mg/L [CaCO3], 0.150 mg/L at > 180 mg/L [CaCO3]**

***for lead: 0.002 for hardness between 0-60 [CaCO3]**

APPENDIX B1
LAKE TROUT METAL CONCENTRATIONS

Appendix B1
Analytical Results for Lake Trout Muscle Tissue Samples from Contwoyto Lake, August 2001

ALS File No.	N6125									
Date Received	26-Sep-01									
Sample ID	**60**	**63**	**68**	**69**	**70**	**71**	**74**	**114**	**115**	**118**
Date Sampled	**14/08/2001**	**14/08/2001**	**14/08/2001**	**14/08/2001**	**14/08/2001**	**14/08/2001**	**14/08/2001**	**15/08/2001**	**15/08/2001**	**15/08/2001**
ALS Sample ID	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Physical Tests										
Moisture %	**80.1**	**76.7**	**78.7**	**72.3**	**72**	**74.6**	**76.8**	**77.6**	**75.6**	**79.7**
Total Metals										
Aluminum T-Al	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Antimony T-Sb	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Arsenic T-As	0.16	0.09	0.26	0.21	0.28	0.23	0.28	0.24	0.17	0.18
Barium T-Ba	0.15	<0.05	0.08	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Beryllium T-Be	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Bismuth T-Bi	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Cadmium T-Cd	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Calcium T-Ca	371	243	267	185	162	220	221	184	229	269
Chromium T-Cr	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cobalt T-Co	<0.1	<0.1	0.4	<0.1	<0.1	0.2	<0.1	<0.1	0.1	0.2
Copper T-Cu	2	1.74	1.59	1.33	1.66	1.44	1.07	2.82	1.34	0.97
Lead T-Pb	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Lithium T-Li	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Magnesium T-Mg	1350	1200	1240	982	1030	1100	1090	1200	1320	1300
Manganese T-Mn	0.91	0.42	0.4	0.3	0.41	0.39	0.39	0.34	0.35	0.43
Mercury T-Hg	0.59	0.59	1.71	0.66	0.823	1.29	5.25	1.48	0.963	1.55
Molybdenum T-Mo	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel T-Ni	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Selenium T-Se	1	1	1	<1	<1	<1	1	<1	<1	1
Strontium T-Sr	0.55	0.39	0.32	0.17	0.19	0.24	0.26	0.15	0.22	0.28
Thallium T-Tl	0.07	0.05	0.05	0.04	0.06	0.11	0.04	0.06	0.05	0.05
Tin T-Sn	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Uranium T-U	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium T-V	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Zinc T-Zn	27.5	15.1	15.4	11.2	12.2	14.6	16	11.8	13.6	15.5

Notes: Results are expressed as milligrams per dry kilogram

< = Less than the detection limit indicated.

APPENDIX B2
VEGETATION METAL CONCENTRATIONS

Rescan™ Environmental Services Ltd.

Sixth Floor, 1111 West Hastings Street
Vancouver, British Columbia
Canada, V6E 2J3
Telephone: (604) 689-9460
Facsimile: (604) 687-4277
e-mail: rescan@rescan.com

908 – 5201, 50th Avenue
Yellowknife, Northwest Territories
Canada, X1A 3S9
Telephone: (867) 920-2090
Facsimile: (867) 920-2015

Refer To File No. A.1 - 6237_APD-11.DOC

November 2, 2007

Bathurst Inlet Port and Road Joint Venture Limited
340 Park Place 666 Burrard Street
Vancouver, B.C. V6C 2X8

Attention: Mr. Bob Gilroy, Project Manager

Dear Bob:

Re: Plant Tissue Sampling for the Bathurst Inlet Port and Road Project

Background

The collection of plant tissue samples for metals analysis provides information on the metal levels that occur naturally in vegetation growing within the study area. The data collected will be used to direct future monitoring plans.

Scope of Work

Plant tissue samples were collected at intervals along the proposed road as well as at the proposed port facility (Figure 1). Differences in site characteristics along the route resulted in the collection of willows, sedges, and cottongrass (*Salix*, *Carex*, and *Eriophorum*, respectively). The genera collected are those commonly consumed by wildlife in the area. Replicate samples were collected from two of those locations.

Sampling was carried out following common practices for plant tissue collection and methods specified by ALS Environmental who were conducting the analyses. Only the above-ground portion of herbaceous plants and newest/younger growth of woody species (shrubs) were collected. Samples consisted of several individual herbs of the same species or the stems and leaves from shrubs of the same species.

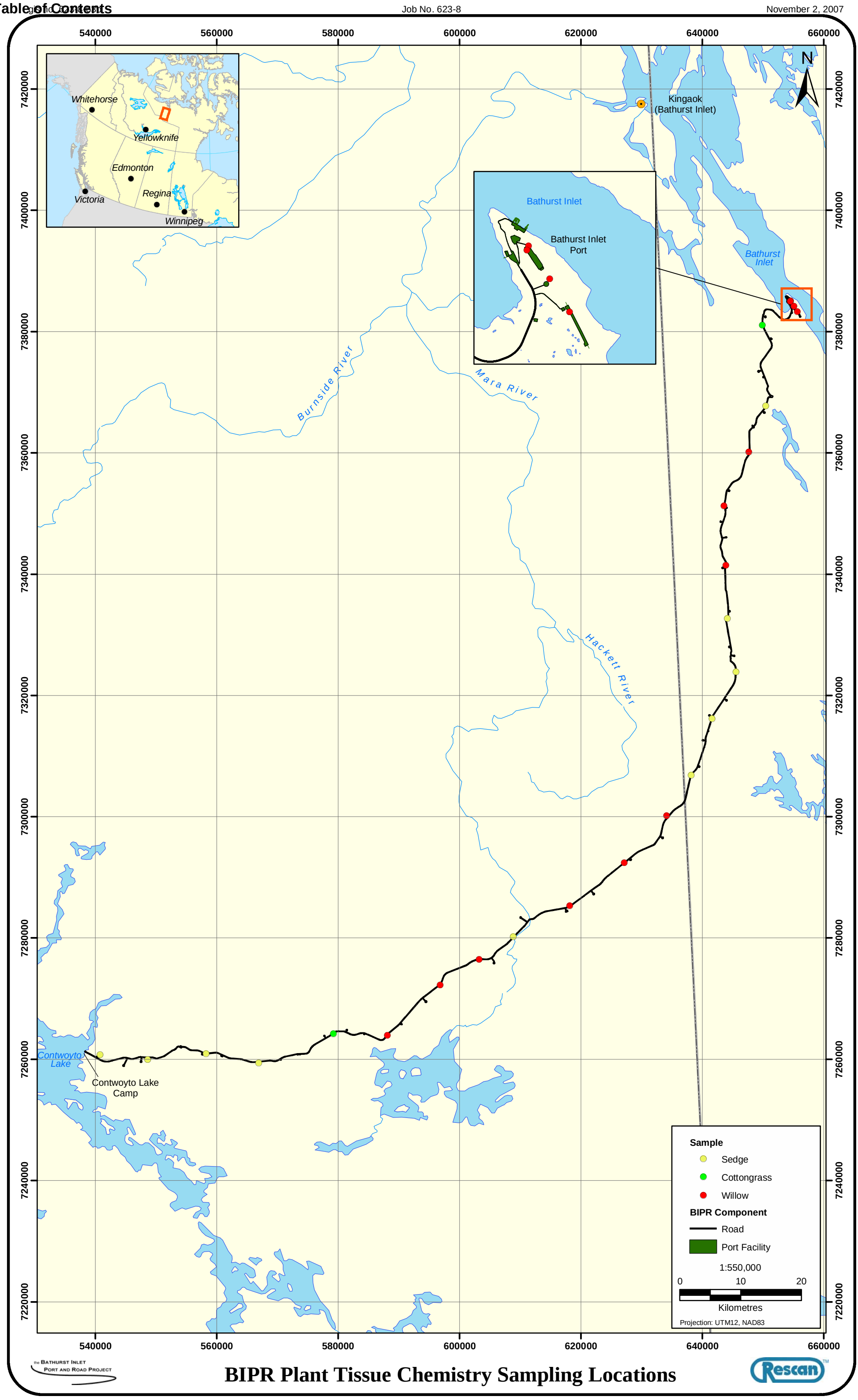
Sampling was conducted by hand. Care was taken to ensure hands were clean during sampling and that any dirt or root material was removed prior to placement into labelled, plastic sampling bags. Samples were kept frozen prior to shipment to ALS Environmental in Vancouver, BC, for analysis. Results are presented as both dry and wet weight. The list of metals analyzed and their associated detection limits are provided in Table 1. The list of samples collected and their geographic location is presented in Appendix 1.

CANADA EXPORT AWARD

Table 1
Analytical Detection Limits

Total Metals	Dry Weight (mg/kg)	Wet Weight (mg/kg wwt)
Aluminum (Al)	10	2
Antimony (Sb)	0.05	0.01
Arsenic (As)	0.05	0.01
Barium (Ba)	0.05	0.01
Beryllium (Be)	0.3	0.1
Bismuth (Bi)	0.3	0.03
Cadmium (Cd)	0.03	0.005
Calcium (Ca)	10	2
Chromium (Cr)	0.5	0.1
Cobalt (Co)	0.1	0.02
Copper (Cu)	0.05	0.01
Iron (Fe)	1	0.2
Lead (Pb)	0.1	0.02
Lithium (Li)	0.5	0.1
Magnesium (Mg)	3	1
Manganese (Mn)	0.05	0.01
Mercury (Hg)	0.005	0.001
Molybdenum (Mo)	0.05	0.01
Nickel (Ni)	0.5	0.1
Phosphorus (P)	20	5
Potassium (K)	100	20
Selenium (Se)	1	0.2
Sodium (Na)	100	20
Strontium (Sr)	0.05	0.01
Thallium (Tl)	0.03	0.01
Tin (Sn)	0.2	0.05
Titanium (Ti)	0.5	0.1
Uranium (U)	0.01	0.002
Vanadium (V)	0.5	0.1
Zinc (Zn)	0.5	0.1

To ensure adequate coverage, sample locations were initially identified at roughly 10 km intervals along the road alignment. Final locations in the field were identified based on the presence and amount of appropriate vegetation available for collection. Where possible, samples were collected adjacent the road alignment where the potential for dust deposition was anticipated to be higher.



the Bathurst Inlet Port and Road Project

BIPR Plant Tissue Chemistry Sampling Locations

Rescan™

Results

Summary results of the laboratory analyses are presented as both dry and wet weight (Table 2 and Table 3, respectively). All laboratory data are presented in Appendix 2. Dry weight displays the metal levels present in plant tissues irrespective of moisture status, while wet weight better reflects *in situ* conditions and provides an approximation of the conditions under which consumers (*e.g.*, wildlife) may naturally encounter and ingest these plants.

Table 2
Dry Weight Metal Concentrations (mg/kg) in Plant Tissues within the BIPR Study Area

	Willow (n=15)			Sedge (N=10)			Cottongrass (n=2)	
Total Metals	**Median (mg/kg)**	**Mean (mg/kg)**	**Range (mg/kg)**	**Median (mg/kg)**	**Mean mg/kg)**	**Range (mg/kg)**	**Median (mg/kg)**	**Range (mg/kg)**
Aluminum (Al)	24.0	27.2	11-73	19.5	30.1	11-133	9.0	5-13
Antimony (Sb)	0.03	0.03	0.025-0.08	0.03	0.03	0.02-0.11	0.03	0.025-0.025
Arsenic (As)	0.03	0.03	0.025-0.07	0.07	0.08	0.02-0.18	0.03	0.025-0.025
Barium (Ba)	24	28	9.08-65.1	17	22	3.31-66.2	10	8.64-12.3
Beryllium (Be)	0.15	0.15	0.15-0.15	0.15	0.15	0.15-0.15	0.15	0.15-0.15
Bismuth (Bi)	0.15	0.15	0.15-0.15	0.15	0.15	0.15-0.15	0.15	0.15-0.15
Cadmium (Cd)	0.73	0.84	0.16-1.98	0.11	0.19	0.04-0.52	0.04	0.04-0.05
Calcium (Ca)	5,760	6,376	4,250-10,300	2,285	2,863	1,570-7,470	1,020	959-1,080
Chromium (Cr)	0.25	0.25	0.25-0.25	0.25	0.25	0.25-0.25	0.25	0.25-0.25
Cobalt (Co)	2.00	2.91	0.1-6.45	0.35	0.39	0.05-0.86	0.05	0.05-0.05
Copper (Cu)	5.53	5.48	4.1-6.92	10.52	10.45	7.36-16.3	3.82	3.15-4.48
Iron (Fe)	44	48	28-83	122	125	48-187	41	31-51
Lead (Pb)	0.05	0.13	0.05-0.59	0.12	0.16	0.05-0.67	0.08	0.05-0.1
Lithium (Li)	0.25	0.25	0.25-0.25	0.25	0.25	0.25-0.25	0.25	0.25-0.25
Magnesium (Mg)	3,600	3,602	2,230-6,560	1,945	1,936	1,520-2,750	955	910-1,000
Manganese (Mn)	257	248	104-404	204	197	56.4-491	109	62.7-155
Mercury (Hg)	0.01	0.01	0.002-0.008	0.00	0.00	0.002-0.01	0.00	0.002-0.005
Molybdenum (Mo)	0.14	0.15	0.02-0.36	0.61	1.28	0.11-4.02	0.73	0.31-1.16
Nickel (Ni)	3.46	6.35	1.18-20.5	9.93	8.73	0.25-14.6	0.75	0.72-0.77
Phosphorus (P)	1,480	1,605	1,130-3,040	1,580	1,758	1,110-2,620	1,190	1,010-1,370
Potassium (K)	8,080	8,413	5,580-12,000	15,700	15,410	10,500-19,100	5,705	4,970-6,440
Selenium (Se)	0.50	0.50	0.5-0.5	0.50	0.50	0.5-0.5	0.50	0.5-0.5
Sodium (Na)	50	85	50-160	50	80	50-150	50	50-50
Strontium (Sr)	36.20	33.18	7.44-66.3	8.77	10.68	3.81-28.7	3.69	3.17-4.2
Thallium (Tl)	0.02	0.02	0.015-0.015	0.02	0.02	0.01-0.01	0.02	0.015-0.015
Tin (Sn)	0.10	0.11	0.1-0.24	0.10	0.10	0.1-0.1	0.10	0.1-0.1
Titanium (Ti)	0.54	0.53	0.25-1.7	0.63	0.55	0.25-1.02	0.25	0.25-0.25
Uranium (U)	0.005	0.005	0.005-0.005	0.005	0.005	0.005-0.005	0.005	0.005-0.005
Vanadium (V)	0.25	0.25	0.25-0.25	0.25	0.25	0.25-0.25	0.25	0.25-0.25
Zinc (Zn)	111.0	118.4	25.6-252	36.9	38.4	18.3-67.1	30	28.4-30.8

Table 3
Wet Weight Metal Concentrations (mg/Wkg) in Plant Tissues within the BIPR Study Area

	Willow (n=15)			Sedge (N=10)			Cottongrass (n=2)	
Total Metals	**Median (mg/Wkg)**	**Mean (mg/Wkg)**	**Range (mg/Wkg)**	**Median (mg/Wkg)**	**Mean (mg/Wkg)**	**Range (mg/Wkg)**	**Median (mg/Wkg)**	**Range (mg/Wkg)**
Aluminum (Al)	8.9	9.77	3.9-22.2	6.6	10.2	4-45.4	3.7	2.3-5
Antimony (Sb)	0.01	0.01	0.005-0.026	0.01	0.01	0.005-0.039	0.01	0.005-0.011
Arsenic (As)	0.01	0.01	0.005-0.026	0.02	0.03	0.005-0.061	0.01	0.011-0.011
Barium (Ba)	10.10	10.10	3.48-20.20	5.56	7.33	1.12-22.7	3.96	3.25-4.67
Beryllium (Be)	0.05	0.05	0.05-0.05	0.05	0.05	0.05-0.05	0.05	0.05-0.05
Bismuth (Bi)	0.015	0.015	0.015-0.015	0.015	0.015	0.015-0.015	0.015	0.015-0.015
Cadmium (Cd)	0.26	0.30	0.06-0.69	0.037	0.064	0.012-0.188	0.017	0.014-0.019
Calcium (Ca)	2,130	2,315	1,560-3,840	760	987	534-2,790	386	361-411
Chromium (Cr)	0.05	0.05	0.05-0.12	0.05	0.05	0.05-0.05	0.05	0.05-0.05
Cobalt (Co)	0.78	1.05	0.04-2.39	0.12	0.13	0.01-0.28	0.01	0.01-0.01
Copper (Cu)	1.96	1.99	1.61-2.57	3.55	3.53	2.42-5.41	1.45	1.19-1.7
Iron (Fe)	16.1	17	10.7-29.9	40.9	42.3	18-64	15.5	11.8-19.2
Lead (Pb)	0.03	0.04	0.01-0.18	0.04	0.05	0.01-0.23	0.03	0.03-0.04
Lithium (Li)	0.05	0.06	0.05-0.16	0.05	0.06	0.05-0.12	0.05	0.05-0.05
Magnesium (Mg)	1,320	1,309	810-1,990	635	658	500-942	362	346-378
Manganese (Mn)	100	91	35.5-153	68	66	21-163	41	23.8-58.4
Mercury (Hg)	0.003	0.002	0.001-0.003	0.002	0.002	0.001-0.003	0.002	0.001-0.002
Molybdenum (Mo)	0.05	0.05	0.02-0.13	0.20	0.44	0.04-1.50	0.28	0.12-0.44
Nickel (Ni)	1.26	2.25	0.5-7.6	3.23	2.91	0.13-4.96	0.28	0.27-0.29
Phosphorus (P)	544	580	417-922	560	589	415-837	451	381-520
Potassium (K)	2,960	3,061	2,140-4,440	5,205	5,192	3,590-6,500	2,160	1,870-2,450
Selenium (Se)	0.10	0.10	0.1-0.1	0.10	0.10	0.1-0.1	0.10	0.1-0.1
Sodium (Na)	10	24	10-69	10	18	10-32	10	10-10
Strontium (Sr)	13.70	11.99	2.86-20.30	2.91	3.58	1.29-9.84	1.40	1.19-1.60
Thallium (Tl)	0.005	0.005	0.005-0.005	0.005	0.005	0.005-0.005	0.005	0.005-0.005
Tin (Sn)	0.025	0.028	0.025-0.071	0.025	0.029	0.025-0.063	0.025	0.025-0.025
Titanium (Ti)	0.18	0.21	0.05-0.52	0.16	0.16	0.05-0.35	0.09	0.05-0.12
Uranium (U)	0.001	0.001	0.001-0.001	0.001	0.001	0.001-0.003	0.001	0.001-0.001
Vanadium (V)	0.05	0.05	0.05-0.05	0.05	0.05	0.05-0.05	0.05	0.05-0.05
Zinc (Zn)	41.7	44.2	9.8-100	12.1	12.9	6.8-22.8	11.2	10.8-11.6

A total of 27 samples were analyzed: 15 willow (including two replicate samples), ten sedge, and two cottongrass. Many of the samples were below the analytical detection limits. In these cases, half of the detection limit value was used for data summaries.

These baseline plant tissue metal concentrations will be used for future monitoring during the operations and closure and reclamation phases. Future metal levels in plant tissue will be compared to baseline values in order to determine if changes in metal levels are occurring. Additional sampling may be conducted in conjunction with the monitoring program for dustfall and fugitive dust.

Results associated with the cottongrass samples should be viewed as anecdotal due to the small sample size (N=2). The identification of possible trends in metals concentrations in plant tissues will focus on those associated with willows and sedges, due to their larger sample sizes. Noticeable changes in metal levels over time could be further analyzed using a risk assessment approach to determine the potential exposure risks to wildlife that may be using the plants of the area as a food source.

Yours truly,

RESCAN™ ENVIRONMENTAL SERVICES LTD.
per:

Tania Perzoff, M.Sc., R.P.Bio.

Appendix 1
Plant Chemistry Sample Locations

Waypoint	Sample	Date	Zone	Northing	Easting	Genus	Replicate
km10	Erio10	7/22/2007	13	7379548	383130	Eriophorum	
km25	Carex25	7/22/2007	13	7366187	382390	Carex	
km34	Salix34	7/22/2007	13	7358920	378889	Salix	
km44	Salix44	7/22/2007	13	7350446	373963	Salix	
km54	Salix54	7/22/2007	13	7340670	373356	Salix	y - 54b
km63	Carex63	7/21/2007	13	7331963	372723	Carex	
km72	Carex72	7/21/2007	13	7323059	373326	Carex	
km81	Carex81	7/21/2007	13	7315717	368631	Carex	
km91	Carex91	7/21/2007	13	7306773	364320	Carex	
km100	Salix100	7/21/2007	12	7300183	634070	Salix	
km111	Salix111	7/21/2007	12	7292460	627104	Salix	
km122	Salix122	7/21/2007	12	7285399	618157	Salix	
km133	Carex133	7/21/2007	12	7280262	608836	Carex	
km140	Salix140	7/21/2007	12	7276537	603189	Salix	
km148	Salix148	7/21/2007	12	7272289	596781	Salix	y - 148b
km160	Salix160	7/21/2007	12	7264011	588108	Salix	
km170	Erio170	7/21/2007	12	7264310	579223	Eriophorum	
km183	Carex183	7/21/2007	12	7259458	566896	Carex	
km193	Carex193	7/21/2007	12	7260977	558275	Carex	
km203	Carex203	7/21/2007	12	7260006	548631	Carex	
km212	Carex212	7/21/2007	12	7260794	540778	Carex	
PortSalix1	PortSalix1	7/18/2007	13	7381212	389065	Salix	
PortSalix2	PortSalix2	7/18/2007	13	7382148	388622	Salix	
PortSalix3	PortSalix3	7/18/2007	13	7383095	388132	Salix	
PortSalix4	PortSalix4	7/18/2007	13	7382987	388078	Salix	

Appendix 2
Laboratory Analysis of Plant Tissue Chemistry

Sample ID	B1PR-SALIX122	B1PR-SALIX111	B1PR-CAREX91	B1PR-SALIX44	PORTSALIX3	B1PR-CAREX212
Date Sampled	21-JUL-07	21-JUL-07	21-JUL-07	22-JUL-07	18-JUL-07	21-JUL-07
Time Sampled	15:20	15:35	16:05	10:30	15:36	11:57
ALS Sample ID	L540099-1	L540099-2	L540099-3	L540099-4	L540099-5	L540099-6
Matrix	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
Physical Tests						
% Moisture	65.2	69.7	65.4	69.5	63.3	65.7
Total Metals						
Aluminum (Al) - dry	25.0	73.0	19.0	13.0	24.0	133
Aluminum (Al) - wet	8.9	22.2	6.7	3.9	8.9	45.4
Antimony (Sb) - dry	<0.050	0.085	<0.050	<0.050	<0.050	0.114
Antimony (Sb) - wet	<0.010	0.026	<0.010	<0.010	<0.010	0.039
Arsenic (As) - dry	<0.050	<0.050	<0.050	<0.050	<0.050	0.107
Arsenic (As) - wet	<0.010	<0.010	0.013	<0.010	<0.010	0.037
Barium (Ba) - dry	33.7	65.1	14.3	32.9	54.9	66.2
Barium (Ba) - wet	11.7	19.7	4.94	10.1	20.2	22.7
Beryllium (Be) - dry	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Beryllium (Be) - wet	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Bismuth (Bi) - dry	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Bismuth (Bi) - wet	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Cadmium (Cd) - dry	1.98	1.15	0.086	1.20	0.164	0.519
Cadmium (Cd) - wet	0.689	0.349	0.0299	0.367	0.0601	0.178
Calcium (Ca) - dry	5220	7300	2140	10300	4250	3500
Calcium (Ca) - wet	1820	2210	741	3150	1560	1200
Chromium (Cr) - dry	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Chromium (Cr) - wet	<0.10	0.12	<0.10	<0.10	<0.10	<0.10
Cobalt (Co) - dry	6.45	3.70	0.34	2.00	0.69	0.64
Cobalt (Co) - wet	2.25	1.12	0.118	0.612	0.255	0.220
Copper (Cu) - dry	5.61	6.02	9.35	6.56	5.53	7.68
Copper (Cu) - wet	1.96	1.82	3.24	2.01	2.03	2.63
Iron (Fe) - dry	39.0	59.5	90.6	70.7	32.7	187
Iron (Fe) - wet	13.6	18.0	31.4	21.6	12.0	64.2
Lead (Pb) - dry	0.15	0.59	0.11	<0.10	<0.10	0.67
Lead (Pb) - wet	0.051	0.179	0.037	<0.020	<0.020	0.229
Lithium (Li) - dry	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Lithium (Li) - wet	<0.10	<0.10	<0.10	<0.10	<0.10	0.12
Magnesium (Mg) - dry	2830	6560	1710	4320	3890	2750
Magnesium (Mg) - wet	985	1990	591	1320	1430	942
Manganese (Mn) - dry	307	117	274	396	170	110
Manganese (Mn) - wet	107	35.5	94.9	121	62.5	37.6
Mercury (Hg) - dry	0.0056	0.0061	<0.0050	0.0060	0.0072	0.0098
Mercury (Hg) - wet	0.0019	0.0019	0.0017	0.0018	0.0027	0.0033
Molybdenum (Mo) - dry	0.131	0.131	2.08	0.152	<0.050	0.586
Molybdenum (Mo) - wet	0.046	0.040	0.722	0.047	0.016	0.201
Nickel (Ni) - dry	8.29	17.4	10.1	2.34	2.59	9.76
Nickel (Ni) - wet	2.89	5.27	3.51	0.72	0.95	3.35
Phosphorus (P) - dry	1310	3040	2010	1600	2140	1560
Phosphorus (P) - wet	458	922	697	489	785	534
Potassium (K) - dry	6140	11000	18800	7540	10400	10500
Potassium (K) - wet	2140	3330	6500	2300	3800	3590
Selenium (Se) - dry	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Selenium (Se) - wet	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Sodium (Na) - dry	<100	<300	<100	<100	160	<100
Sodium (Na) - wet	25	<60	<20	<20	57	32
Strontium (Sr) - dry	38.5	66.3	8.27	24.2	16.6	28.7
Strontium (Sr) - wet	13.4	20.1	2.86	7.39	6.10	9.84
Thallium (Tl) - dry	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Thallium (Tl) - wet	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Tin (Sn) - dry	<0.20	0.24	<0.20	<0.20	<0.20	<0.20
Tin (Sn) - wet	<0.050	0.071	<0.050	<0.050	<0.050	<0.050
Titanium (Ti) - dry	0.54	1.7	<0.50	<0.50	<0.50	1.02
Titanium (Ti) - wet	0.19	0.52	0.16	0.11	0.16	0.35
Uranium (U) - dry	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U) - wet	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0028
Vanadium (V) - dry	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Vanadium (V) - wet	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Zinc (Zn) - dry	150	58.9	42.5	63.7	51.5	29.0
Zinc (Zn) - wet	52.2	17.9	14.7	19.4	18.9	9.93

(continued)

Appendix 2
Laboratory Analysis of Plant Tissue Chemistry (continued)

Sample ID	B1PR-CAREX183	PORTSALIX2	B1PR-SALIX160	B1PR-CAREX133	B1PR-SALIX34	B1PR-CAREX81
Date Sampled	21-JUL-07	18-JUL-07	21-JUL-07	21-JUL-07	22-JUL-07	21-JUL-07
Time Sampled	12:42	14:48	14:20	15:02	10:50	16:23
ALS Sample ID	L540099-7	L540099-8	L540099-9	L540099-10	L540099-11	L540099-12
Matrix	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
Physical Tests						
% Moisture	68.1	57.8	58.3	66.9	61.6	66.1
Total Metals						
Aluminum (Al) - dry	20.0	18.0	37.0	21.0	14.0	13.0
Aluminum (Al) - wet	6.4	7.7	15.6	6.8	5.4	4.4
Antimony (Sb) - dry	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Antimony (Sb) - wet	<0.010	<0.010	<0.010	0.014	<0.010	<0.010
Arsenic (As) - dry	0.057	<0.050	<0.050	0.075	<0.050	0.058
Arsenic (As) - wet	0.018	<0.010	<0.010	0.025	<0.010	0.020
Barium (Ba) - dry	37.0	11.9	24.2	13.9	10.1	3.31
Barium (Ba) - wet	11.8	5.01	10.1	4.61	3.87	1.12
Beryllium (Be) - dry	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Beryllium (Be) - wet	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Bismuth (Bi) - dry	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Bismuth (Bi) - wet	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Cadmium (Cd) - dry	0.146	0.375	0.481	0.200	0.407	0.055
Cadmium (Cd) - wet	0.0465	0.158	0.201	0.0664	0.157	0.0188
Calcium (Ca) - dry	2320	6970	4840	2060	9990	1570
Calcium (Ca) - wet	741	2940	2020	681	3840	534
Chromium (Cr) - dry	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Chromium (Cr) - wet	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cobalt (Co) - dry	0.35	1.86	5.73	0.28	0.10	0.46
Cobalt (Co) - wet	0.113	0.784	2.39	0.092	0.040	0.156
Copper (Cu) - dry	11.9	4.72	4.58	11.4	4.72	9.83
Copper (Cu) - wet	3.79	1.99	1.91	3.77	1.82	3.34
Iron (Fe) - dry	89.8	53.4	44.5	175	36.9	139
Iron (Fe) - wet	28.7	22.5	18.6	57.9	14.2	47.2
Lead (Pb) - dry	0.12	<0.10	<0.10	0.14	<0.10	<0.10
Lead (Pb) - wet	0.037	0.022	0.041	0.046	0.026	<0.020
Lithium (Li) - dry	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Lithium (Li) - wet	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium (Mg) - dry	1910	4400	2720	1540	3600	1520
Magnesium (Mg) - wet	609	1860	1130	511	1380	517
Manganese (Mn) - dry	268	257	367	223	125	231
Manganese (Mn) - wet	85.5	108	153	73.7	48.0	78.3
Mercury (Hg) - dry	<0.0050	0.0083	0.0077	<0.0050	0.0069	0.0078
Mercury (Hg) - wet	0.0015	0.0035	0.0032	0.0015	0.0027	0.0027
Molybdenum (Mo) - dry	1.23	0.258	0.084	0.528	0.129	0.111
Molybdenum (Mo) - wet	0.392	0.109	0.035	0.175	0.049	0.038
Nickel (Ni) - dry	10.4	1.18	7.05	6.53	1.36	14.6
Nickel (Ni) - wet	3.33	0.50	2.94	2.16	0.52	4.96
Phosphorus (P) - dry	2620	1130	1300	1420	1240	1590
Phosphorus (P) - wet	837	474	544	471	478	538
Potassium (K) - dry	19100	8080	5580	15300	5710	18500
Potassium (K) - wet	6110	3400	2330	5060	2200	6270
Selenium (Se) - dry	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Selenium (Se) - wet	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Sodium (Na) - dry	<300	160	<100	<300	<100	<100
Sodium (Na) - wet	<60	69	<20	<60	<20	<20
Strontium (Sr) - dry	16.2	36.0	39.5	8.95	8.12	3.81
Strontium (Sr) - wet	5.19	15.2	16.5	2.96	3.12	1.29
Thallium (Tl) - dry	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Thallium (Tl) - wet	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Tin (Sn) - dry	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Tin (Sn) - wet	<0.050	<0.050	<0.050	0.063	<0.050	<0.050
Titanium (Ti) - dry	<1.5	0.62	<0.50	<1.5	<0.50	<0.50
Titanium (Ti) - wet	<0.30	0.26	0.15	<0.30	0.19	<0.10
Uranium (U) - dry	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U) - wet	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Vanadium (V) - dry	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Vanadium (V) - wet	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Zinc (Zn) - dry	43.3	157	240	46.6	25.6	67.1
Zinc (Zn) - wet	13.8	66.3	100	15.4	9.85	22.8

(continued)

Appendix 2
Laboratory Analysis of Plant Tissue Chemistry (continued)

Sample ID	B1PR-ERIO10	PORTSALIX1	B1PR-CAREX203	B1PR-SALIX140	B1PR-SALIX148	B1PR-ERIO170
Date Sampled	22-JUL-07	18-JUL-07	21-JUL-07	21-JUL-07	21-JUL-07	21-JUL-07
Time Sampled	11:25	14:20	12:10	14:50	14:35	13:00
ALS Sample ID	L540099-13	L540099-14	L540099-15	L540099-16	L540099-17	L540099-18
Matrix	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
Physical Tests						
% Moisture	62.3	58.4	62.9	68.1	63.8	62.0
Total Metals						
Aluminum (Al) - dry	13.0	24.0	30.0	35.0	37.0	<10
Aluminum (Al) - wet	5.0	10.1	11.0	11.1	13.3	2.3
Antimony (Sb) - dry	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Antimony (Sb) - wet	0.011	<0.010	0.018	<0.010	<0.010	<0.010
Arsenic (As) - dry	<0.050	<0.050	0.088	<0.050	0.072	<0.050
Arsenic (As) - wet	0.011	<0.010	0.032	0.011	0.026	0.011
Barium (Ba) - dry	8.64	32.7	18.9	24.0	29.1	12.3
Barium (Ba) - wet	3.25	13.6	7.00	7.65	10.5	4.67
Beryllium (Be) - dry	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Beryllium (Be) - wet	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Bismuth (Bi) - dry	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Bismuth (Bi) - wet	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Cadmium (Cd) - dry	0.038	0.576	0.507	0.810	1.44	0.049
Cadmium (Cd) - wet	0.0145	0.240	0.188	0.259	0.523	0.0186
Calcium (Ca) - dry	959	4660	2140	5320	6610	1080
Calcium (Ca) - wet	361	1940	795	1700	2390	411
Chromium (Cr) - dry	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Chromium (Cr) - wet	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cobalt (Co) - dry	<0.10	1.29	0.14	2.71	5.28	<0.10
Cobalt (Co) - wet	<0.020	0.536	0.050	0.865	1.91	<0.020
Copper (Cu) - dry	3.15	4.10	11.2	6.14	6.20	4.48
Copper (Cu) - wet	1.19	1.70	4.15	1.96	2.25	1.70
Iron (Fe) - dry	51.0	46.5	168	40.1	82.6	31.0
Iron (Fe) - wet	19.2	19.4	62.2	12.8	29.9	11.8
Lead (Pb) - dry	0.10	<0.10	0.19	0.16	0.16	<0.10
Lead (Pb) - wet	0.038	0.026	0.070	0.052	0.057	0.026
Lithium (Li) - dry	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Lithium (Li) - wet	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium (Mg) - dry	1000	4170	1990	2540	2500	910
Magnesium (Mg) - wet	378	1740	739	810	906	346
Manganese (Mn) - dry	155	104	56.4	199	404	62.7
Manganese (Mn) - wet	58.4	43.3	20.9	63.4	146	23.8
Mercury (Hg) - dry	0.0050	<0.0050	<0.0050	0.0070	<0.0050	<0.0050
Mercury (Hg) - wet	0.0019	0.0014	0.0013	0.0022	0.0016	0.0014
Molybdenum (Mo) - dry	1.16	0.168	0.306	0.186	0.066	0.308
Molybdenum (Mo) - wet	0.436	0.070	0.113	0.059	0.024	0.117
Nickel (Ni) - dry	0.77	2.78	4.45	9.38	8.00	0.72
Nickel (Ni) - wet	0.29	1.16	1.65	3.00	2.90	0.27
Phosphorus (P) - dry	1010	2050	1570	1870	1220	1370
Phosphorus (P) - wet	381	855	582	596	442	520
Potassium (K) - dry	4970	10300	12400	9280	8180	6440
Potassium (K) - wet	1870	4280	4600	2960	2960	2450
Selenium (Se) - dry	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Selenium (Se) - wet	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Sodium (Na) - dry	<100	<300	<300	<100	<300	<100
Sodium (Na) - wet	<20	<60	<60	<20	<60	<20
Strontium (Sr) - dry	3.17	36.2	10.4	42.7	53.2	4.20
Strontium (Sr) - wet	1.19	15.1	3.85	13.7	19.3	1.60
Thallium (Tl) - dry	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Thallium (Tl) - wet	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Tin (Sn) - dry	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Tin (Sn) - wet	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Titanium (Ti) - dry	<0.50	<1.5	<1.5	0.56	<1.5	<0.50
Titanium (Ti) - wet	0.12	0.46	<0.30	0.18	<0.30	<0.10
Uranium (U) - dry	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U) - wet	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Vanadium (V) - dry	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Vanadium (V) - wet	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Zinc (Zn) - dry	30.8	123	18.3	111	252	28.4
Zinc (Zn) - wet	11.6	51.2	6.80	35.4	91.1	10.8

(continued)

Appendix 2
Laboratory Analysis of Plant Tissue Chemistry (continued)

Sample ID	B1PR-SALIX100	PORTSALIX4	B1PR-SALIX54	B1PR-SALIX54B	B1PR-SALIX148B	B1PR-CAREX25
Date Sampled	21-JUL-07	18-JUL-07	22-JUL-07	22-JUL-07	21-JUL-07	22-JUL-07
Time Sampled	15:50	15:45	10:18	10:21	14:35	11:04
ALS Sample ID	L540099-19	L540099-20	L540099-21	L540099-22	L540099-23	L540099-24
Matrix	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
Physical Tests						
% Moisture	63.0	63.6	61.6	62.9	64.0	62.6
Total Metals						
Aluminum (Al) - dry	36.0	18.0	12.0	11.0	31.0	11.0
Aluminum (Al) - wet	13.4	6.4	4.5	4.1	11.1	4.0
Antimony (Sb) - dry	<0.050	<0.050	<0.050	<0.050	0.064	<0.050
Antimony (Sb) - wet	<0.010	<0.010	<0.010	<0.010	0.023	<0.010
Arsenic (As) - dry	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Arsenic (As) - wet	<0.010	<0.010	<0.010	<0.010	0.016	<0.010
Barium (Ba) - dry	43.4	19.4	9.08	10.4	23.6	22.7
Barium (Ba) - wet	16.1	7.05	3.48	3.88	8.49	8.48
Beryllium (Be) - dry	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Beryllium (Be) - wet	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Bismuth (Bi) - dry	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Bismuth (Bi) - wet	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Cadmium (Cd) - dry	1.13	0.684	0.488	0.729	0.978	0.037
Cadmium (Cd) - wet	0.420	0.249	0.187	0.271	0.352	0.0137
Calcium (Ca) - dry	5760	7270	5230	6590	5330	7470
Calcium (Ca) - wet	2130	2640	2010	2450	1920	2790
Chromium (Cr) - dry	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Chromium (Cr) - wet	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cobalt (Co) - dry	5.46	1.07	0.76	1.03	5.46	<0.10
Cobalt (Co) - wet	2.02	0.389	0.292	0.382	1.96	<0.020
Copper (Cu) - dry	4.82	4.44	6.55	6.92	5.34	7.36
Copper (Cu) - wet	1.79	1.61	2.51	2.57	1.92	2.75
Iron (Fe) - dry	43.5	37.8	28.5	28.9	72.9	48.1
Iron (Fe) - wet	16.1	13.7	11.0	10.7	26.2	18.0
Lead (Pb) - dry	0.11	<0.10	<0.10	<0.10	0.26	<0.10
Lead (Pb) - wet	0.040	<0.020	<0.020	<0.020	0.092	0.027
Lithium (Li) - dry	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Lithium (Li) - wet	<0.10	0.16	<0.10	<0.10	<0.10	<0.10
Magnesium (Mg) - dry	4110	5090	2230	2690	2380	2160
Magnesium (Mg) - wet	1520	1850	854	999	857	809
Manganese (Mn) - dry	145	276	213	324	320	59.7
Manganese (Mn) - wet	53.6	100.0	81.8	120	115	22.3
Mercury (Hg) - dry	<0.0050	0.0074	0.0066	0.0067	0.0075	0.0053
Mercury (Hg) - wet	0.0017	0.0027	0.0025	0.0025	0.0027	0.0020
Molybdenum (Mo) - dry	0.145	0.361	0.144	0.153	0.081	4.02
Molybdenum (Mo) - wet	0.054	0.131	0.055	0.057	0.029	1.50
Nickel (Ni) - dry	20.5	3.46	2.07	2.28	6.57	<0.50
Nickel (Ni) - wet	7.60	1.26	0.79	0.85	2.36	0.13
Phosphorus (P) - dry	1590	1480	1460	1490	1160	1110
Phosphorus (P) - wet	589	538	560	554	417	415
Potassium (K) - dry	12000	10800	6940	7470	6770	13100
Potassium (K) - wet	4440	3920	2660	2770	2430	4890
Selenium (Se) - dry	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Selenium (Se) - wet	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Sodium (Na) - dry	<100	<100	<100	<100	<100	<100
Sodium (Na) - wet	<20	36	<20	<20	<20	<20
Strontium (Sr) - dry	54.7	24.9	7.44	9.11	40.2	4.22
Strontium (Sr) - wet	20.3	9.06	2.86	3.38	14.4	1.58
Thallium (Tl) - dry	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Thallium (Tl) - wet	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Tin (Sn) - dry	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Tin (Sn) - wet	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Titanium (Ti) - dry	<0.50	0.56	<0.50	<0.50	0.72	<0.50
Titanium (Ti) - wet	0.17	0.20	0.10	<0.10	0.26	0.16
Uranium (U) - dry	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U) - wet	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Vanadium (V) - dry	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Vanadium (V) - wet	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Zinc (Zn) - dry	34.9	78.4	109	128	193	23.0
Zinc (Zn) - wet	12.9	28.5	41.7	47.7	69.5	8.60

(continued)

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Appendix 2
Laboratory Analysis of Plant Tissue Chemistry (completed)

Sample ID	B1PR-CAREX72	B1PR-CAREX63	B1PR-CAREX193
Date Sampled	21-JUL-07	21-JUL-07	21-JUL-07
Time Sampled	16:39	16:54	12:26
ALS Sample ID	L540099-25	L540099-26	L540099-27
Matrix	Tissue	Tissue	Tissue
Physical Tests			
% Moisture	66.7	66.9	70.4
Total Metals			
Aluminum (Al) - dry	22.0	13.0	19.0
Aluminum (Al) - wet	7.4	4.4	5.7
Antimony (Sb) - dry	<0.050	<0.050	<0.050
Antimony (Sb) - wet	<0.010	<0.010	<0.010
Arsenic (As) - dry	0.185	0.123	<0.050
Arsenic (As) - wet	0.061	0.041	0.011
Barium (Ba) - dry	4.43	15.5	20.2
Barium (Ba) - wet	1.48	5.13	5.99
Beryllium (Be) - dry	<0.30	<0.30	<0.30
Beryllium (Be) - wet	<0.10	<0.10	<0.10
Bismuth (Bi) - dry	<0.30	<0.30	<0.30
Bismuth (Bi) - wet	<0.030	<0.030	<0.030
Cadmium (Cd) - dry	0.105	0.117	0.088
Cadmium (Cd) - wet	0.0351	0.0389	0.0261
Calcium (Ca) - dry	2340	2840	2250
Calcium (Ca) - wet	779	940	666
Chromium (Cr) - dry	<0.50	<0.50	<0.50
Chromium (Cr) - wet	<0.10	<0.10	<0.10
Cobalt (Co) - dry	0.53	0.86	0.29
Cobalt (Co) - wet	0.177	0.285	0.087
Copper (Cu) - dry	16.3	11.3	8.19
Copper (Cu) - wet	5.41	3.76	2.42
Iron (Fe) - dry	170	104	74.7
Iron (Fe) - wet	56.7	34.6	22.1
Lead (Pb) - dry	<0.10	<0.10	0.14
Lead (Pb) - wet	<0.020	<0.020	0.042
Lithium (Li) - dry	<0.50	<0.50	<0.50
Lithium (Li) - wet	<0.10	<0.10	<0.10
Magnesium (Mg) - dry	1980	2110	1690
Magnesium (Mg) - wet	660	699	500
Manganese (Mn) - dry	185	491	71.5
Manganese (Mn) - wet	61.7	163	21.2
Mercury (Hg) - dry	0.0060	0.0052	<0.0050
Mercury (Hg) - wet	0.0020	0.0017	0.0014
Molybdenum (Mo) - dry	0.616	2.75	0.596
Molybdenum (Mo) - wet	0.205	0.912	0.177
Nickel (Ni) - dry	11.5	9.24	10.5
Nickel (Ni) - wet	3.83	3.06	3.12
Phosphorus (P) - dry	1330	2300	2070
Phosphorus (P) - wet	443	762	613
Potassium (K) - dry	16100	16600	13700
Potassium (K) - wet	5350	5500	4050
Selenium (Se) - dry	<1.0	<1.0	<1.0
Selenium (Se) - wet	<0.20	<0.20	<0.20
Sodium (Na) - dry	<100	<100	<100
Sodium (Na) - wet	<20	<20	<20
Strontium (Sr) - dry	3.88	8.58	13.8
Strontium (Sr) - wet	1.29	2.84	4.08
Thallium (Tl) - dry	<0.030	<0.030	<0.030
Thallium (Tl) - wet	<0.010	<0.010	<0.010
Tin (Sn) - dry	<0.20	<0.20	<0.20
Tin (Sn) - wet	<0.050	<0.050	<0.050
Titanium (Ti) - dry	0.73	<0.50	0.53
Titanium (Ti) - wet	0.24	<0.10	0.16
Uranium (U) - dry	<0.010	<0.010	<0.010
Uranium (U) - wet	<0.0020	<0.0020	<0.0020
Vanadium (V) - dry	<0.50	<0.50	<0.50
Vanadium (V) - wet	<0.10	<0.10	<0.10
Zinc (Zn) - dry	57.9	31.2	25.4
Zinc (Zn) - wet	19.3	10.3	7.51

APPENDIX C
PREDICTED TISSUE CONCENTRATIONS

Appendix C – Predicted Tissue Concentrations

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1. Introduction

Tissue concentrations were estimated based on a food chain model. The model used the established baseline concentrations in soil, vegetation and water, animal specific ingestion rates (US EPA, 1993) and metal specific biotransfer factors.

2. Methods

The following equation was used to predict animal tissue concentrations:

$$C_{meat}\ (mg/kg) = C_{msoil} + C_{mveg} + C_{mwater}$$

Where:
Cmsoil = Concentration in meat from the animals exposure to metals in soil.
Cmveg = Concentration in meat from the animals exposure to metals in vegetation.
Cmwater = Concentration in meat from the animals exposure to metals in water.

The terrestrial wildlife uptake equations used to obtain the concentrations in meat from exposure to soil, vegetation and water are presented in Table C-1.

Table C-1
Terrestrial Wildlife Uptake Equations

Pathway	Equation and Equation Parameters
Soil ingestion	$C_{msoil} = BTF_{tissue\text{-}food}$ (day/kg) x C_{soil} (mg/kg) x IR_{soil} (mg/day) x fw
Vegetation ingestion	$C_{mveg} = BTF_{tissue\text{-}food}$ (day/kg) x C_{veg} (mg/kg wet weight) x IR_{veg} (mg wt/day) x fw
Water ingestion	$C_{mwater} = BTF_{tissue\text{-}food}$ (day/kg) x C_{water} (mg/L) x IR_{water} (L/day) x fw

BTF = Biotransfer Factor (day/kg).
IR = ingestion rate for caribou.
C = concentration.
fw = fraction of daily consumption (assumed 1; unitless).

2.1 Metal Concentrations in Environmental Media

Rescan conducted several field studies to determine the current metal concentrations in surface waters and vegetation in the Project area. No soil samples were collected during the baseline assessments. Maximum concentrations were calculated and used to predict the concentrations in caribou muscle tissue.

The data used from the water sampling program included 12 surface water samples collected along the 500 meter study radius from the proposed road on August, 2001 and 7 in June and August 2007. 95% UCLMs were calculated for plant tissue, which had a total of 27 samples.

The data used from the plant tissue sampling program included 27 samples collected from along the proposed road route and 500 meter radius study area. Table C-3 presents the vegetation species that were analysed for metals and Appendix B2 presents the analytical results.

Table C-2
Metal Concentrations in Plant Tissue and Surface Water

Parameter	Maximum Plant Tissue (mg/kg wet weight)	95% UCLM Plant Tissue (mg/kg wet weight)	Average Surface Water (mg/L)	Maximum Surface Water (mg/L)
Aluminum	9.49	12.25	0.345	1.75
Cadmium	0.191	0.248	0.000014	0.000042
Chromium	0.053	0.057	0.000825	0.00412
Copper	2.519	2.838	0.00239	0.00598
Iron	26.46	31.91	0.467	2.27

[1] Rescan, 2007. BIPR Draft Environmental Impact Statement. Volume 5B. Appendix D-11.
[2] Rescan, 2007. BIPR Draft Environmental Impact Statement. Volume 4B. Appendix C-8.
UCLM = upper confidence limit of the mean.

Table C-3
Species Collected and Analysed for Metals

Genus Species Name	Common Name
Carex species	Sedge species
Salix species	Willow species
Eriophorum species	Cottongrass species

2.2 Terrestrial Wildlife Characteristics

Terrestrial wildlife characteristics were based on values provided in the primary literature and guidance from the Oakridge National Laboratory (ORNL, 1997). Table C-4 presents the species specific characteristics that were used to predict meat concentrations. It was conservatively assumed that caribou spend all year eating and drinking from within the project although they are known to migrate long distances.

Table C-4
Terrestrial Wildlife Characteristics

Receptor	Body Weight (kg)	Food Ingestion Rate (kg ww/day)	Vegetation Ingestion Rate (kg ww/day)	Soil Ingestion Rate (kg/day)	Water Ingestion Rate (L/day)	Fraction of Year at Site
Caribou	169	15.2	14.9	0.3	7	1
Arctic hare	2.3	0.162	0.161	0.001	0	1
Canada goose	1.44	0.0432	0.0432	0	0.07488	1

2.3 Biotransfer Factors

The tissue uptake calculations were based on metal specific biotransfer factors (BTF). No data on are available, therefore beef BTFs were used. The use of beef BTFs for wild mammals is considered to be a conservative approach (RAIS, 2006). The metal-specific BTFs for food-to-tissue were used, because no BTFs were found for soil-to-tissue or water-to-tissue (Table C-5).

This methodology is based on the document entitled *Guidance for Country Foods Surveys for the Purpose of Human Health Risk Assessment, 2005* prepared for Health Canada by Golder and Associates (2005).

Table C-5
Biotransfer Factors Used to Predict Metal Uptake into Wildlife Tissue

Parameter	BTF_{beef} [1]	$BTF_{chicken}$ [2]
Aluminum	0.0015	0.014
Cadmium	0.0004	0.8
Chromium	0.009	0.2
Copper	0.009	0.5
Iron	0.02	N/A

[1] **RAIS, 2005.**
[2] **US Department of Energy.**

BTFs are designed to predict the uptake of metals into animal tissue (*i.e.*, muscle). However, many metals become concentrated in organs (*i.e.*, kidney and liver). Caribou organs were not selected for evaluation at this stage due to data gaps for soil concentrations, the absence of caribou tissue-to-organ biotransfer rates and the relatively low consumption frequency among country food harvesters. Bioaccumulation factors (BAFs) were applied to the estimated caribou muscle concentrations.

3. Sample Calculation and Results

Table C-6 provides a sample calculation for the concentration of aluminium in caribou tissue from vegetation consumption and drinking water. Soil concentrations are not available to estimate tissue concentrations. Tables C-7 to C-8 presents the estimated tissue concentrations in caribou from uptake of vegetation and water. Table C-9 presents the estimated total concentration in meat tissue.

Table C-6
Sample Calculation Aluminum Concentration in Caribou Tissue

Cmsoil =	BTF x Csoil x IRsoil x fp x fw
Cmveg =	BTF x Cveg x IRveg x fp x fw
=	0.0015 day/kg x 9.496 mg/kg ww x 14.9 kg ww/day x 1 x 1
=	0.2122 mg/kg
Cmwater=	BTF x Cwater x IRwater x fp x fw
=	0.0015 day/kg x 0.345 mg/L x 7 L/day x 1 x 1
=	0.0036 mg/kg
Cmeat =	Cmsoil + Cmveg + Cmwater
=	0 mg/kg + 0.2122 mg/kg + 0.0036 mg/kg
=	0.2158 mg/kg

(continued)

Table C-6
Sample Calculation Aluminum Concentration in Caribou Tissue (completed)

Parameter		Parameter Value
BTF =	biotransfer factor (day/kg)	0.0015
Csoil =	concentration in soil (mg/kg)	Not available
Cveg =	average concentration in vegetation (mg/kg wet weight)	9.496
Cwater =	average concentration in water (mg/L)	0.345
IRsoil =	soil ingestion rate (kg/day)	0.30
IRveg=	vegetation ingestion rate (kg wet weight/day)	14.9
IRwater =	water ingestion rate (L/day)	7
fp =	fraction of the year the animal is onsite (unitless)	1
fw =	fraction of daily consumption (assumed to be 1; untiless)	1
C_{meat} =	metal concentration in meat (mg/kg)	

Table C-7
Estimated Metal Concentration in Wildlife from Exposure to Vegetation (mg/kg)

Cmvegetation =	BTF x Cveg x IRveg x fp x fw
BTF =	biotransfer factor (day/kg)
IRveg=	vegetation ingestion rate (kg wet weight/day)
Cveg =	concentration in vegetation (mg/kg wet weight)
fp =	fraction of the year the animal is onsite (unitless)
fw =	fraction of daily consumption (assumed to be 1; unitless)

Parameter	Caribou Mean Vegetation Concentrations	Caribou Max Vegetation Concentrations	Arctic Hare Mean Vegetation Concentrations	Arctic Hare Max Vegetation Concentrations	Canada Goose Mean Vegetation Concentrations	Canada Goose Max Vegetation Concentrations
Aluminum	0.2121	1.0147	0.0023	0.0110	0.0057	0.0275
Cadmium	0.0011	0.0041	0.0000	0.0000	0.0066	0.0238
Chromium	0.0034	0.0161	0.0000	0.0002	0.0002	0.0010
Copper	0.3358	0.7255	0.0036	0.0078	0.0541	0.1169
Iron	8.9171	19.0720	0.0964	0.2061	0.6463	1.3824

Units are expressed in mg/kg.

Table C-8
Estimated Metal Concentrations in Wildlife Tissue from Exposure to Water (mg/kg)

Cmwater=	BTF x Cwater x IRwater x fp x fw
BTF =	biotransfer factor (day/kg)
IRwater =	water ingestion rate (L/day)
Cwater =	concentration in water (mg/L)
fp =	fraction of the year the animal is onsite (unitless)
fw =	fraction of daily consumption (assumed to be 1; unitless)

Parameter	Caribou Mean Water Concentration	Caribou Max Water Concentration	Canada Goose Mean Water Concentration	Canada Goose Max Water Concentration
Aluminum	0.0036	0.0184	0.0004	0.0018
Cadmium	0.0000	0.0000	0.0000	0.0000
Chromium	0.0001	0.0003	0.0000	0.0001
Copper	0.0002	0.0004	0.0001	0.0002
Iron	0.0654	0.3178	0.0175	0.0850

Note: Arctic hare drinks negligible amounts of water. Primary source of water is through metabolism.
Units expressed as mg/kg.

Table C-9
Estimated Total Metal Concentration in Wildlife Tissue from Exposure to Vegetation and Water (mg/kg)

Parameter	Caribou Mean Concentrations	Caribou Max Concentrations	Arctic Hare Mean Concentrations	Arctic Hare Max Concentrations	Canada Goose Mean Concentrations	Canada Goose Max Concentrations
Aluminum	0.2158	1.0331	0.0023	0.0110	0.0061	0.0293
Cadmium	0.0011	0.0041	0.0000	0.0000	0.0066	0.0238
Chromium	0.0034	0.0164	0.0000	0.0002	0.0002	0.0011
Copper	0.3359	0.7259	0.0036	0.0078	0.0542	0.1171
Iron	8.9824	19.3898	0.0964	0.2061	0.6638	1.4674

Cmeat (mg/kg) = Cmsoil + Cmveg + Cmwater
Units expressed as mg/kg.

References

An explanation of the acronyms used throughout this reference list can be found in the *Acronyms and Abbreviations* section of the main report.

Golder and Associates. 2005. *Guidance Document for Country Foods Surveys for the Purpose of Human Health Risk Assessment*. Prepared for Health Canada.

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US EPA. 1993. *Wildlife Exposure Factors Handbook, Volume I of II*. Report number: EPA600/R-93/187.

US EPA. 2005. *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities*. Multimedia Planning and Permitting Division Office of Solid Waste Center for Combustion Science and Engineering, Report number: EPA530-R-05-006.

APPENDIX D
SAMPLE CALCULATIONS OF ESTIMATED DAILY INTAKE

Appendix D
Sample Calculation of the Estimated Daily Intake of Aluminum for Toddlers Consuming Caribou Tissue

$$EDI_{meat} = \frac{IR \times F_s \times C_{meat}}{BW}$$

$$EDI_{meat} = \frac{0.063\ kg/day \times 1 \times 1.0331\ mg/kg}{16.5\ kg}$$

EDI_{meat} = 0.00394 mg/kg bw/day
or
3.94 ug/kg bw/day

Parameter	
IR =	Ingestion rate (kg/day)
F_s =	Fraction of year consuming meat
C_{meat} =	Maximum predicted aluminum concentration in meat (mg/kg)
BW =	Body weight of receptor (kg)
EDI =	Estimated daily intake (mg/kg bw/day)

Parameter Value	
IR =	0.063
F_s =	1
C_{meat} =	1.0331
BW =	16.5
EDI =	

APPENDIX E
METAL-SPECIFIC RECOMMENDED MAXIMUM WEEKLY INTAKES

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Appendix E
Metal-specific Recommended Maximum Weekly Intakes

$$RMWI = \frac{TRV \times BW \times 7}{C_{food}}$$

RMWI	= Recommended maximum weekly intake of food (g/week)
TRV	= Toxicological reference value (ug/kg body weight/day)
BW	= Body weight of human receptor
7	= Days/week
C_{food}	= Maximum metal concentration in selected country food (µg/g)

	Caribou (Predicted)		Arctic Hare (Predicted)		Canada Goose	
Parameter	**Toddler**	**Adult**	**Toddler**	**Adult**	**Toddler**	**Adult**
Aluminum	111803	479060	10534380	45138224	3942992	16895121
Cadmium	28085	120340	2599244	11137366	4843	20751
Chromium	10595319	45399338	996376812	4269323671	157714905	675784473
Copper	19890	85227	1841732	7891541	123313	528379
Iron	4765	20419	448370	1921196	62969	269813
RMWI	**4765**	**20419**	**448370**	**1921196**	**4843**	**20751**

	Blueberry (Measured)		Lake Trout (Measured)	
Parameter	**Toddler**	**Adult**	**Toddler**	**Adult**
Aluminum	2544	10901	30637	131273
Cadmium	167	717	9625	41242
Chromium	1443750	6186250	911842	3907105
Copper	2669	11435	6778	29043
Iron	1444	6186	N/A	N/A
RMWI	**167**	**717**	**6778**	**29043**

APPENDIX 7.19-1A
COMMUNITY QUESTIONNAIRE PACKAGE

THE BATHURST INLET PORT AND ROAD PROJECT

PROJECT SUMMARY

Bathurst Inlet Port and Road Project

The Bathurst Port and Road Project lies entirely within the Kitikmeot Region of Nunavut, and is considered crucial infrastructure for the local communities and expansion of the region's mining and economic growth. The Project would be owned and operated by Inuit companies and would provide much needed economic development for Nunavut communities.

The Project entails construction of a port on Bathurst Inlet and a 211 km all-weather road to Contwoyto Lake that would link to the existing Yellowknife to Contwoyto Winter Road (YCWR).

The Project has received strong support from the Kitikmeot Inuit and both political and financial support from the Government of Nunavut and from the Federal Government through Indian and Northern Affairs Canada.

Background

The Project is located in the Slave Geological Province (SGP), which includes all of the mining developments to date between Yellowknife and the Arctic coast. The full mineral potential of this area has not yet been realized due for the most part to the lack of transportation infrastructure.

The only road transportation infrastructure developed within SGP is the YCWR from Yellowknife to the Tahera diamond mine, also servicing the Ekati and Diavik diamond mines and other developing diamond projects in the NWT. The YCWR capacity is limited by weather and by the additional trucking requirements for the new diamond projects. Transporting fuel and supplies through a port at Bathurst Inlet could provide certainty of supply routes and reductions in operating costs for these mines.

Prior to June 2000, extensive work including hydrographical studies for shipping routes, road route planning and economic studies had already been undertaken to advance the Project. In June 2000, the Kitikmeot Inuit Association (KIA) organized the stakeholders and formed a Technical Committee to manage the project and move it forward. The engineering feasibility studies and baseline environmental studies required for permitting and construction were largely completed in late 2002, with further studies carried out in 2004/5.

A Project Description was submitted to the Nunavut Impact Review Board (NIRB) in May 2003 that included the construction and operation of port facilities at Bathurst Inlet and a 211 km all-weather road from Bathurst Inlet to the YCWR at Contwoyto Lake.

On September 23, 2003 NIRB provided a Screening Decision recommending a public review be held for the project. On May 4, 2004 the Minister of Indian Affairs and Northern Development referred the project for a Part 5 review under Article 12 of the Nunavut land Claim Agreement (NLCA). Following public scoping meetings held in Yellowknife and Kitikmeot communities, the Project received the Final Guidelines for the Environmental Impact Statement from NIRB in December 2004.
The Draft Environmental Impact Statement (DEIS) will be submitted to NIRB in the 3rd quarter of 2007, to start the permitting process.

Economic Effects of the Project in the Kitikmeot Region

It is estimated that Project construction will occur over a 16 month period and create 2,800 man-months of employment. Project operations will create 31 seasonal jobs each year and requires the services of up to 150 contracted truck drivers per year. Much of the new employment opportunities can go to the workforce resident in the Kitikmeot Region which currently has an unemployment rate of more than 25%; with aggressive training for the employment needs of the Project, most of the payroll money would stay in the region.

The cost of diesel fuel landed in Cambridge Bay from the port in Bathurst Inlet could be reduced substantially. The cost of freight from the south by truck to the port on winter road and barge to Cambridge Bay would be competitive with freight costs via Hay River and the goods would arrive in the community four to six weeks earlier; early in the construction season rather than at the end of summer.

The Project will reduce the cost of fuel and supplies for any commercial venture in the Kitikmeot communities, especially a mine in the Project area. It is expected that the Project will reduce the cost of living in the region and stimulate new mineral exploration and production in the Kitikmeot Region of Nunavut and so create many new employment and business opportunities for the residents and businesses of the region.

In addition, economic studies have shown that any project in northern Canada has considerable spin-off effects in the south, in terms of indirect jobs and supply of materials.

Project Construction

The Project requires the use of Federal Crown Lands and Inuit Owned Lands. The port is located on Crown Land. The port site will include a wharf to serve large ice class vessels; a dock to handle barges serving the Kitikmeot communities; 150 person camp and services; 180 million litre diesel fuel tank farm and an airstrip for small aircraft.

Port construction can be completed within 18 months from the first summer sealift. Road construction can be completed within two years, working from both Contwoyto Lake and Bathurst Inlet.

Project Operations

The Project's annual operating schedule will reflect the seasons of the arctic environment. Marine shipping will be carried out between mid-July and late-October. Ice breaker support may be required as with other arctic projects, however, this shipping schedule can be accomplished without ice breaking to extend the normal shipping season. Marine barge operations will also supply fuel and general cargo to the Kitikmeot communities.

The road, although designed and constructed for all-weather use, will operate from January to April and connect with the existing YCWR from Yellowknife to haul fuel and supplies to the Ekati and Diavik diamond mines in NWT, and the Jericho diamond mine in Nunavut. No hauling will occur during the period from the end of April to late December.

Project Interactions with the Environment

The effect of road construction on fish habitat will be negligible. On the land, animals will always have the right of way over traffic on the road. The most common animal in the Project area is caribou of the Bathurst caribou herd. During spring migration almost all of the animals in the herd could move through the Project area. The road will not operate between May and December, thus there will be no interaction between road traffic and caribou during the spring and fall migrations; there will be very few caribou along the road during the winter hauling seasons. Hunting and fishing by workers will be guided by the recommendations in the West Kitikmeot Land Use Plan. The Project will be built and will operate in a safe and environmentally sound manner.

Project Financing

The Project will be financed and developed as a Public Private Partnership (P3), where the cost and risks of the Project can be shared between the public and private sectors. Port fees and road tolls will provide revenue for the Project. The Project is technically practical, economically sustainable and bankable under a P3 arrangement.

Bathurst Inlet Port and Road Project
Socioeconomic Assessment Interview, May 2007

Date of Interview: _____ Interview conducted by: _____

Interviewee's Name: _____ Interviewee's Age: _____

Interviewee's community of residence: _____

1. Interviewee's Status:
    - Inuit
    - Inuvialuit
    - Dene
    - Métis
    - Non-Aboriginal

2. What type of work are you currently doing?
    - _____
    - _____
    - _____

3. Do you work:
    - full time
    - part time
    - on the land
    - in town
    - Another community

4. What level of education do you have?
    - Less than grade 9
    - Grade 9-11
    - High school
    - Some College
    - Some university
    - College diploma
    - University degree
    - Grad school
    - Trade specific training

5. Do you have any job skills or certifications?
    - Heavy equipment license
    - plumber
    - Carpenter
    - electrician
    - Chain saw
    - dry wall
    - Fire equipment
    - First aid/CPR
    - Computer
    - other

6. Do you have experience working in the mining or transportation industries?
    - Yes
    - No

7. On average, over the last year how many days (weeks) did you spend on the land?
    - 1-6 days
    - 1-3 weeks
    - 4-7 weeks
    - over 7 weeks

8. What is the main language spoken in your home?
    - Inuinnaqtun

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- Inuktitut
- English
- Slavy
- Other

9. Of the food you eat how much is country food?
    - 10-30%
    - 30-50%
    - 50-70%
    - 70-100%

10. What country food do you eat the most?
    - Caribou
    - Moose
    - Seal
    - whale
    - goose/ water foul
    - rabbit
    - other

11. How many people live in your home?
    - 1-3
    - 3-5
    - 5-7
    - 7 or more

12. Is there a need for new housing in your community?

13. Is there a need for better education facilities?

14. Is there need for better healthcare facilities?

15. Are you a member of any community groups?
    - Hunters Trappers Groups
    - Elders
    - Youths groups
    - Crafts groups
    - Athletic clubs
    - Environmental
    - Other

16. Are you aware of the project?
    - aware
    - somewhat aware
    - not aware

17. When did you first find out about the project?

18. Did you find the public meeting helped you understand the project better?
    - yes
    - no

19. Is there any additional information you would like to have been given at the meeting?

20. In what way do you think the project will help your community the most?
    - Job opportunities
    - Business opportunities
    - Training opportunities
    - Cheaper fuel
    - Better access to the land
    - Cheaper goods in stores

21. What do you think is the most serious problem or problems facing your community?
    - health care
    - opening land to non Inuit
    - unemployment
    - possibility of too much development
    - education
    - impact on traditional life style
    - loss of culture
    - impact to wild life
    - drugs
    - alcohol
    - crime
    - other

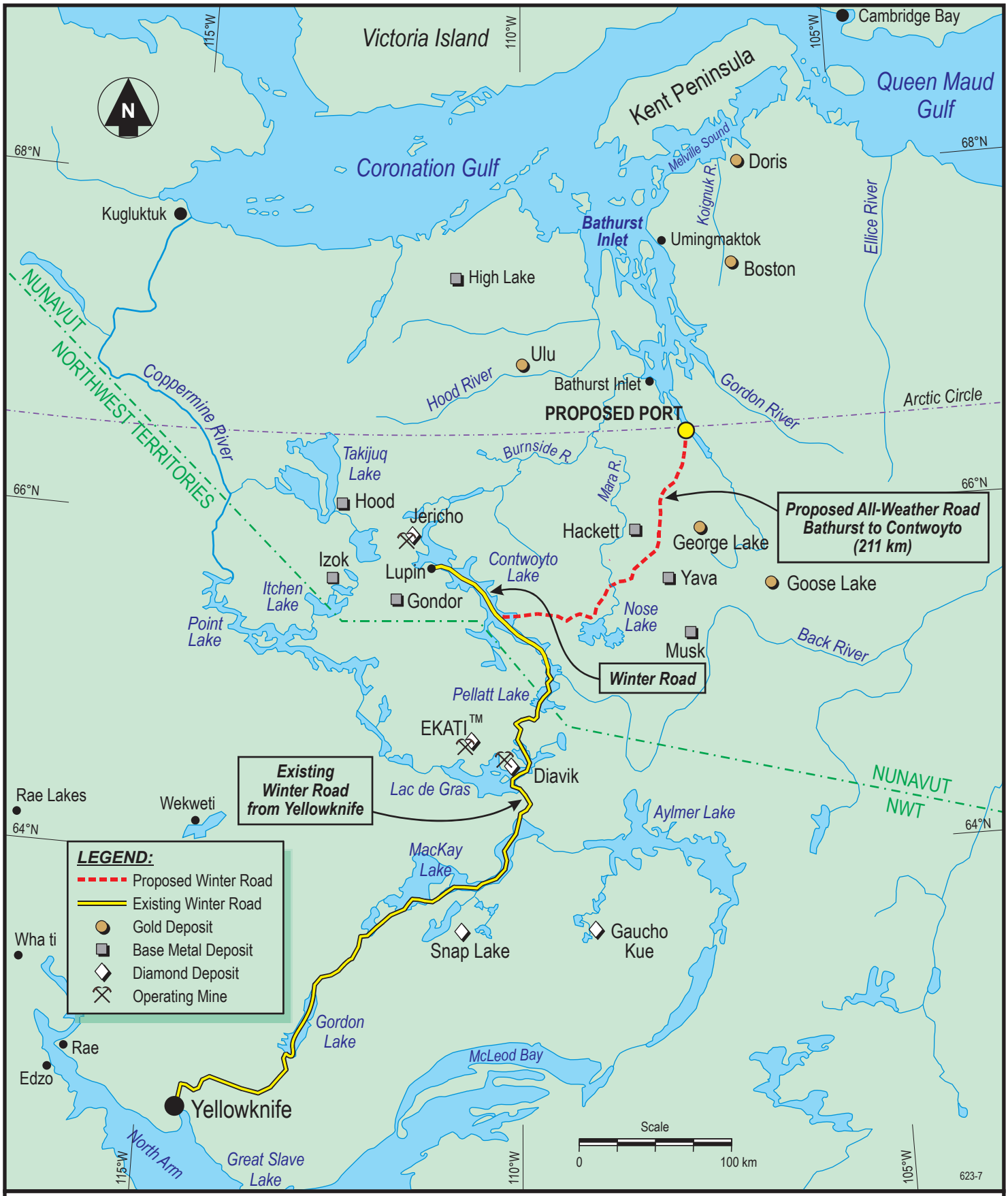
22. Do you think this project will overall be:
    - better
    - worse

23. Do you know of any other projects that have taken place in or around your community?

24. Did your family or community get involved with those projects? If so, were there any positive or negative effects?

25. Can you suggest ways to overcome the problems you identified?

26. Are any of these problems so important that you believe the project should not go ahead? Which problems?



the BATHURST INLET PORT AND ROAD PROJECT

Bathurst Inlet Port and Road Project - Location Map

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APPENDIX 7.19-1B
COMMUNITY CONSULTATION MEETING NOTES

the **BATHURST INLET PORT AND ROAD PROJECT**

Community Meeting Cambridge Bay
Sign-in Sheet

7pm Wednesday may 9 2007 (B.I)

Name	Community	Phone#/email	Signature
JOHN PANEGYUK	Community	780-440-1095	
MOSES KOOVIAK			
Mabel Ayalyoak	Bathurst Inlet / Ogoki		
Gwen. TIKHAK			
Joseph. TIKHAK			
Paul Panegyuk			
Robert Esser		867-983-5617	
Tilia Ogina	CB	Jogina@qnis.ca	
Jerry Puglik	CB/Bathurst Inlet	jpuglik@nac.nu.ca	
J. Kiloodluk			
M. KILAODLUK			
LENA KAMOAYOK			
Patti Bluff.			
Karen Wilford			
Gordon Norberg	NTCL/Hydrovac		
Mary Epp	Cambridge Bay	983-3859	

the **BATHURST INLET**
PORT AND ROAD PROJECT

Community Meeting Cambridge Bay
Sign-in Sheet 7pm Wed. 09 2007.

Name	Title	Phone#/email	Signature
Nancy Maghagak		(867) 983-2231	N Maghagak
Kitty Ettegik		983-3688	
Brenda Jaeke		983-2223	Brenda Jaeke
Keith Peterson		983-2425	
Henry Ohokannoak		983-2446	
Derek Elias		983 2276	
Darrell Ohokannoak		-2176	
David Kaniak		-2433	
David General		-2200.	
JESSIE NAIKAK			
CHARLIE KEYOK			
LINDA Klengenberg		983-2088	
HARRY MAKSAGAK		983-2246	
Mary Rose Maksagak		983-2246	MR Maksagak
Joni Peck	CB. - KG Staff.		

the **BATHURST INLET**
PORT AND ROAD PROJECT

Community Meeting Cambridge Bay
Sign-in Sheet

Name	Title	Phone#/email	Signature
Leslie Payette	NIRB.	983·4611.	Leslie Payette
Adam Kaaha		983-3849	Adam Kaaha
Kassidy Kaaha			
Mike Lozowski	NHC Program Manager	983-3138	
Brandi Kaaha			
Georgee Kavanaugh		3049	
Winnie Kavanaugh		983-3049	W. K
Donald Hanuya		983-2596	DH
Margaret Hanuya		"	DH
J Okheena		987.2667	
M Okheena		983 2667	
Kevin Sanguya		983 3726	
George Rabesca	PPD Bay Chimo	983 2088	
Eileen Rakoluk	Bay Chimo	983-2088	Eileen Rakoluk
John Emaglak		983 2683	John Emaglak
Noah Kuptana			

the **BATHURST INLET**
PORT AND ROAD PROJECT

Community Meeting Cambridge Bay 1:30pm
Sign-in Sheet Wed May 9 2007

Name	Title	Phone#/email	Signature
Jean Conrad	Program Manager NAC	983 4109 jconrad@nac.nu.ca	
Syd Hawkes	D/Mayor	983-2206 sidneyg@qiviq.com	
GORDON NORBERG	MANAGER Community Relations	gnorberg@netnet.com 867 874 5124	

the **BATHURST INLET PORT AND ROAD PROJECT**

Community Meeting Cambridge Bay
Sign-in Sheet

Name	Title	Phone#/email	Signature
KAJIK TATTOONA	KITNUNA	983-3008	KT.

May 11/07

the **BATHURST INLET PORT AND ROAD PROJECT**

Community Meeting Gjoa Haven.
Sign-in Sheet

Name	Title	Phone#/email	Signature
SARAH KAMINMACIK	COMMUNITY ECONOMIC DEVELOPMENT OFFICE	867-360-6186 skaminmaliie@hotmail.com	
Lorraine Pudlat		867-360-6256	
Roger Ekekiik		867-360 6233	
ELIZABETH HIGINIQ		867-360-6454	
Alain Palangyak		867 360-6264	
ALAN JOHNSON		867 360-4606	
Klengenberg			
Allan Aglukkaq	Co-principal	867-360-7201	
JOSEPH SUASSAK	CARVER	867360 6178	
ENOCH PANGOESIE	NUNAVUT GOV'T	867 360-4638	
OTTO IKKUTISUK		867-360-6838	

May 11/07

the **BATHURST INLET PORT AND ROAD PROJECT**

Community Meeting Gjoa Haven Nu
Sign-in Sheet

Name	Title	Phone#/email	Signature
Theresa Jewell	Gov. & Community Liaison Officer	W-867-360-6008 Theresa-jewell@hotm	
Debbie Ehaloak	Dept of Education Teacher.	W 867-360 7414	
		867 360 6533	
Noah Sivtinmaq			
Emma Pauloosie	Teacher	ej Pauloosie@ yahoo.ca 867-360-7414	
Julia Putugua	student	(867) 360-7921 Julia Putugua@yahoo.ca	Julia Putugua
DAVID Porter		(867) 360-6035	
Martha Pooyalak		360 6055	
Elizabeth Aranilow		360 7832	
Eli Higinig	Teacher	360 6450	

May 11/05

the **BATHURST INLET PORT AND ROAD PROJECT**

Community Meeting GJOA HAVEN
Sign-in Sheet

Name	Title	Phone#/email	Signature
M. Siutiniuaq			M. Siutiniuaq
Pd Jimmy Qiquat			
Leonie Aaluk			Leonie Aaluk
CHARLIE KAMOKAK			
ᐊ–ᑭ ᐊ–ᑲ			
ᑲᒧᑲ			
ᓄᓕ ᓂᒥᑕᑐ			
ROY Pootoogo			
Rhoda Porter			
ᐅᐱᐅ²⁶			
Jimmy Paulogie	Contracter	JC pauloosie@yahoo.ca	
ᑲᒥᑐ			
Paul Aaluk		fuma.l@Hotmail.com	CTZ
CTZ			
Lucy Amerallk			LAmerallk

May 11/07

the **BATHURST INLET PORT AND ROAD PROJECT**

Community Meeting Gjoa Haven
Sign-in Sheet

Name	Title	Phone#/email	Signature
ᖃᓄᐃᓕᖅ ᑕᕐᕕᒃ			
ᑕᕐᕕᒃ			
Louie Kamookak		lkamookak@yahoo.	
Danny Aaluk		metsilikarts@yahoo.ca	
ᐊᑕᑭᑐ			Kimberly
Kimberly maria			
Annie Qoqak		Aoqak@yahoo.ca	Annie Qoqak
Lena Arqviq		lenaarqviq@yahoo	
ᑐᓂᓗ ᐅᒃ			
JANE PUTUAVA			
ULULIKATAP			
Annie Napachee			
Mary Napachee			
Noah Siutiinnaq			
ᓴᓇᓕ ᑭᑭᑕ			
ᖃᓄᐃᓕᖅ ᑕᕐᕕᒃ			

May 11/07

the **BATHURST INLET PORT AND ROAD PROJECT**

Community Meeting Gjoa Haven
Sign-in Sheet

Name	Title	Phone#/email	Signature
DORICA SEVER	SISTER MISSIONNARY	360-6020	Dorica Sever
Georgina Porter	Parent	360-6705	G Porter
Vera Pootatak			
Dominic Divoart			
David Ikkidluak			
Walter J. Porter		360-6013	
Arsien Tungilik	building maintainer	360-7117	
RUTH RUBEN			
Wally Porter	owner	867 360 6705	
Joyce Kamookak	Josephine Kamookak	867-360-7926	
WALTER M. PORTER	Community Liaison officer	(867)360-6106	
P Pd			
Pd			
Salomie Q		360-6997	
Gideon Q			
ᐃᓕᓐ ᐊᑭᓴᓐ			

June 13/07
Gjoa Haven

the **BATHURST INLET PORT AND ROAD PROJECT**

Community Meeting Gjoa Haven

Sign-in Sheet

Name	Signature	
Darren Porter	Darren Porter	
Leena Jootalik	Leena Jootalik	
Alan Johnson	Alan Johnson	-GN
Enuk Pauloosie	Enuk Pauloosie	
Peter Akkikumaguq	P Akkikumaguq	-Business
Sharon Dwyer		
Aida Qitsualik	Aida Qitsualik	
FOR DU		
Teddy Carter	Teddy Carter	
Asher Kaloon	Asher Kaloon	
David Siksik		
Nick Pandoyak	Nick Pandoyak	
Jim Oegak		
Soni Pooyatak		
Alex Sivutinnuaq		
Clayton Keknek		

June 13/07
Gjoa Haven

the **BATHURST INLET PORT AND ROAD PROJECT**

Community Meeting Gjoa Haven

Sign-in Sheet

Name	Signature
Annie Panioyak	Annie Panioyak
Uriash Elechatie	
Tom Akoak	Tom Akoak
Kelly Oogak	

June 11/07

the BATHURST INLET PORT AND ROAD PROJECT

Community Meeting Taloyoak
Sign-in Sheet

Name	Title	Phone#/email	Signature
AMBUTTUGAR CHRISTOPHER	Interpreter	—	
David IRQUIT	ASAU	867-561-6341	
Joseph KUNGAKTOOK		(867) 561-5995	
Eva. Nannuq		(867) 561-6233	

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May 14/07

the **BATHURST INLET PORT AND ROAD PROJECT**

Community Meeting Yellowknife
Sign-in Sheet

Name	~~Title~~ Community	Phone#/email	Signature
Yvon Theriault	Env. Canada	780-239-1165	
Chris Hanks	Alexco Res	chanks@alexcoresource.com 719-689-3522	
Shirley Standofer-Pfister	EBA Engineering	sstandoferpfister@eba.ca (867) 766-3728, ext. 124	
DAVE NICKERSON	Yellowknife	867-444-9825 dn@tyhee.com	Dave Nickerson
Eric Christiansen	DIAVIK	669-6508	
Richard Green	CBC	920-5420	
Gordon Clarke	North Arrow Minerals	445-6527 gord@northarrowminerals.com	
Ed Hoeve	Yellowknife	766-3728 x114 ehoeve@eba.ca	
Carolyn Relf	DIAND	669-2447 relfc@inac.gc.ca	
Arlene Laudrum	Yellowknife	alaudrum @gartnerlee.com	
TOM HUETER	"	867 669-6518 tom.hueter@diavik.ca	
Pierre Gratton	MAC	613 233 9391 pgratton@mining.ca	
RICK MEYERS	"	rmeyers@mining.ca	
MIKE VAVDIK	CHAMBER OF MINES		
DALE WHEATON	TLICHO LOGISTICS YK	867-444-4114 dwheaton@tlichologistics.com	
MERVYN HERRENSTEIN	NUNA	MERVYN@NUNALOGISTICS.COM	

May 14/07

the **BATHURST INLET PORT AND ROAD PROJECT**

Community Meeting Yellowknife
Sign-in Sheet

Name	~~Title~~ Community	Phone#/email	Signature
Florence Catholique	Łutselk'e	fcatholique@msn.com	florence
Roy Sheilds	Lutsel'ke	867-370-3095	
ERIK MADSEN	Yellowknife	867-669-6561 erik.madsen@diavik.com	
GORNE SCHMIDT	Yellowknife	(867) 873-5853	
Sunny Munroe	Yellowknife	867 444 2441	SMunroe
JIM STEVENS	" "	jim_stevens@gov.nt.ca	
Kris Vascotto	Yellowknife	kvascotto@rescan.com	
Sarah Vascotto	Yellowknife.	biologist@corrb.ca	

(24)

Meeting Summary for Yellowknife BIPR held May 14, 2007

- Open house meeting in the Copper Room of the Yellowknife Inn at 7 pm to 930 pm.
- Meeting notification was in Yellowknifer News paper Wednesday May 9th edition as well as 3- 30 second radio notices read daily from May 9th to May 14th on CBC radio North
- Posters and repeating power point show were displayed in the Copper room.
- 24 people attended meeting
- Despite letters of invitation sent to First Nations groups weeks before meeting only 1 First Nations person attended meeting. She was from Lutsel K'e
- Meeting Interpreter told us three respected elders died in the communities over the previous week and everyone was at the wakes.
- Most of the meeting participants were from DIAND, Chamber of Mines, or Mining industry representatives
- Meeting format was open house; there was no formal presentation from project proponents.
- Majority of comments were the attendees wanted a formal presentation and question period.
-

Bathurst Inlet Port and Road Community Consultations,

Community: Cambridge Bay, Evening Meeting

Date: June 4, 2007

- Could oil and gas companies use the road as well to slip oil and gas to Edmonton or Hay River here are lots of oil and gas here and we could use it.

- *Harvester* – If the project is approved, what provision are there for monitoring wildlife? Are there any guidelines and regulations for monitoring wildlife? What provisions are there for compensating harvesters if there is a loss of wildlife?

- *Darrel* – Wildlife that lives on ice is very fragile. Has there been ay studies on the short term or long term effects of just from the road on wildlife and aquatic life and vegetation? What about crossing rivers, how are you going to do that? You have to do protection for animals, fish; you can't have oil and gas from tunnels going into water. What are you going to do to prevent sills and what are you going to do to clean spills up?

- *Grade 10 Teacher* – In our research something that kelp coming up – good idea but wrong place. How are you going to pay for this and have you chosen the right place? How was the road put there? What is going to be carried on the road? Which mines? Does Bathurst Inlet want the road now? The big concern for the grade 10s was, do they (Bathurst Inlet) want the road and are there opinions being heard? Once the port is set up, what sort of electric power plants will be incorporated along the road way? And at camps and at the port? Can we have more clarification about how fuel is going to get there? I would like to know more about training and education aspect. What type of jobs and training will come from this project that are not first labour jobs?

- *John from KIA* – How are we going to balance with social issues – traditional lifestyle? What about tourism? Who will the project effect tourism? We have seen in the past oil and gas exploration come and go. What would be your long term effects for this project? Are you bulking it for the mines or for the communities? This is the first time the road has been built to the main land. We saw caribou tracks, heard there was a caribou come close to Cambridge Bay? They some where they want to how much closer are they going to come to Cambridge Bay? Have you seen a polar bear close to there? Will the road bring them closer? Are there ships coming from the east? I assume they would come from the west. Do you have anyone to do security to screen shipment for drugs? How are you going to monitor for drugs and illegal activities? How are you going to control employee activities? Will the road shut down at the end of the min life of will it continue to service the communities?

Bathurst Inlet Port and Road Community Consultations,

Community: Kugluktuk

Date: June 4, 2007

- Question about the size of the ships to go into the Port, are they ocean going vessels or smaller?

- Has there been any bathymetry on Bathurst Inlet and is there a copy available for the public?

s

- *Donald* -talking about community wellness, there are lots of drugs and alcohol, is there a plan to limit these problems in the communities? Education programs for employment? Mining companies have policies; they are things we need to concentrate on. The proponents are the ones who should say Yes we are going to do something about it

- *New speaker*- Any revenues generated from this project, will there be any sort of revenue sharing with the communities?

- *new speaker* -You mentioned 2 times, no ice breaking, 2 times, bottom line, it is a business, cant see you stopping ships and pushing the season if it means more money.

- *New speaker*- Will the federal government be involved in the clean up of major oil spills with ships?

- *Rodger from Holman*- references to fuel oil and diesel, how about auto gas? Other goods shipped such as food, limited by shipping season; will food still have to come from sea lift? Various routes for other roads, why was the northern route not chosen? I think costs should come down and business opportunities should go up.

- *New speaker*- Is there going to be fright coming up for the whole of the north if you build the port?

- *New speaker*- is the fuel going to be for the communities of just the mine sites?

- *New speaker*- are there going to be jobs for northerners or just the whites from the south?

- *New speaker*- there are going to be buildings at the port, how many people will be living there?

- *New speaker*- Will ships have enough room to turn around down there, it looks really narrow, if they have to back out they could crash and cause oil spills and environmental damage.

1.1 Community: Kugluktuk Elders Lunch

1.2 Date: June 5, 2007

- *Alice Ayalik*- I am worried about the ships in the inlet because I worry about oil spills. I am worried about oil killing the birds, ducks, sea mammals and fish. I worry about the mines because the animals may get poisoned if they use the bomb (explosives) they need to clean up really good, clean up really fast. I am really worried about the environment.

- *Jako*- We have a dust control problem here in town and we have to put a chemical on the road to control the dust. There will be the same problem there on the road, will you use the chemicals there because it is not good for the animals and the fish.

- *Josephs Niptaniak*- What about fuel spills on the road, will they fix it right away or in years? The mines sometimes take a year to fix the spills. The road is a good idea. It will make the cost of fuel cheaper for those people who want to stay in the north. The cost of fuel is too much and it will keep going up. We should look close at the road to Kugluktuk, it will help us, and we can get jobs.

- *Alice Ayalik*- I would like to go and visit the mine sites to see if it is where I pick berries. If they are going to use the bomb and I eat he berries I will get a stomach ache, I want to know where I can still pick berries. When will the project begin? When are there going to be jobs?

- *Woman in red fleece*- My late husband used to go to that land where they are going to have the port. It's a good place for hunting and fishing, I want to know if the port will kill the fish and the caribou.

- *Blind woman*- I am worried about my grandson who is working in the mines, He is never home with his family, and he should be home by now.

- *Translator (woman*) – some people are asking about the area. There was concern that is ships go down there they will not be able to turn around and have to back out. If they have to back out they will crash and spill oil.

- *Joseph Niptaniak*- I was born there, it is 40 km wide and very deep, the ships will not have a problem turning

- *Very short man*- When school is over they should let the students go over there to the port and road so they can see what is there and they can plan ahead for jobs and think about their future.

1.1 Community: Kugluktuk Stakeholders

1.2 Date: June 5 2007

- *Karen Whent* Arctic College- see e-mail

- *Jeff (KIA)* - One thing that should be though about are the changes that have taken place socio-economic changes. There are several mines in the area and proposed mines in the area. The question is where are they going to find all the employees, everyone who wants to work and is skilled is working so there are not enough people to fill all the mining jobs and the port jobs.

- *Peter Scholz*- my team had been working on community planning for the last 6 months. If we had a port from High Lake, then build a road from there to Grays Bay then winter road to Yellowknife, would be a lot better than the port and road at Bathurst Inlet.

- *Beatrice*- Could you tell me what kind of increased economic activities for this region will come from the project?

- *Jargen Gronfeldt*- How do you envision the financing for the project?

- *Peter Scholz*- Do the financial estimates include Izoc and fuel handling?

- *Jeff (KIA)* - Three years ago I recall this project with a lot of dissension on caribou, very heated and politically loaded subject. How is this project going to manage this issue? It's a political issue really not an environmental one.

- *Peter Scholz*- Is the road still envisioned for just winter use? How will that be possible, when the mining companies have a load of ore they want shipped they will just ship it on the road to make sure its out on a ship. How can you stop them from doing that?

- *Woman on bench*- In terms of security, will people be able to access the road? If there is a road from Yellowknife then there will be lots more booze and drugs, I don't like that, I am against that. You have to figure a way to stop them.

- *David Kaosoni* (social services) - In terms of the Government of Nunavut, where do they stand? The Government tends to look after the social side of things, we are second only to Iqualuit, but there are only 2 social workers, are there possibilities of putting pressure on the government to get more help here?

- *Charlie*- What I am concerned about is social issues, drugs, alcohol, criminal records, how far will you go to hire someone from the communities if they have a criminal record, what is your policy?

- *Beatrice*- I know the mines look at what kind of charges a person has, such as theft, assault, B and E, will you be the same?

1.1 Community: Cambridge Bay Stakeholders

1.2 Date: June 6, 2007

- *Fred*- Once the process is done and you sent the EIS to NIRB what happens after that?

- *Keith (NTI)* - for our office, we see the benefits, we can not go on record as saying NTI is in support. NTI will not disagree with the Inuit Association.

- *George (IDC*)- I want to know what aspects of the IDC with respect to the road and port KIA own NTI, so they are actually negotiating impact benefits with themselves, how is that going to be a benefit when they are not meeting the terms of IAD's with the mining companies already?

- *Jacque (HTO*) - why is the all weather road only going to be used in the winter months, why would it not be used all year?

- *Rick (Nunavut Power*) - with the ice road season getting shorter and shorter would it not make sense to have a bulk fuel storage at the end of the ice road where this all weather road starts?

- *Dale (Kitikmeot Foods*) - For marine mammals surveys, will it be complete survey of the whole inlet or just a tertiary look?

- *Paul (KIA*) - Has the group looked at impact studies from other projects and historic projects and reports?

- *Jacque (HTO)* - There has to be a better system to show the kids the importance of education. Show them there are goals and good opportunities. You should get people to go to the high schools and explain the different trades/ professions that will be involved with the port and road.

1.1 Bathurst Inlet Port and Road Project

1.1.1 Community Consultation: Taloyoak Nunavut

1.1.2 Date: June 11, 2007

Community meeting was organized and set to take place June 11 at 7 pm in the Taloyoak Community Recreation Center, Jako from KC assisted in organizing the meeting, including retaining the services of a caterer and translator. He also organized the local radio to announce the meeting for 5 days prior to the meeting 3 times a day. In attendance from SCN-Lavalin were Tony Wachmann and David Cook; from KC were Charlie Lytle and David General.

Three people showed for the meeting. It was decided to postpone the meeting and suggested to return to the community of Taloyoak in the fall of 2007, either late September or early October was made.

Bathurst Inlet Port and Road Project

Community Consultation: Gjoa Haven Nunavut

Date: June 13, 2007

Community meeting was organized and set to take place June 13, 2007 in the Gjoa Haven Community recreation center. Addie, the Recreation coordinator for the community assisted in the organization of the meeting including radio announcements three times a day for the five days leading up to the meeting, retaining of a translator and a caterer. In attendance from SNC-Lavalin were Tony Wachmann and David Cook; from KC was David General.

The day of the meeting was the first day of sunshine in over a month. The temperature was above 5 degrees centigrade. From 430 pm on June 12 to the time of the meting at 9am June 13, a very large percentage of the communities population left for hunting and fishing camps. The day of June 13 the town was almost deserted.
There were no teachers, healthcare workers, housing officers, SOA, or regional government people in town.
20 people showed up for the meeting, however most were young school age children who came for free donuts.
The only adults who showed up were in favour of the project happening and wanted to know what was taking so long to get it going.

APPENDIX 7.19-1C
NORTHWEST TERRITORIES CORRESPONDENCE

Cook, David

From: Sheryl [lands@nsma.net]
Sent: Friday, May 04, 2007 12:44 AM
To: David.Cook@snclavalin.com
Cc: 'Bill Enge'
Subject: Invitation - Bathurst Inlet Port and Road

Hello David,

Thank you for the invitation, and your request for input to the organization of community consultation meetings.

Judging from the previously suspended environmental assessment, NSMA expects that our members will continue to have a number of environmental concerns about the project.

The indigenous Métis of the North Slave area are a People (sometimes referred to as a community) separate and distinct from the general Yellowknife population, with different rights, values, history, culture and interests. NSMA therefore expects separate consultation from the general public. However, since you already plan to hold a public meeting in Yellowknife, we can adapt our usual procedures to accommodate you. We can arrange for our staff to accompany our members (perhaps 10?) to the meeting you are planning. Following that meeting, NSMA would need to confer with the most interested and knowledgeable members (perhaps 5?) to ascertain what the community view is. NSMA can then provide you with some written feedback on the community view. Depending on the issues raised, and your responses, additional meetings between us may be needed.

NSMA would prefer not to send only one elder and one staff. NSMA is currently recruiting for an EDO, so the position is vacant. Our membership have clearly told us that they do not want decisions to be made by individuals in isolation. They wish to be informed, and have their opinions heard. They do not want their views to be drowned out or diluted by the voices of other groups. NSMA also aims to increase capacity for and improve continuity through the environmental assessment and permitting stages of the project, so it is not advisable for us to depend on a single participant.

To attend the "public" meeting, as proposed, NSMA would incur costs of $50 for each member who chooses to attend, as well as the cost of staff time at $500 per day. The subsequent internal meeting would be more of a workshop and decision making exercise, so the participants would expect $350 per day. There are also costs for meeting space and refreshments, coordination, and staff time to conduct the meeting and prepare the written feedback to you. In all, NSMA would expect to be reimbursed for its costs in the amount of approximately $3,500.00 to get us to the stage of providing a first round of written feedback.

The dates in May which are (as yet) still not fully booked are May 16 (but very short notice), the 22nd, 27th, 30th, and 31st.

I am the correct person to contact for Environmental Assessments and environment related consultation with the North Slave Métis Alliance. Email is the most efficient way.

I will start making arrangements once I receive confirmation from you that our proposal is acceptable.

Sheryl Grieve
Environment Manager
North Slave Métis Alliance
lands@nsma.net

Akaitcho Territory Government

Head Office: Salt Plains Reserve #195

URGENT MEMORANDUM

TO: SNC – LAVILIN Engineers and Contractors

FR: Sharon Lafferty, Executive Assistant

CC: Yellowknives Dene First Nation and Lutsel K'e

DT: 27 July 2007

RE: **Bathurst Inlet Port and Road Project**

F#: 10 H 1

The Akaitcho Territory Government (ATG) does not provide any comments or recommendations to any type of consultation within the Akaitcho Territory. Our office will forward the information to the affected area identified on the above-noted carbon copy for their perusal.

The executive may request an update at our next scheduled meeting. We may be contacted to provide information to our meeting in August or month of September 2007.

If you may have any questions, please do not hesitate to contact Annie Boucher, Executive Director at (867) 394-3313.

APPENDIX 7.19-1D
POWERPOINT PRESENTATIONS

PRESENTATION TO THE NUNAVUT COMMUNITIES, 2001

Bathurst Inlet Port and Road Project

Presentation

to the

Nunavut Communities

Introduction

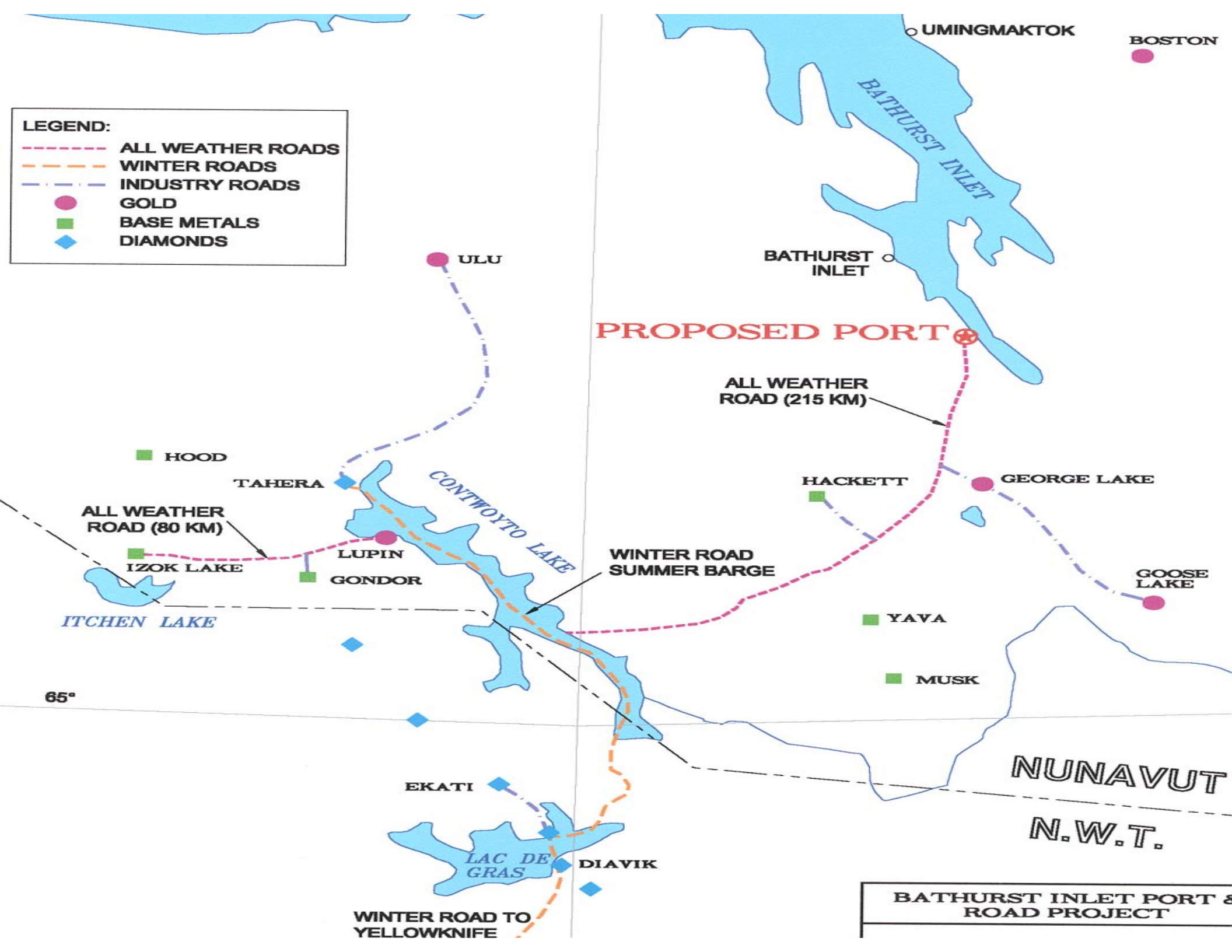
- The Slave Geological Province (SGP) is rich in mineral resources. About 40% of the SGP is in Nunavut (Kitikmeot).
- Full potential of SGP has not been developed because of a lack of transportation infrastructure.
- The only road access is by winter road from Yellowknife to Lupin Mine (630km).
- An arctic sea port and connecting roads would lead to significant growth in the area.

Infrastructure Solution

- Preliminary studies indicate the best option is a port on Bathurst Inlet and all-weather road to the Izok mineral deposit.
- Project built and operated by a partnership of Inuit, industry and government.
- The port and road would provide revenues from user fees or tolls.
- This infrastructure is part of the Nunavut “Transportation Strategy” Vision.
- Strong support from Kitikmeot Inuit Association and Kitikmeot Corporation.

The Project

- A port site on Bathurst Inlet, capable of handling 50,000 tonne OBO vessels.
- Facilities at the port for receiving, storing and shipping of base metal concentrates; fuel storage; bulk supply storage.
- All weather road to Contwoyto Lake(211km)
- Winter ice road and summer barge on Contwoyto Lake.
- All weather road - Lupin to Izok (79km). Izok is the major customer for the project.


LEGEND:
ALL WEATHER ROADS
WINTER ROADS
INDUSTRY ROADS
GOLD
BASE METALS
DIAMONDS
UMINGMAKTOK
BOSTON
BATHURST INLET
BATHURST INLET
ULU
PROPOSED PORT
ALL WEATHER ROAD (215 KM)
HOOD
TAHERA
CONTWOYTO LAKE
HACKETT
GEORGE LAKE
ALL WEATHER ROAD (80 KM)
LUPIN
IZOK LAKE
GONDOR
WINTER ROAD SUMMER BARGE
GOOSE LAKE
ITCHEN LAKE
YAVA
MUSK
65°
NUNAVUT
N.W.T.
EKATI
LAC DE GRAS
DIAVIK
WINTER ROAD TO YELLOWKNIFE
BATHURST INLET PORT & ROAD PROJECT

Project Benefits

- Reduced capital and operating costs for mining exploration and development.
- Increased exploration activity.
- Reduction in cost of fuel and supplies for the Kitikmeot communities.
- Significant increase in local employment
- Increased economic activity and taxation revenues in Nunavut.

Port Location

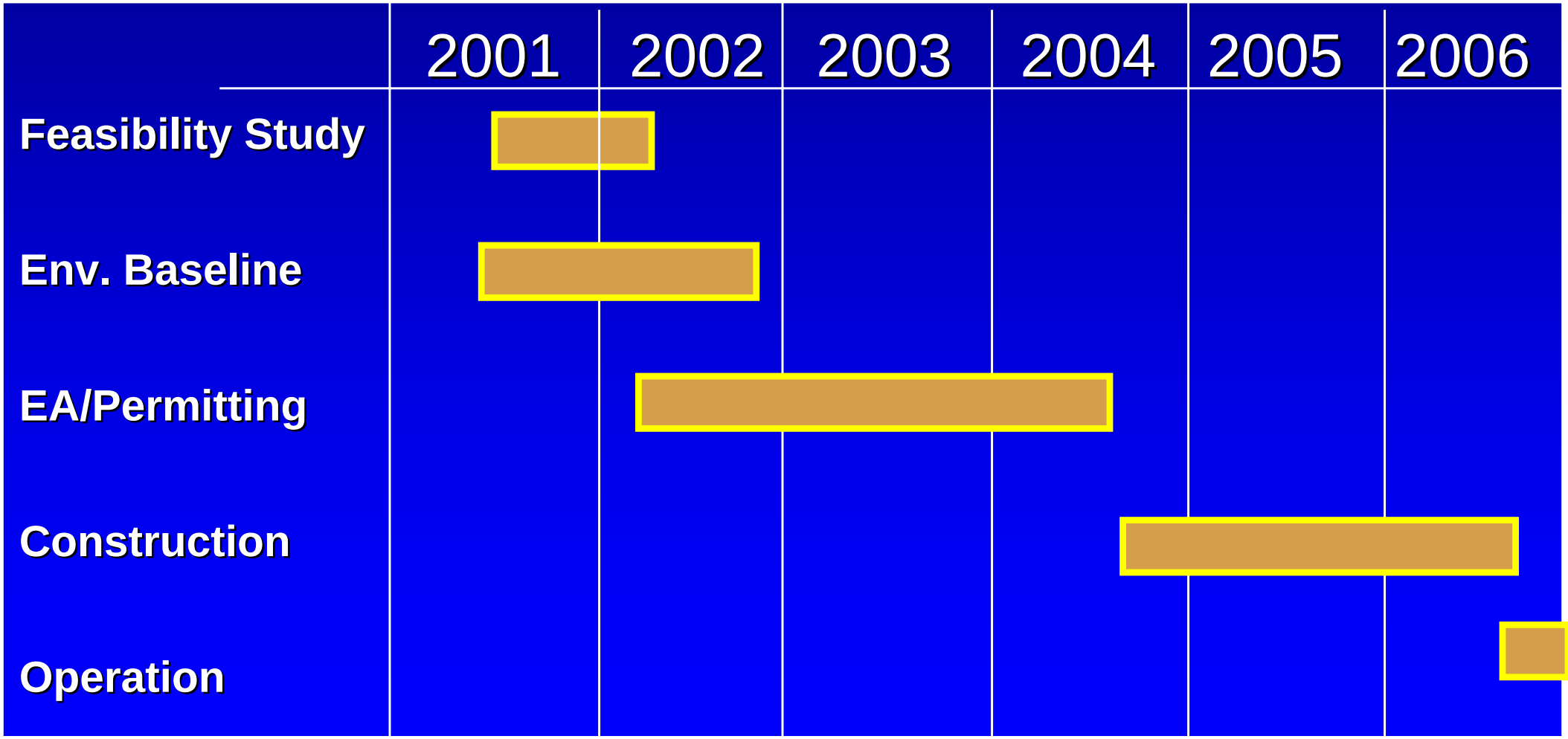
- Bathurst Inlet was selected over a Coronation Gulf site as the best location for the port :

- lower capital and operating costs for the all weather road from Izok to the coast.
- potential to service more mineral deposits and prospects.
- the Coronation Gulf site would require another road to access mineral deposits

Project Phases

- Phase 1 - Scoping Studies - *completed.*
- Phase 2 - Feasibility Study and Environmental baseline, socio-economic, Traditional Knowledge, archaeology studies - *in progress*.
- Phase 3 - Environmental assessment and permitting process.
- Phase 4 - Construction.
- Phase 5 - Operation.

Project Schedule



Feasibility Study

- Analysis of port and road users.
- Site selection for the port site.
- Route selection for the all weather road.
- Route selection for the Contwoyto Lake barge.
- Capital and operating costs for the project.
- Economic analysis of the project, including estimates of income from user fees.
- Review of financing options.
- Analysis of labour resources and employment.

Port and Road Users

Potential users (existing)

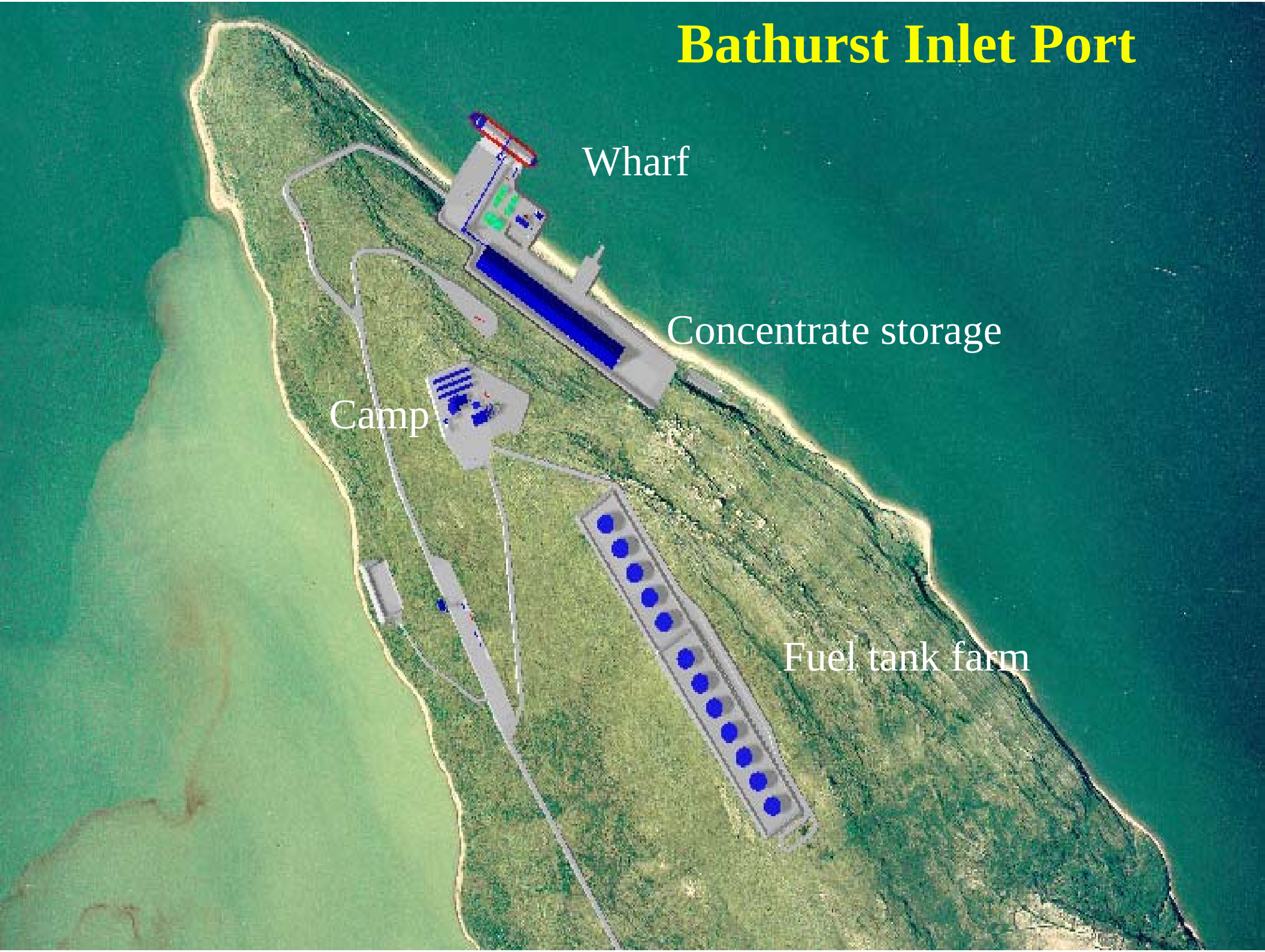
- **Lupin, Diavik, and Ekati mines.**
- **Nunavut communities**
  - **Cambridge Bay**
  - **Kugluktuk**
  - **Gjoa Haven**
  - **Taloyoak**
  - **Bathurst Inlet**

Possible users (future)

- **Izok**
- **Jericho**
- *George Lake, Goose Lake, Hope Bay*
- *Hackett River, Gondor*

Bathurst Inlet Port

- Dock suitable for handling 50,000 tonne vessels and ocean going barges;
- Fully enclosed mineral concentrate receiving and storage facilities owned by mines
- Ship unloading/loading equipment;
- 220 million litre fuel storage tank farm, barge and truck loading facilities;
- Accommodation, maintenance shops, airstrip and site services;


Bathurst Inlet Port
Wharf
Concentrate storage
Camp
Fuel tank farm

Community Barging Distances

- **Hay River to Bathurst Inlet and /or Cambridge Bay - 2500 km.**

- **Barge routes to Nunavut Communities and Mines, from Bathurst Inlet:**
  - Gjoa Haven - 840 km
  - Cambridge Bay - 400 km
  - Kugluktuk - 440 km
  - Taloyoak - 960 km
  - Hope Bay - 180 km

Shipping

- Ocean barge and tug to Kitikmeot communities;
- Normal shipping season during open ice period, mid-July to mid/late October (similar to existing shipping at Polaris and Nanisivik Mines);
- Majority of concentrate shipping will be via eastern route.

Shipping

Number of vessel return trips into Bathurst Inlet each summer:

- Concentrate/fuel ships 8 trips.
- Tug and barge to communities 2/3 trips.
- Other ships, coast guard etc 2/3 trips.

All-weather Road

- **Bathurst Inlet to Contwoyto Lake - 211 km**
- **Lupin Mine barge terminal site to Izok - 79 km**
- Road connections to mines from the all-weather road:
  - Ekati - 98 km (existing ice road)
  - Diavik - 127 km (existing ice road)
  - Jericho - 28 km
  - Hackett River - 25 km
  - George Lake - 19 km
  - Goose Lake - 55 km

Road Route Selection

- Three routes assessed using existing topo maps and aerial photos;
- Tried to locate route close to known and potential mines;
- Selected shortest route to reduce construction and trucking costs;
- Maximize route on bedrock and avoid poorly drained areas; follow smooth terrain, minimize road cuts;
- Minimize water crossings. Only 3 major river crossings (Amagog Creek, Mara River, Itchen Narrows);
- Construction materials, (quarried rock);
- Height of fill above land to average 1.6 m;
- Avoid cultural/heritage use area.

Contwoyto Lake Barge

- 69 km long barge route with minimum 5 m depth;
- Tug and barge to carry 10 - 90 tonne trailers at 20 km/hr;
- 90 day ice-free period;
- Vessel unloading/loading mobile equipment;
- Docks, accommodation, spill response, barge fuelling, maintenance shop, airstrip and site services at Lupin and South Contwoyto.

Land Ownership

- Inuit Owned Lands, total of 4,500 ha.
  - **142 km of road plus associated quarry sites.**
  - **South barge dock site on Contwoyto Lake.**
- Crown Land, total of 4,600 ha.
  - **Bathurst Inlet port site.**
  - **148 km of road and associated quarry sites.**
- Lupin Mine.
  - **12 km of existing roads, plus the north barge dock site.**

Operating Seasons

- Shipping: normal “open water” season, mid July to mid/late October.
- Road operation:

  - Winter, January 31 to April 30.

  - Summer, July 15 to October 15.

(Note: based on Contwoyto Lake ice road and barge shipping seasons).

Capital Cost

	$(Millions)
Bathurst Inlet Port	50
Bathurst to Contwoyto Lake Road - 210 km	83
Lupin to Izok Road - 80 km	29
Sub-total	**$162 million**
Bathurst Inlet Fuel Storage	49
Contwoyto Barge sites	4
Total	**$ 215 million**

*direct and indirect costs included

*includes royalties on borrow (approx. $8.3 million)

Revenue

- Tariffs/User Fees.

Road (travel over road network)

- Fuel @ $ per tonne - km. (1 tonne fuel = 1,200 litres)
- Operating supplies/concentrates @ $ per tonne -km.

Barge on Contwoyto Lake

- Rates $ per tonne.

Port (handling and storage)

- Fuel @ $ per tonne ($ per litre).
- Operating supplies/concentrates @ $ per tonne.

(The capital and operating costs for the project will be recovered through tariffs paid by the system users.)

Potential Employment Opportunities

- Operation (average)
  - **Administrative** **6**
  - **Operation & Maintenance** **72**
  - **Trucking (contract to mining companies)** **150**
- Construction (peak)
  - **Administration & Supervision** **35**
  - **Labour & Equipment Operators** **265**

Heritage Resources

- ***Heritage resources*** **- the archaeology studies are being carried out by Fedirchuk McCullough & Associates.**

  Two field assistants were hired from Bathurst Inlet and Contwoyto lake.

Archaeology - Field Results

- Inventory – 100 archaeological sites
- Site Types
  - **5 precontact campsites**
  - **60 precontact artifact scatters**
  - **15 precontact isolated finds**
  - **5 stone features**
  - **7 historic/traditional sites**
  - **8 mixed types**

Field Results continued.

- **Site Nature**
  - Majority are single component
  - Few are multicomponent containing both precontact and historic/traditional remains
  - Detailed assessment is required to determine whether the precontact scatters/campsites reflect more than one occupation
- **Site Values**
  - Based on scientific potential and perceived value to traditional residents as a monument to ‘presence on the land’
  - No further concern – isolated finds
  - Mitigation (avoidance/further work)

Preliminary Recommendations.

- Avoidance or further study is recommended at 22 of the 100 inventoried sites if they are in conflict with proposed road construction or borrow extraction areas.
- Verification of the 22 sites relative to the final borrow requirements.
- Other sites, although not in conflict with proposed construction or borrow activities, may be impacted as a result of the provision of access into currently inaccessible areas.

Future Work - 2002

- **Impact Assessment**
  - Reroutes, additional or different borrow sources, additional facilities, etc.
- **Mitigation**
  - Sites that cannot be avoided
  - Sites identified as having scientific potential and value to traditional residents
  - Controlled collection and excavation; detailed mapping of structures/features; analysis and reporting requirements
  - Deposition of artifacts/records as per instruction of the Culture and Heritage Division

Environmental Baseline Studies

- Environmental baseline studies are being carried out by Rescan Environmental Services Ltd :

  Sub-contractors:

  - Geowest Environmental Consultants
  - Kugluktuk Hunters and Trappers Ass'n.
  - New Economic Development Group

Environmental Studies

Studies underway 2001:

- Vegetation/terrain/ecosystem classification
- Geology/ARD
- Fresh water environment
- Marine environment
- Wildlife (continues into 2002)
- Atmospheric (to 200)
- Community consultation
- Socio-economic studies

Studies to begin 2002:

- Traditional Knowledge
- Marine mammals
- Waterfowl, birds, raptors

- Total person field days in 2001 were 427, of which 226 were Inuit field assistants.

Reporting of Baseline Studies

Interim Wildlife	Jan 28/02
Fresh Water	Feb 15/02
Marine Water	Mar 15/02
Terrestrial (vegetation/terrain/geology)	Mar 31/02
Socio-economic	April 2002
Traditional Knowledge	Sept 2002
Final Wildlife	Sept 2002
Atmospheric	Sept 2002

Freshwater Environment - Streams

1) Fish and fish habitat.

- **Reconnaissance survey (165 crossings).**
- **Field assessment (75 crossings).**

- Fish assessment (electro-shocking)
- Fish habitat assessment - 200m section surveyed for physical characteristics, water characteristics and photographed.

2) Aquatic Ecology.

- **9 selected streams.**

- Water/sediment
- Benthic invertebrates and periphyton

Contwoyto Lake

1) Fish and fish habitat.

- Fish community and habitat assessment at the proposed barge dock sites.

2) Aquatic Ecology.

- Water and sediment at the south and north discharge.
- Physical parameters, water, sediment, zooplankton, benthic invertebrates and periphyton at the proposed barge dock sites and at a point near the centre of the lake.

3) Bathymetry.

- Bathymetry at the proposed dock sites.

Marine Environment

- **Physical Oceanography.**

  Temperature, oxygen, conductivity, water quality, sediment quality.

- **Biological Oceanography.**

  Phytoplankton, zooplankton,

- Fish

  Gillnets, beach seines, lines and minnow traps.

- Fish Habitat.

  Aerial survey and ground survey.

Wildlife Studies

- Terrestrial.

  Caribou, muskoxen, grizzly bears, wolves, foxes, raptors, waterfowl, songbirds, small mammals.

  - Large mammal aerial surveys along the road alignment.
  - Esker and den surveys - analysis of den sites.
  - Small mammal trapping.

- Marine.

  Ringed seals.

Atmospheric Studies

- Weather station.

-Tower installed on a hill above the port site, with solar panel and datalogger.

- Instruments:

temperature and humidity probe

wind sensor

tipping rain gauge

pyranometer (solar radiation)

sonic ranger (snowpack depth)

Bedrock Geology/ARD Studies

- Mapping bedrock outcrops within the road corridor. Identification of mineralized areas and carving stone deposits.
- 38 samples taken for acid base accounting analysis.

Surficial Geology/Soils and Landforms

- 160 plots established.

  Information collected on parent materials, texture, surface expression, modifying processes, percent slope, drainage.

Vegetation and Terrain Analysis

- Vegetation Surveys.

  740 plots completed

  Information collected, vegetation types, percent cover for each species, slope, aspect, moisture regime, nutrient regime, percent substrate cover, terrain texture, drainage.

Traditional Knowledge Program

- Fully utilize existing Traditional Knowledge studies
- Extract information that is relevant for the Project Area
- Summarize in a report and use in baseline studies, interpreting data, and evaluating the environmental and socioeconomic impact of Project

Traditional Knowledge Studies

- NTKP (existing) - whole project area, covers a wide variety of topics such as, transportation routes, harvesting, cultural resources, wildlife and fish.
- TNP (existing) - “caribou and calves”, covers the calving grounds of the Bathurst Caribou herd.
- Project is participating in IQ study of polar bear in MacClintock Channel

Socio-Economic Study

Scope

- Profile baseline conditions in the four affected communities (*e.g.,* demographics, employment and income, education, training and employment skills, *etc.*)
- Develop a Human Resource Development Plan
- Develop a Health and Safety Plan

Methodology

- detailed literature search
- questionnaire to survey residents
- visits to communities
- interviews

Community Consultations

- **Kugluktuk.** January 14/02; two meetings, one with council. Other with the public. Over 70 people attended.
- **Bathurst Inlet.** January 15/02; met with the BI residents in Cambridge Bay, 14 people attended.
- **Cambridge Bay.** January 15/02; public meeting, over 80 people attended.
- **Taloyoak.** March4/02, council meeting, also public meeting, 40 people attended.
- **Kugaaruk.** March 5/02, 15 people attended.
- **Gjoa Haven.** March 6/02, 50 people attended.

- Will be more meetings through the next two years.

Comments from Communities

- Education/Training/Employment.
- Need development to provide a future for our children.
- Cost of living benefits to the Inuit in the Kitikmeot.
- Oil/concentrate spills.
- Caribou.
- Ice breaking.
- Project economics.

Caribou

- Bathurst Caribou Herd

- Range over the entire SGP

- Now calving West of Bathurst Inlet, but to date not in the area of the road or port.

- Spring migration through the project area coincides with the road closure for breakup

- GN management status of this herd is “secure”.

Caribou continued

- Victoria Island Caribou (also referred to as the Dolphin and Union Herd).

- Summers on Victoria Island, including calving.
- Migrates to the mainland for winter, across Dease Strait when ice is only 6 to 10 cms (mid to late October). Winters north of the project area.
- GN management status, “sensitive”.

Caribou continued

- Queen Maud Caribou.

- Western periphery of the summer and winter ranges includes the road route area around Nose Lake.

- Calving is in the Queen Maud Gulf Bird Sanctuary to the east of Bathurst Inlet.

- GN management status is “secure”

Next Step

- Submit a Draft Project Description and necessary applications to DIAND and KIA before end of March.

Project Proponent

- A 50/50 Joint Venture between the Kitikmeot Corporation and Nuna Logistics Limited.
- Kitikmeot Corporation owns 25% of Nuna Logistics.
- Both companies are registered Inuit owned companies

Major Components of the Project

- Port site at Bathurst inlet.
- All weather road to Contwoyto Lake.
- Barge system on Contwoyto Lake.
- All weather road Lupin to Izok.
- Provide fuel and supplies to the Kitikmeot communities by barge, and fuel via the existing winter road to Lupin, Ekati and Diavik. Followed by service to Izok on start up.

HERITAGE RESOURCE STUDIES, 2001

BATHURST INLET PORT & ROAD PROJECT

HERITAGE RESOURCE STUDIES

2001

FIELD PROGRAM

- *OBJECTIVES*
  - *To provide an inventory of heritage resource sites along the identified route through the assessment of both previously recorded and newly identified sites.*
- *METHODOLOGY*
  - *Field methods consisted of an aerial overview, foot traverse and visual inspection of high potential areas, as well as a shovel testing program.*

FIELD RESULTS

- *Inventory – 100 archaeological sites*
- *Site Types*
  - *5 precontact campsites*
  - *60 precontact artifact scatters*
  - *15 precontact isolated finds*
  - *5 stone features*
  - *7 historic/traditional sites*
  - *8 mixed types*

FIELD RESULTS

Brian Agoluk shovel testing isolated find site MdNk 4.

FIELD RESULTS

View northeast of the high bedrock knoll on which LjPb 37 is located. Assistants Brian Agoluk and John Franklin walk in foreground.

FIELD RESULTS

View east across site LjPb 37, a historic campsite. Assistants Denis Klemencic, john Franklin, and Brian Agoluk can be seen in background.

FIELD RESULTS

Detail of oval tent ring, site LjPb 37.

FIELD RESULTS

Aerial view of cabin site LiNs 2 on Contwoyto Lake belonging to John Franklin's father.

FIELD RESULTS

Brian Agoluk and John Franklin prepare to document artifact scatter site LiNq 1.

FIELD RESULTS

Denis Klemencic, John Franklin, and Gloria Fedirchuk perform shovel tests at site LjPb 33, a large artifact scatter.

FIELD RESULTS

View southwest of large artifact scatter site LjNp 3, David Blower, John Franklin, and Brian Agoluk prepare to record attributes.

FIELD RESULTS

- *Site Nature*
  - *Majority are, or appear to be, single component*
  - *Few are multicomponent containing both precontact remains and historic/traditional remains*
  - *Detailed assessment is required to determine whether the precontact scatters/campsites reflect more than one occupation*
- *Site Values*
  - *Based on scientific potential and perceived value to traditional residents as a monument to 'presence on the land'*
  - *No further concern – isolated finds*
  - *Mitigation (avoidance/further work)*

    -artifact scatters with a large number of artifacts and potential for buried deposits

    -Precontact campsites

    -Historic/traditional use sites with features

ELDER VISIT

- *July 30 – Lupin*
  - *Kugluktuk – 3/Cambridge Bay – 3*
  - *Short briefing*
    - *field program*
    - *results (maps, site types)*
    - *General approach to site value/recommendations*
  - *Site visit – stream rapids north shore Itchen Lake*
    - *View of at least 10 sites*
    - *Sites pointed out, described*
    - *Helicopter view of terrain types examined, types associated with sites found*

PRELIMINARY RECOMMENDATIONS

- *Avoidance or further study is recommended at 22 of the 100 inventoried sites if they are in conflict with proposed road construction or borrow extraction areas.*
- *Verification of the 22 sites relative to the final borrow requirements (eg. LiNp 9, LjPb 23).*
- *Other sites, although not in conflict with proposed construction or borrow activities, may be impacted as a result of the provision of access into currently inaccessible areas.*

FUTURE WORK - 2002

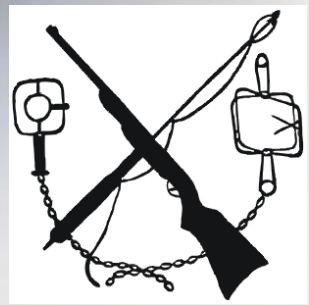
- *Impact Assessment*
  - *Reroutes, additional or different borrow sources, additional facilities, etc.*
- *Mitigation*
  - *Sites that cannot be avoided*
  - *Sites identified as having scientific potential and value to traditional residents*
  - *Controlled collection and excavation; detailed mapping of structures/features; analysis and reporting requirements*
  - *Deposition of artifacts/records as per instruction of the Culture and Heritage Division*

ENVIRONMENTAL STUDY, JANUARY 11, 2002

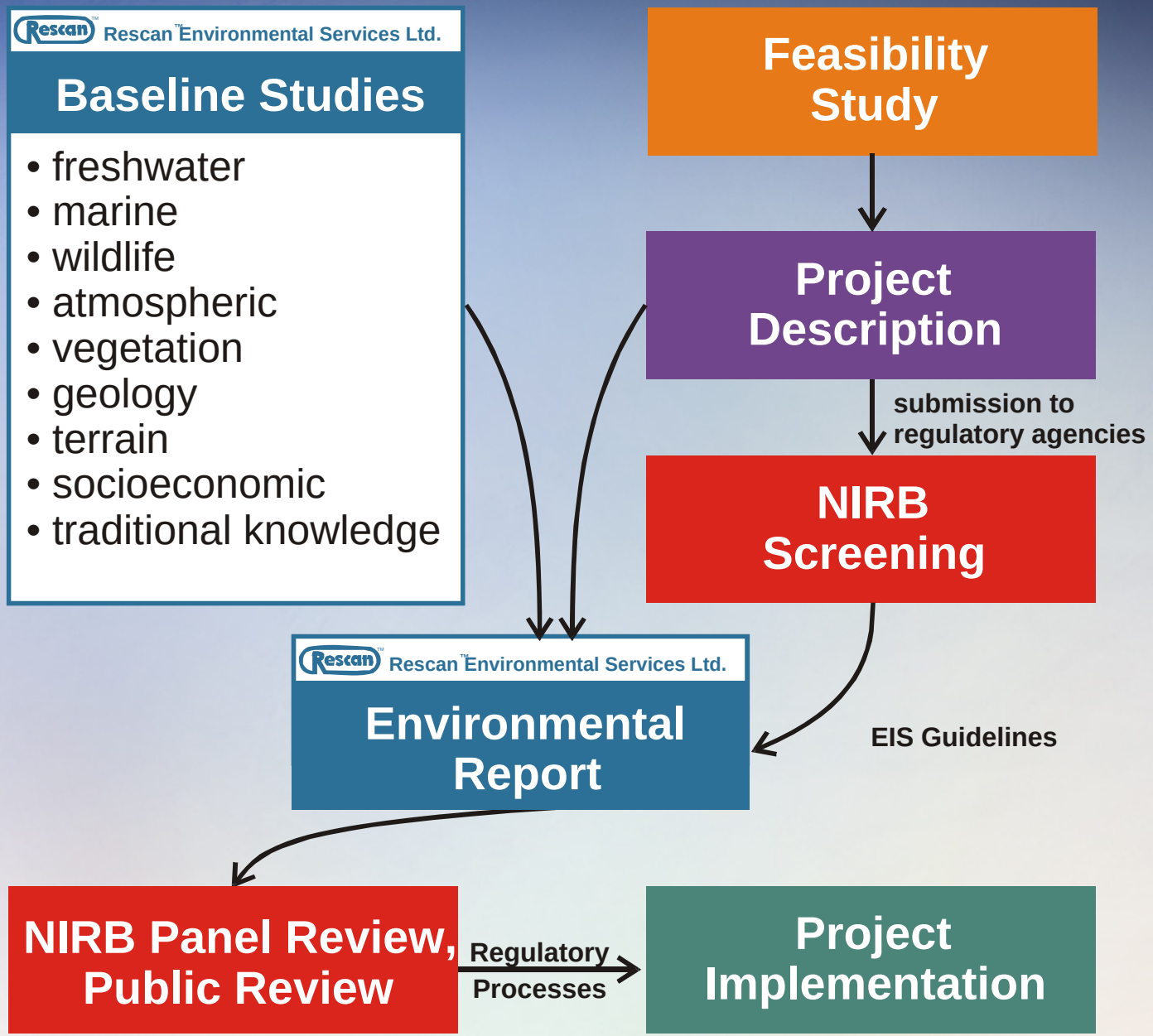
the BATHURST INLET PORT AND ROAD PROJECT

Bathurst Inlet Port and Road Environmental Study

Rescan™



Overview of Environmental Services Provided by Rescan



Bathurst Inlet Port and Road Project

Summer 2001 Field Work

27 participants

- 16 scientists
- 11 assistants

- 2 NWT residents
- 11 Nunavut residents

Total person days = 427

Total assistant days = 226

Freshwater Scientific Team

François Landry, M.Sc., R.P.Bio.
Fisheries Biologist
8 years experience (4 years Arctic)

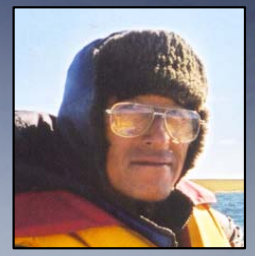
Michael McGurk, Ph.D, R.P.Bio.
Senior Fisheries Biologist
20 years experience (5 years Arctic)

Shane Uren, M.A.Sc.
Water Resource Specialist
5 years experience (2 years Arctic)

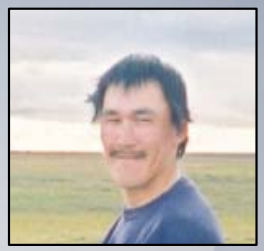
John Chételat, M.Sc.
Environmental Scientist
5 years experience

Field Assistants

Isaac Klengenberg



George Hitkolok



David Nivingalok

Streams - Fish and Fish Habitat

- Reconnaissance Survey (165 crossings)

- Field Assessment (75 crossings)
  - 3 crews
  - Fish assessment
  - Habitat assessment

Streams - Fish Assessment

Burbot
Slimy sculpin
Longnose sucker

Lake trout
Arctic Cisco
Ninespine stickleback

Arctic grayling

Arctic char

Streams - Fish Habitat Assessment

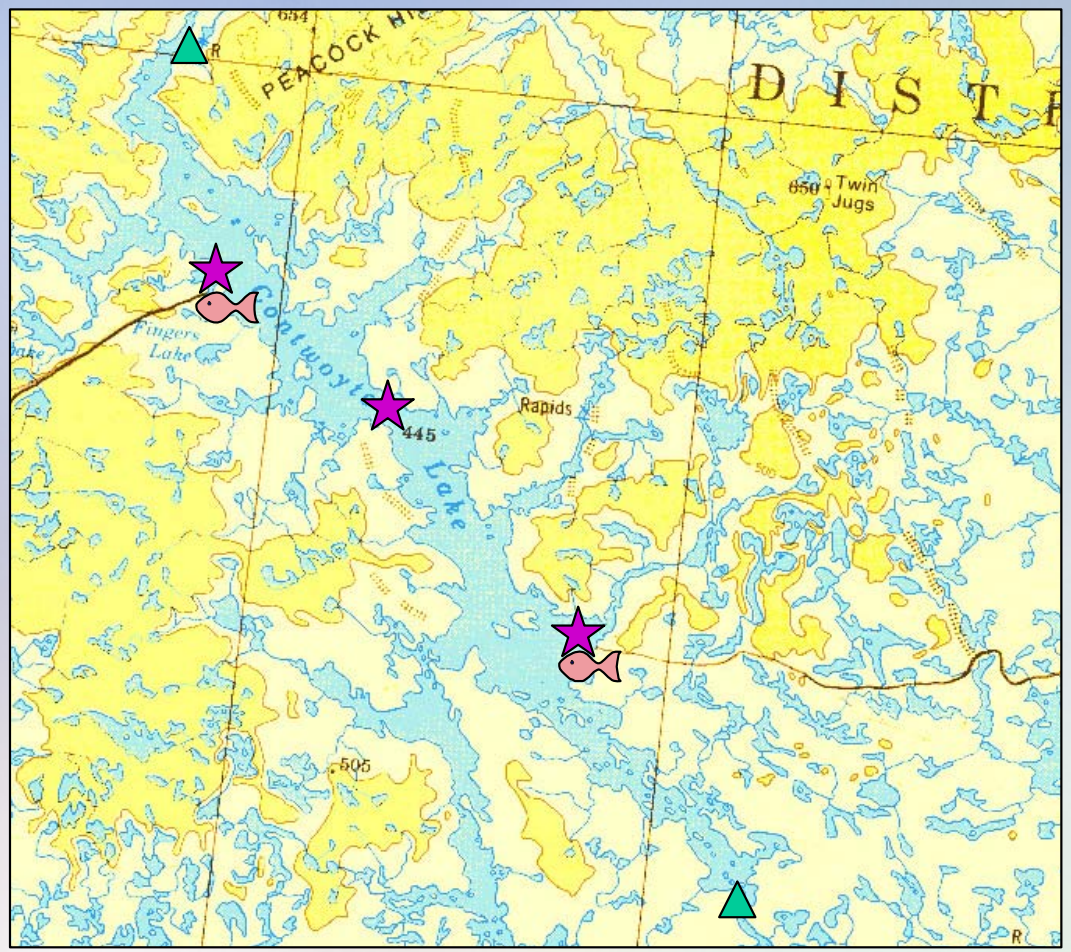
- 200 m section surveyed
- Physical characteristics
  - *e.g.* depth, width, gradient, bed material, instream cover
- Water characteristics
  - *e.g.* temperature, pH, conductivity
- Preliminary assessment

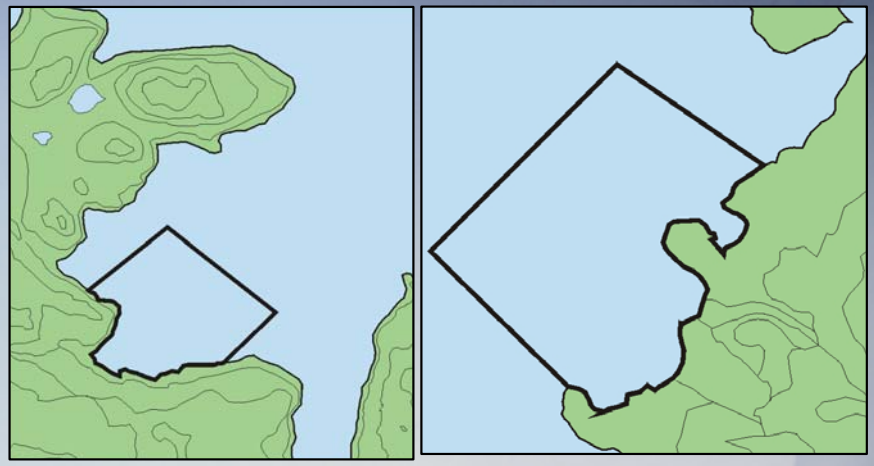
Streams - Aquatic Ecology

- 9 selected streams
- water
- sediment
- benthic invertebrates
- periphyton

Contwoyto Lake

- **Fish and fish habitat**
- **Aquatic ecology**
- **Bathymetry**





North Port

South Port

LEGEND:

- Fish Community and Habitat
- Physical Parameters, Water, Sediment, Zooplankton, Phytoplankton, Benthic Invertebrates
- Water and Sediment

Marine Scientific Team

Marc Wen, M.Sc., R.P.Bio
Biological Oceanographer
10 years experience

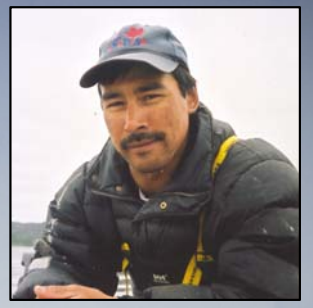
Mike McGurk, Ph.D., R.P.Bio
Senior Fisheries Biologist
20 years experience

François Landry, M.Sc., R.P.Bio
Fisheries Biologist
8 years experience

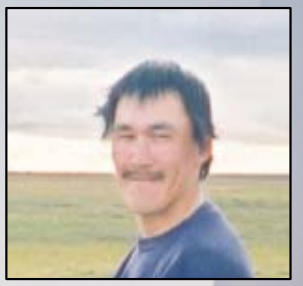
John Chételat, M.Sc.
Environmental Scientist
5 years experience

Field Assistants

Allen Kapolak



George Hitkolok

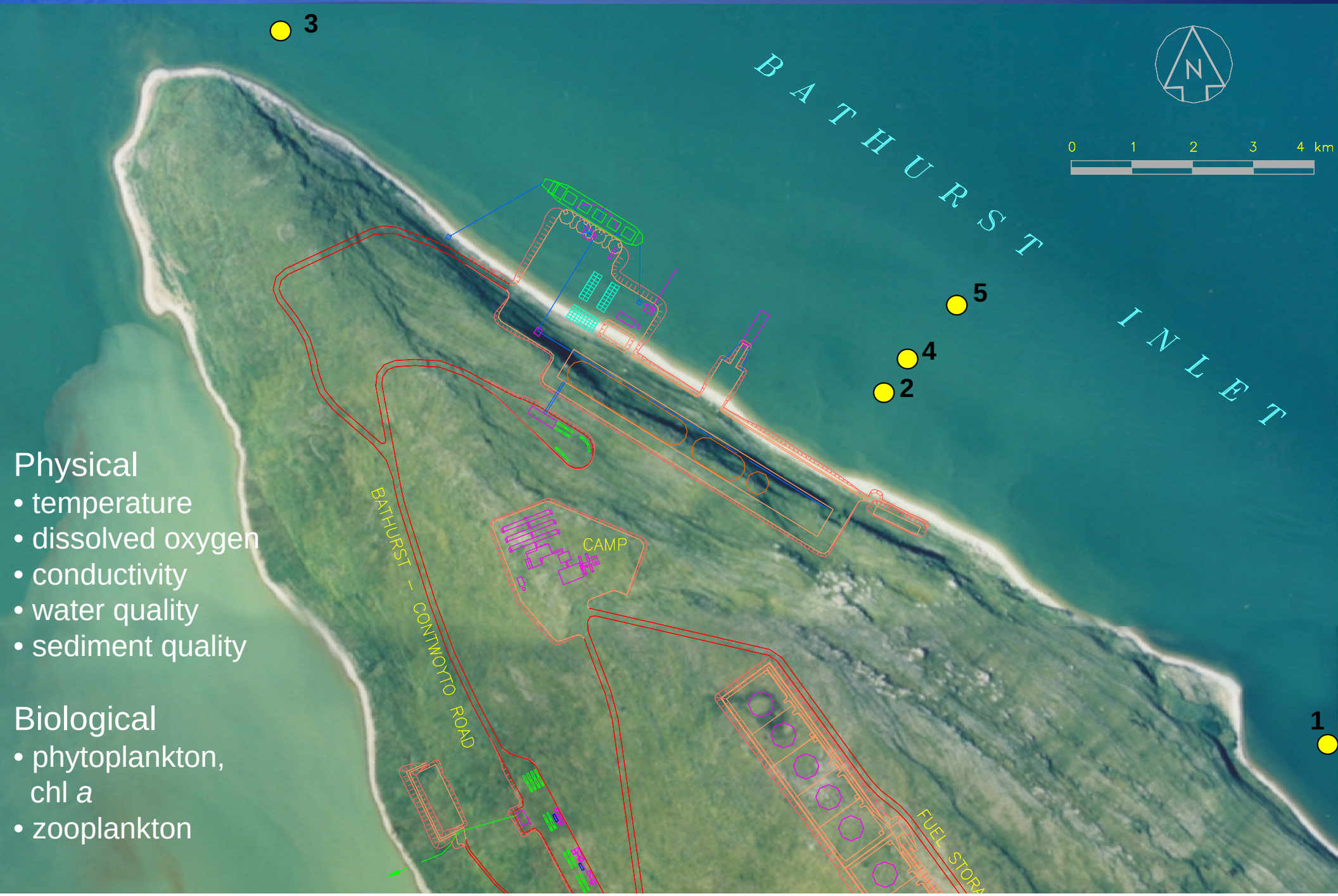


Marine Environment

- Physical Oceanography
- Water and Sediment Quality
- Biological Oceanography

- Fish and Fish Habitat

Marine Port Oceanographic Study



Physical

- temperature
- dissolved oxygen
- conductivity
- water quality
- sediment quality

Biological

- phytoplankton, chl *a*
- zooplankton

Marine Port Fish Study

Fish Community

- gillnets
- beach seines
- bug lines
- minnow traps

Fish Habitat

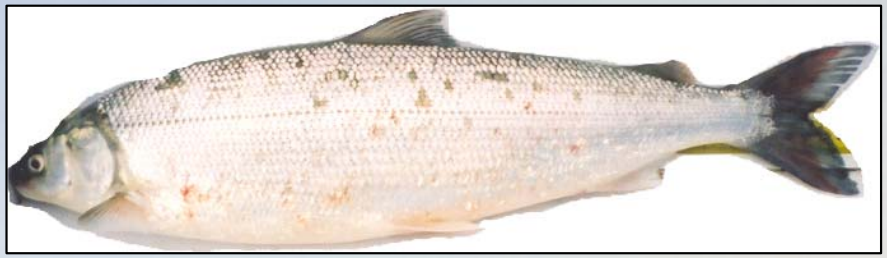
- aerial survey
- ground survey

Marine Species

- Arctic cod

- Starry flounder

- Broad whitefish



- Fourhorn sculpin
- Rainbow smelt
- Pacific herring
- Arctic cisco
- Ogac
- Arctic flounder
- Arctic char

Wildlife Scientific Team

Fiona Danks
B.A. Environmental Biology and Geography
M.S. Biology
5 years experience (5 years Arctic)

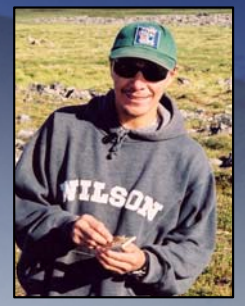
Ian Ross
B.Sc. Wildlife Biology
18 years experience (7 years Arctic)

Mark Fraker
B.A. Zoology
M.A. Zoology/Ecology
33 years experience (28 years Arctic)

John Cooper
B.Sc. Zoology
M.Sc. Biology
19 years experience in northern environments

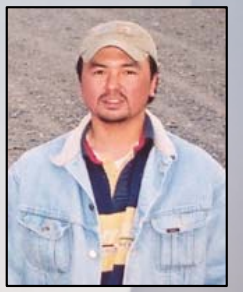
Field Assistants

David Sateana

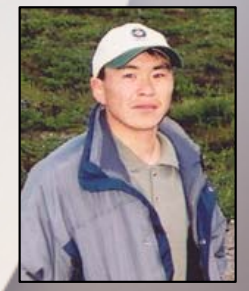


J.F. Koudluak

George Taptuna



Colin Niptanatiak



Large Mammal Aerial Surveys - Summer

- cover road alignment from Bathurst Inlet to Izok
- all wildlife seen along transect route recorded

Esker and Den Surveys

FOX

WOLF **GRIZZLY**

Analysis of Den Sites

- dens located by helicopter
- den site assessed

Signs of active dens :

- hair on den entrances
- recent prey remains

Small Mammal Trapping

- time permitted the addition of small mammal trapping

- traplines set in a wide variety of habitat types including: sedge, fen, heaths, stream & lake riparian zones, eskers, *etc.*

Ground Work and Wildlife Observations

Large Mammal Aerial Surveys - Fall

- survey methodology refined to use handheld GPS units

Future Fieldwork 2002 (Winter, Spring, and Summer)

Atmospheric Scientific Team

Daniel Jarratt, B.Sc., P.Eng.
Sr. Environmental Engineer
10 years experience

Shane Uren, M.A.Sc.
Water Resource Specialist
5 years experience (2 years Arctic)

Installation

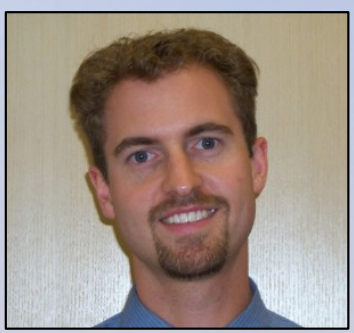
- tower and anchors
- solar panel
- datalogger
- instruments

Instruments

- temperature and humidity probe
- wind sensor
- tipping rain gauge
- pyranometer (solar radiation)
- sonic ranger (snowpack depth)

Bedrock Geology/ARD Studies Scientific Team

Lara Woodhouse, B.Sc.
Bedrock Geologist
6 years experience



Kyle Stanfield, B.A.Sc., EIT
Environmental Engineer
4 years experience

Dr. George Poling, PhD, P.Eng, B.Sc.
Senior ARD Specialist
40+ years experience

Field Assistant

Patsy Avakana

Bedrock Mapping

Mapping Bedrock Outcrops within the Corridor

Identification of:

- mineralized areas
- carving stone deposits

Geology and ARD Assessment

G – location of gossanous and rusty patches in outcrop indicative of weathered sulphides

Sx – location of visible sulphides in surface outcrops.

Vegetation Scientific Team

Page Burt,M.Sc.
Senior Vegetation Ecologist
20+ years experience

Jerry Bentz, M.Sc.,B.Sc.
Senior Landscape Ecologist
20+ years experience

Heather DeCoursey
B.Sc.*Vegetation Ecologist*
5+ years experience

Craig DeCoursey, B.Sc.
Vegetation Ecologist
5+ years experience

Field Assistants

George Taptuna

Jason Bolduc

J.F. Koudluak

Melanie Panioyak

Vegetation Surveys

740 vegetation plots completed

- vegetation present
- percent cover for each species

Other Site Information

- slope
- aspect
- moisture regime
- nutrient regime
- percent substrate cover
- terrain texture
- drainage

Terrain Scientific Team

Field Assistant

Dennis O'Leary, M.A, B.Sc.,B.A.
Senior Terrain Scientist
20 years experience

George Taptuna

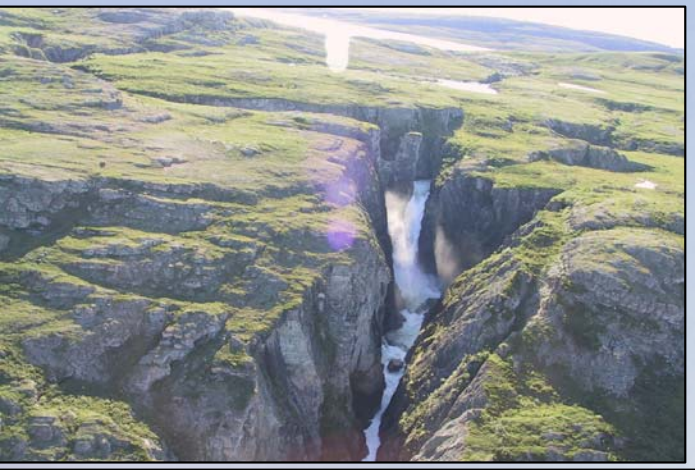
Surficial Geology and Soils

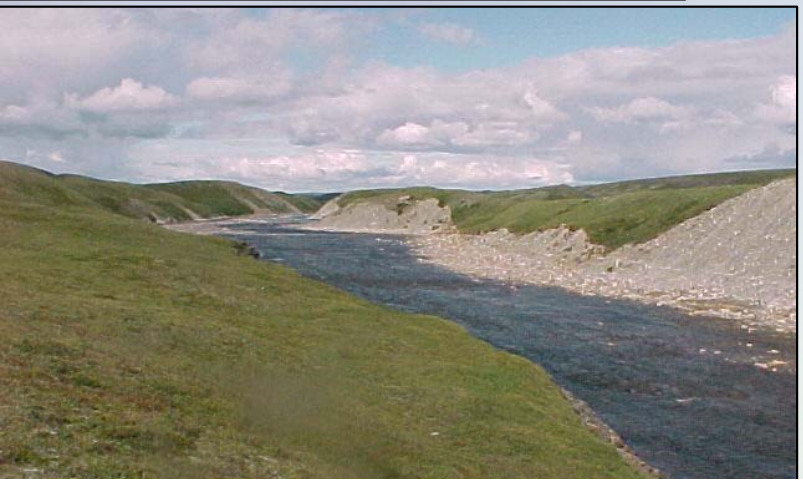
160 plots established

Information collected on:

- parent materials
- texture
- surface expression
- modifying processes
- percent slope
- drainage

Landforms





Soil Pits

Boulder Fields

Traditional Knowledge Team

Vivian Banci
Wildlife Biologist and
NTKP researcher

Traditional Knowledge Program

- Fully utilize existing Traditional Knowledge studies
- Extract information that is relevant for the Project Area
- Summarize in a report and use in baseline studies, interpreting data, and evaluating the environmental and socioeconomic impact of Project

Naonaiyaotit Traditional Knowledge Project (NTKP)

- whole Bathurst Port and Road Project within study area of the NTKP
- covers wide variety of topics, such as transportation routes, harvesting, cultural resources, wildlife, and fish
- raw data contained within a GIS database

Tuktu Nogak Project ("Caribou and Calves")

- covers the calving grounds of the Bathurst Caribou herd
- raw data contained within a GIS database

Socio-Economic Study

Research Team (New Economy Development Group)

Dal Broadhead

Doug Kane

Baljit (Bava) Wadhwa

Sandy Lockhart

Marian Nivingalok

Margo Neglak

Socio-Economic Scope

- Profile baseline conditions in the four affected communities (*e.g.,* demographics, employment and income, education, training and employment skills, *etc.*)
- Develop a Human Resource Development Plan
- Develop a Health and Safety Plan

Methodology

- detailed literature search
- questionnaire to survey residents
- visits to communities
- interviews

Community of Bathurst Inlet

Angoniatit Niovikvia Ltd. (ANL) Participants in Summer 2001 Field Work

Patsy Avakana

the BATHURST INLET PORT AND ROAD PROJECT

George Taptuna

Jason Bolduc

David Sateana

J.F. Koudluak

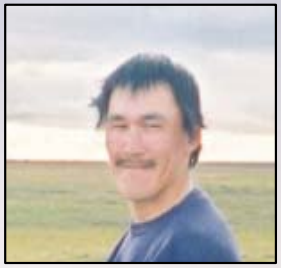
Rescan™

Melanie Panioyak

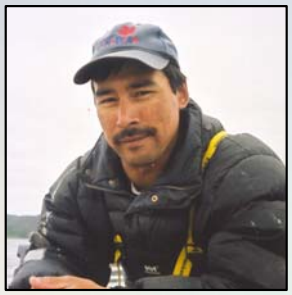
Allen Kapolak

Isaac Klengenberg

Colin Niptanatiak



George Hitkolok



David Nivingalok

AN ECONOMIC DEVELOPMENT PROJECT FOR THE KITIKMEOT REGION, PRESENTATION TO KIA APRIL 25, 2002

Bathurst Inlet Port and Road Project

An Economic Development Project for the Kitikmeot Region.

Presentation to KIA

April 25, 2002

Introduction

- The Slave Geological Province (SGP) is rich in mineral resources. About 40% of the SGP is in Nunavut (Kitikmeot).
- Full potential of SGP has not been developed because of a lack of transportation infrastructure.
- The only road access is by winter road from Yellowknife to Lupin Mine (630km).
- An arctic sea port and connecting roads would lead to significant growth in the area.

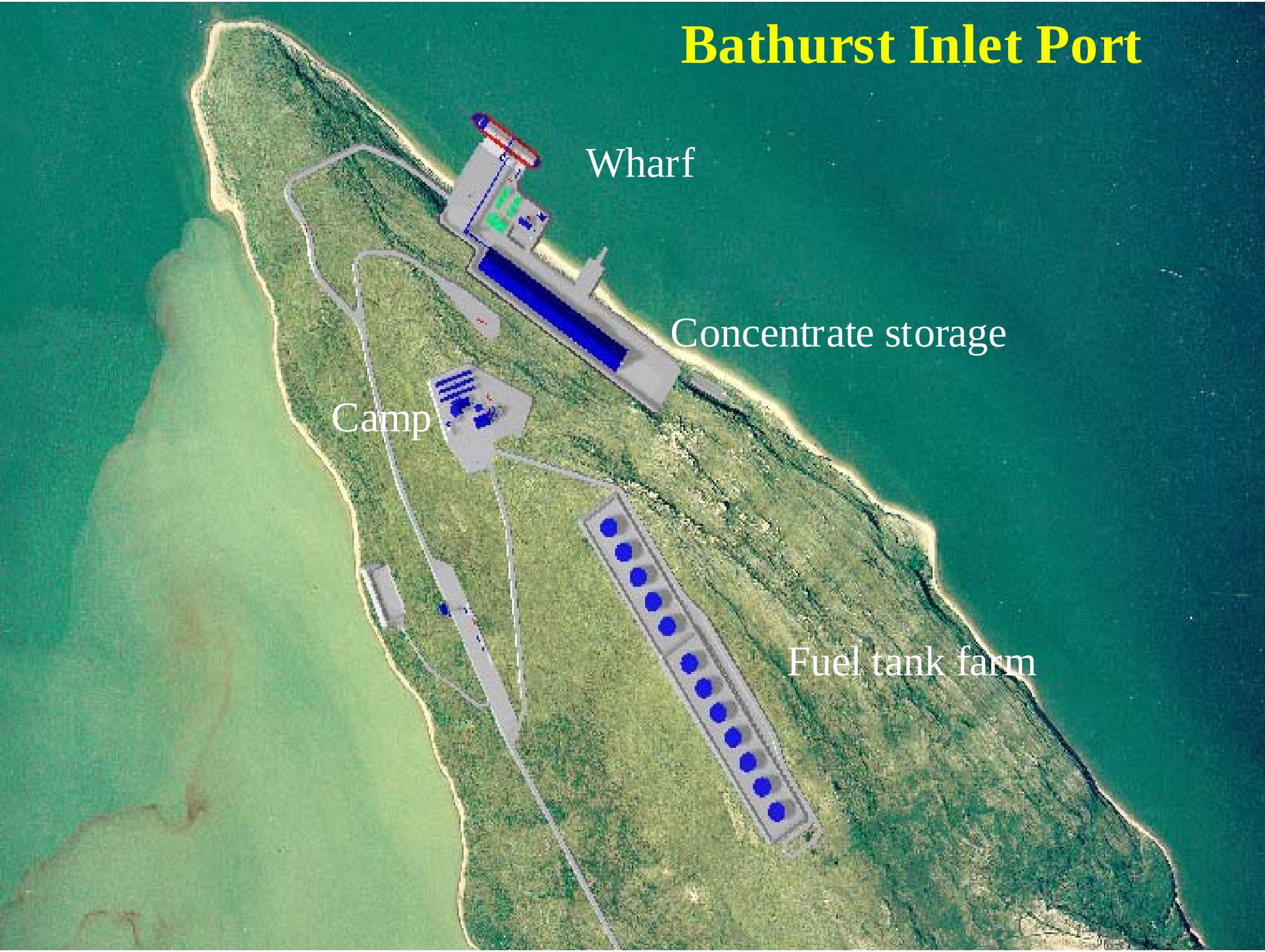
Infrastructure Solution

- Studies indicate the best option is a port on Bathurst Inlet and all-weather road to the Izok mineral deposit.
- Project built and operated by a public/private partnership of Inuit, industry and governments.
- The port and road would provide revenues from user fees or tolls.

The Project

- A port site on Bathurst Inlet, capable of handling 50,000 tonne ice class vessels.
- Facilities at the port for handling base metal concentrates, fuel and bulk supplies.
- All weather road to Contwoyto Lake-211km.
- Winter ice road and summer barge on Contwoyto Lake.
- All weather road - Lupin to Izok - 79km. (Izok to be the major customer.)

Ulu
Hood River
Bathurst Inlet
PROPOSED PORT
Burnside
Mara R.
George Lake
Lupin
Izok
Itchen Lake
Contwoyto Lake
Winter Road
Summer Barge
Nose Lake
EKATI™
Diavik
Lac de Gras
NUNAVUT
NWT


Bathurst Inlet Port
Wharf
Concentrate storage
Camp
Fuel tank farm

Bathurst Inlet Port

Project Benefits

- Reduced cost of fuel and supplies for the Kitikmeot communities.
- Reduced capital and operating costs for mining exploration and development.
- Significant increase in local employment
- Increased economic activity and taxation revenues to Nunavut and Canada.

Project Studies

- Total cost 2001 to 2004 - $6 million

- Funded by:

- DIAND	$3.0 million
- GN	$1.5 million
- Industry & others	$1.5 million

Project Status

- Feasibility study complete.
- Baseline environmental studies complete summer 2002
- Preliminary Project Description sent to DIAND and KIA April 5, 2002.
- EIS complete December 2002

Feasibility Study

- Analysis of port and road users.
- Site selection for the port site.
- Route selection for the all weather road.
- Dock site selection and route selection for the Contwoyto Lake barge.
- Brief review of environmental effects and mitigation methods, including abandonment and reclamation.
- Capital and operating costs for the project.
- Economic analysis of the project, including estimates of tariffs and user fees.
- Review of financing options.
- Analysis of labour resources and employment.

Port and Road Users

Potential users (existing)

- **Lupin, Diavik, Ekati**
- **Nunavut communities**
  - **Cambridge Bay**
  - **Kugluktuk**
  - **Gjoa Haven**
  - **Taloyoak**

Possible users (future)

- **Izok**
- **Jericho**
- *George Lake, Goose Lake, Hope Bay*
- *Hackett River, Gondor*

Land Ownership

- Inuit Owned Lands, total of 4,500 ha.
  - **142 km of road plus associated quarry sites.**
  - **South barge dock site on Contwoyto Lake.**
- Crown Land, total of 4,600 ha.
  - **Bathurst Inlet port site.**
  - **148 km of road and associated quarry sites.**
- Lupin Mine.
  - **12 km of existing roads, plus the north barge dock site.**

Operating Seasons

- Shipping: normal “open water” season, mid July to mid/late October.
- Road operation:

  - Winter, January 15 to April 30.

  - Summer, July 15 to October 15.

(Note: based on Contwoyto Lake ice road and barge shipping seasons).

Potential Employment Opportunities

- Operation (average)
  - **Administrative** **6**
  - **Operation & Maintenance** **72**
  - **Trucking (contract to mining companies)** **150**
- Construction (peak)
  - **Administration & Supervision** **35**
  - **Labour & Equipment Operators** **265**

Capital Cost

	$(Millions)
Bathurst Inlet Port	49
Bathurst/Contwoyto Lake Road - 211 km	83
Lupin to Izok Road - 80 km	29
Sub-total	$161 million
Bathurst Inlet Fuel Storage	50
Contwoyto Barge sites	4
Total	**$ 215 million**

Revenue

- Tariffs/User Fees.

Road (travel over road network)

- Fuel, supplies/concentrates @ $ per tonne -km.

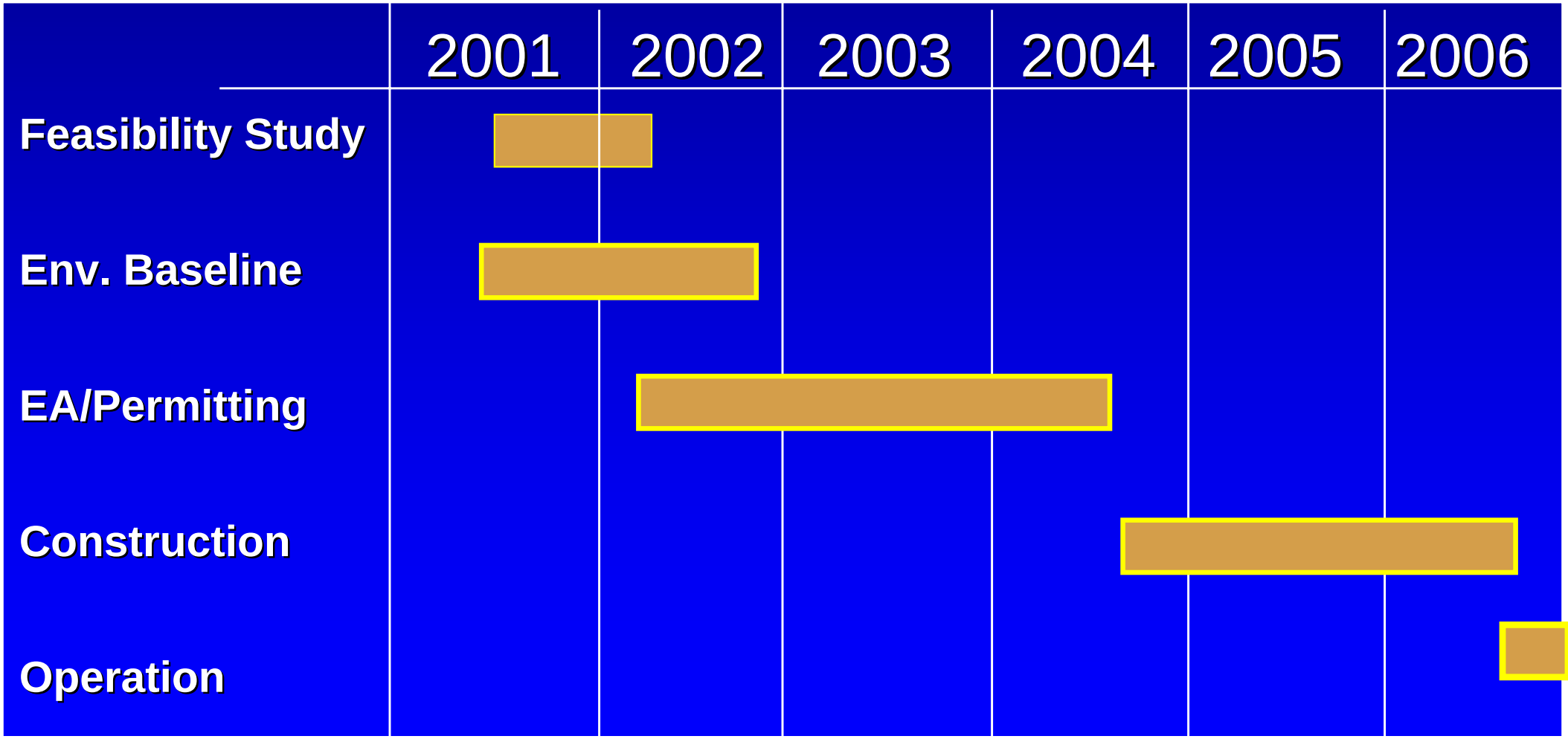
Barge on Contwoyto Lake

- Rates $ per tonne.

Port (handling and storage)

- Fuel, supplies/concentrates @ $ per tonne.

Project Schedule



Baseline Studies

- Heritage Studies
- Environmental Studies
- Traditional Knowledge
- Socio-economic

Baseline Studies

Studies underway 2001:

- Heritage/Archaeology
- Vegetation/terrain/ecosystem classification
- Geology/ARD
- Fresh water environment
- Marine environment
- Wildlife (continues into 2002)
- Atmospheric (to 200)
- Community consultation
- Socio-economic studies

Baseline Studies

Studies in 2002:

- Further archaeology/cultural
- Further fisheries studies
- Traditional Knowledge
- Marine mammals
- Waterfowl, birds, raptors
- Socio-economic
- More community consultations

Heritage Studies

Heritage Resource Studies will provide an inventory of heritage sites along the road route and at the port site.

- **2001 Program**
  - ➔ File search of previously recorded sites
  - ➔ Review of reports and papers on the area
  - ➔ Assess previously recorded sites and record new sites
  - ➔ Elders tour of main sites
- **2002/3 Program**
  - ➔ Impact assessment of project
  - ➔ Mitigation of sites, if necessary
  - ➔ Reporting to Regulatory agencies

Community Consultations

- **Kugluktuk.** January 14/02; two meetings, one with council. Other with the public. Over 70 people attended.
- **Bathurst Inlet.** January 15/02; met with the BI residents in Cambridge Bay, 14 attended.
- **Cambridge Bay.** January 15/02; public meeting, over 80 people attended.
- **Taloyoak.** March4/02, council meeting, also public meeting, 40 people attended.
- **Kugaaruk.** March 5/02, 15 people attended.
- **Gjoa Haven.** March 6/02, 50 people attended.

Project Proponent

- A 50/50 Joint Venture between the Kitikmeot Corporation and Nuna Logistics Limited.
- Both companies are registered Inuit owned companies

Summary of the Project

- Port site at Bathurst inlet.
- All weather road to Contwoyto Lake.
- Winter road and summer barge on Contwoyto Lake.
- All weather road Lupin to Izok.
- Fuel and supplies to the Kitikmeot communities by barge
- Fuel and supplies to mining projects in the Kitikmeot Region and northern NWT.

AN ECONOMIC DEVELOPMENT PROJECT FOR THE KITIKMEOT REGION, APRIL 26, 2002

Bathurst Inlet Port and Road Project

An Economic Development Project for the Kitikmeot Region.

April 26, 2002

Introduction

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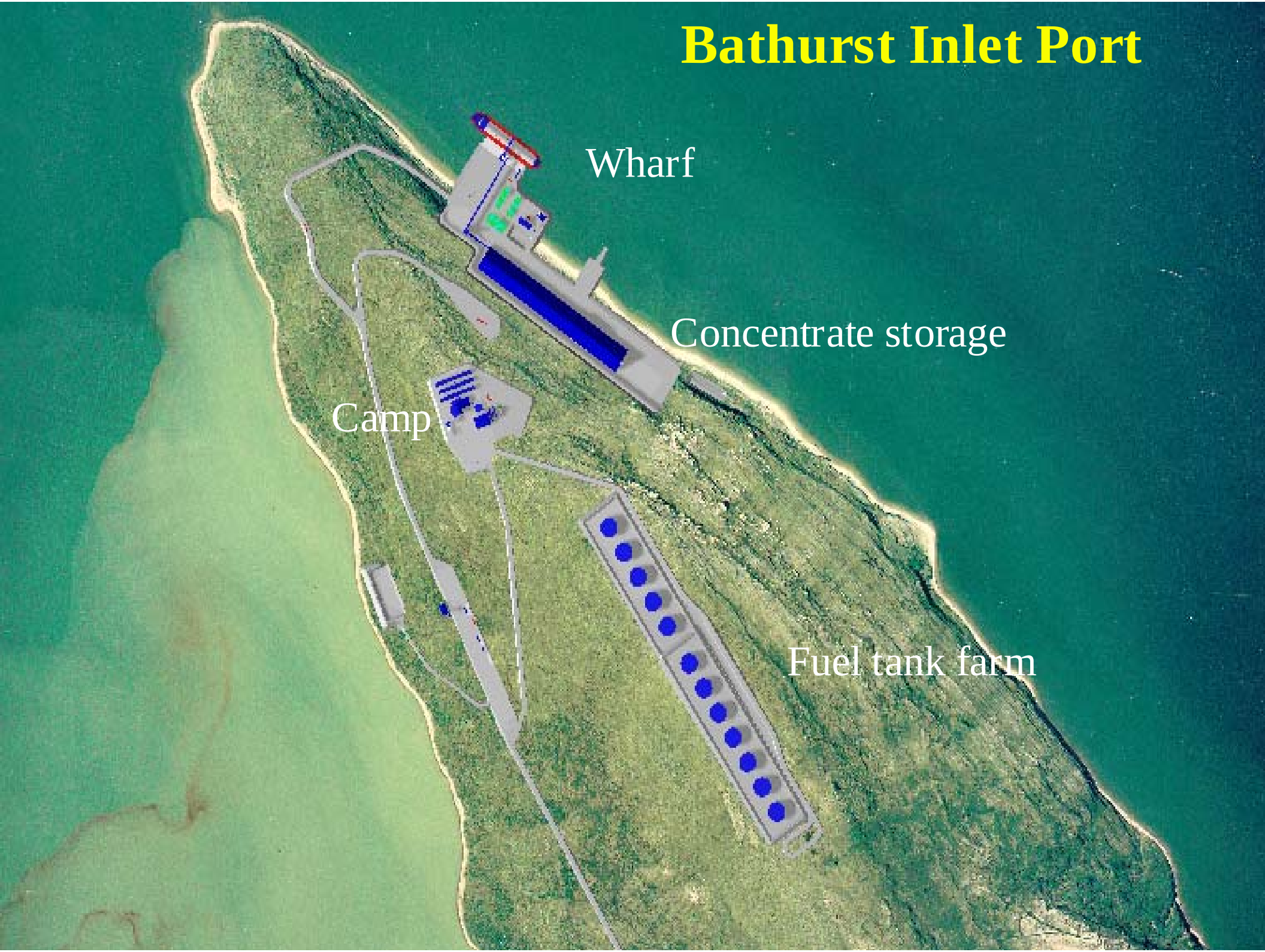
Infrastructure Solution

- Studies indicate the best option is a port on Bathurst Inlet and all-weather road to the Izok mineral deposit.
- Project built and operated by a public/private partnership of Inuit, industry and governments.
- The port and road would provide revenues from user fees or tolls.

The Project

- A port site on Bathurst Inlet, capable of handling 50,000 tonne ice class vessels.
- Facilities at the port for handling base metal concentrates, fuel and bulk supplies.
- All weather road to Contwoyto Lake-211km.
- Winter ice road and summer barge on Contwoyto Lake.
- All weather road - Lupin to Izok - 79km. (Izok to be the major customer.)

Ulu
Hood River
Bathurst Inlet
PROPOSED PORT
Burnside
Mara R.
George Lake
Lupin
Izok
Itchen Lake
Contwoyto Lake
Winter Road
Summer Barge
Nose Lake
EKATI™
Diavik
Lac de Gras
NUNAVUT
NWT


Bathurst Inlet Port
Wharf
Concentrate storage
Camp
Fuel tank farm

Bathurst Inlet Port

Project Benefits

- Reduced cost of fuel and supplies for the Kitikmeot communities.
- Reduced capital and operating costs for mining exploration and development.
- Significant increase in local employment
- Increased economic activity and taxation revenues to Nunavut and Canada.

Project Studies

- Total cost 2001 to 2004 - $6 million

- Funded by:

- DIAND	$3.0 million
- GN	$1.5 million
- Industry & others	$1.5 million

Project Management

- Technical Committee

- Kitikmeot Corporation.

- Nuna Logistics Limited.

- Inmet Mining Corporation.

- Government of Nunavut (DSD & CG&T).

- Kitikmeot Inuit Association

- Cambridge Bay & Kugluktuk

Project manager reporting to the committee.

Feasibility Study

- Analysis of port and road users.
- Site selection for the port site.
- Route selection for the all weather road.
- Dock site selection and route selection for the Contwoyto Lake barge.
- Brief review of environmental effects and mitigation methods, including abandonment and reclamation.
- Capital and operating costs for the project.
- Economic analysis of the project, including estimates of tariffs and user fees.
- Review of financing options.
- Analysis of labour resources and employment.

Port and Road Users

Potential users (existing)

- **Lupin, Diavik, Ekati**
- **Nunavut communities**
  - **Cambridge Bay**
  - **Kugluktuk**
  - **Gjoa Haven**
  - **Taloyoak**

Possible users (future)

- **Izok**
- **Jericho**
- *George Lake, Goose Lake, Hope Bay*
- *Hackett River, Gondor*

All-weather Road

- **Bathurst Inlet to Contwoyto Lake - 211 km**
- **Lupin Mine to Izok - 79 km**

- **Road connections to mines from the all-weather road:**
  - **Ekati - 98 km (existing ice road)**
  - **Diavik - 127 km (existing ice road)**
  - Jericho - 28 km
  - Gondor - 10 km
  - Hackett River - 25 km
  - George Lake - 19 km
  - Goose Lake - 55 km

Land Ownership

- **Inuit Owned Lands, total of 4,500 ha.**

  - 142 km of road plus associated quarry sites.
  - South barge dock site on Contwoyto Lake.

- **Crown Land, total of 4,600 ha.**

  - Bathurst Inlet port site.
  - 148 km of road and associated quarry sites.

- **Lupin Mine.**

  - 12 km of existing roads, plus the north barge dock site.

Operating Seasons

- **Shipping:**

  - normal “open water” season, mid July to mid/late October.

- **Road operation:**

  - Winter, January 15 to April 30.

  - Summer, July 15 to October 15.

  (Note: based on Contwoyto Lake seasons).

Potential Employment Opportunities

- Operation (average)
  - **Administrative** **6**
  - **Operation & Maintenance** **72**
  - **Trucking (contract to mining companies)** **150**
- Construction (peak)
  - **Administration & Supervision** **35**
  - **Labour & Equipment Operators** **265**

Capital Cost

	$(Millions)
Bathurst Inlet Port	49
Bathurst/Contwoyto Lake Road - 211 km	83
Lupin to Izok Road - 80 km	29
Sub-total	$161 million
Bathurst Inlet Fuel Storage	50
Contwoyto Barge sites	4
Total	$ 215 million

Revenue

- **Tariffs/User Fees.**

Road (travel over road network)

- Fuel, supplies/concentrates @ $ per tonne -km.

Barge on Contwoyto Lake

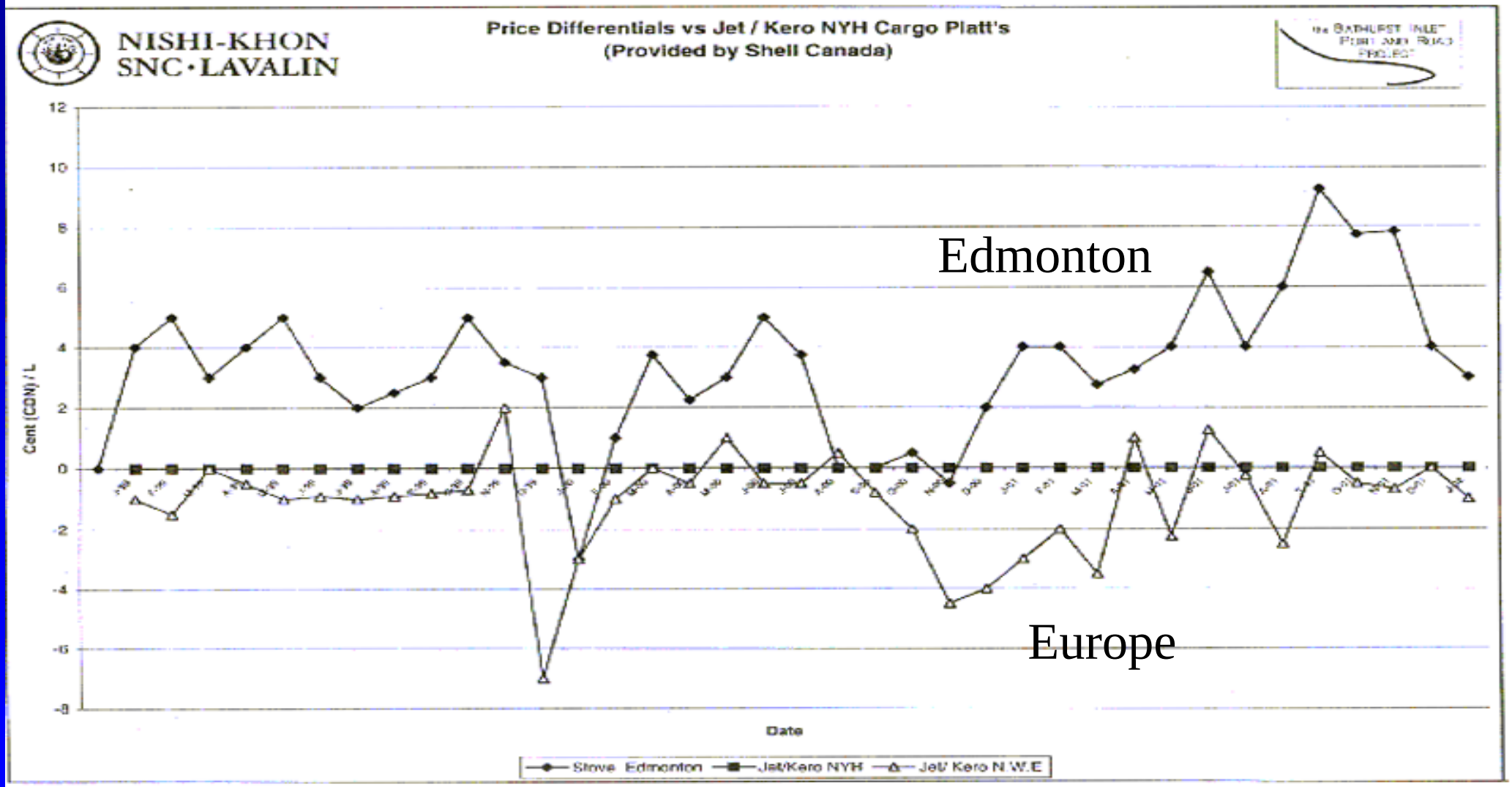
- Rates $ per tonne.

Port (handling and storage)

- Fuel, supplies/concentrates @ $ per tonne.

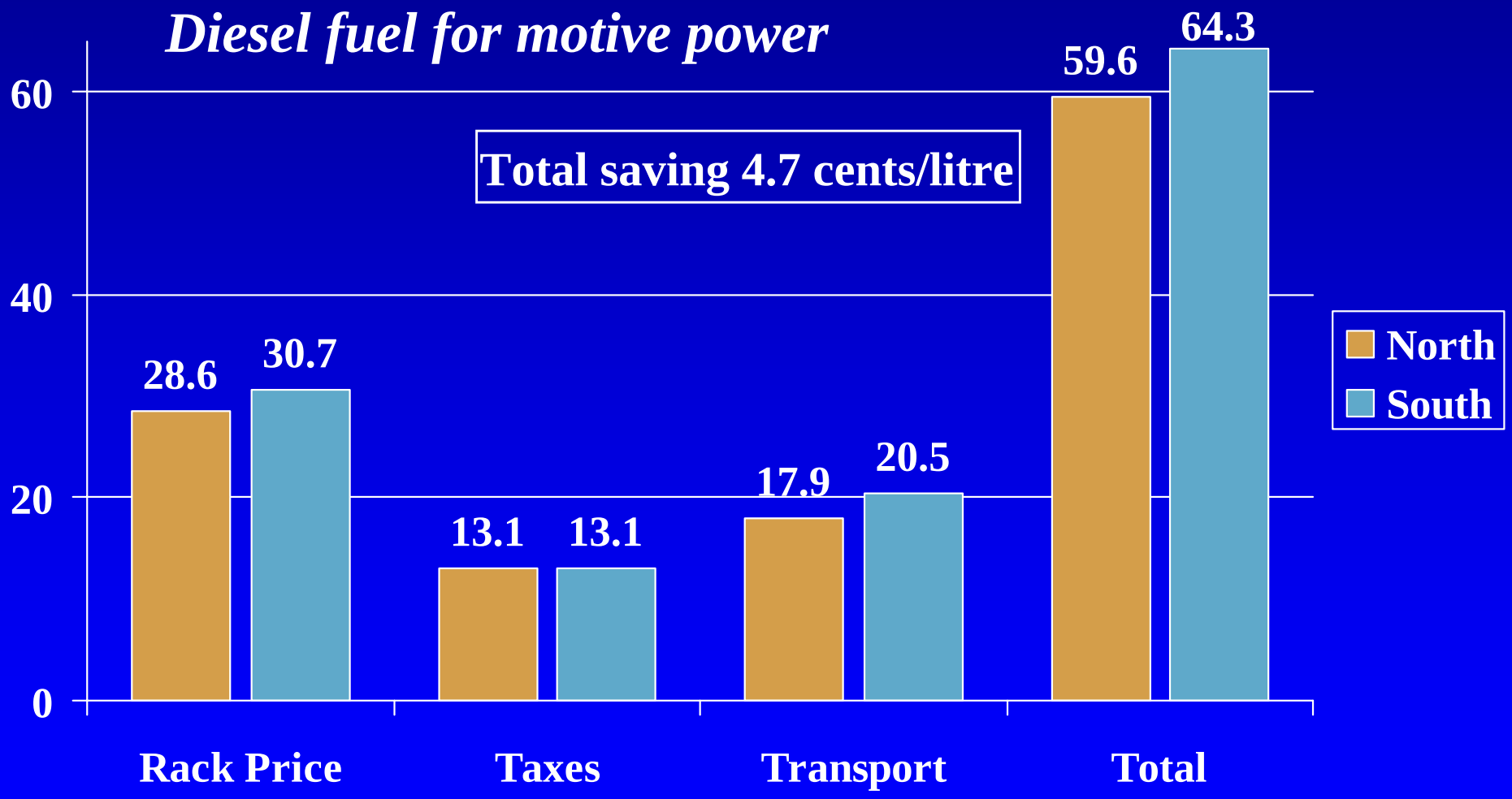
Comparison of fuel rack prices Edmonton vs Europe (Jan1999 - Jan 2002)

Figure 3.8 -1



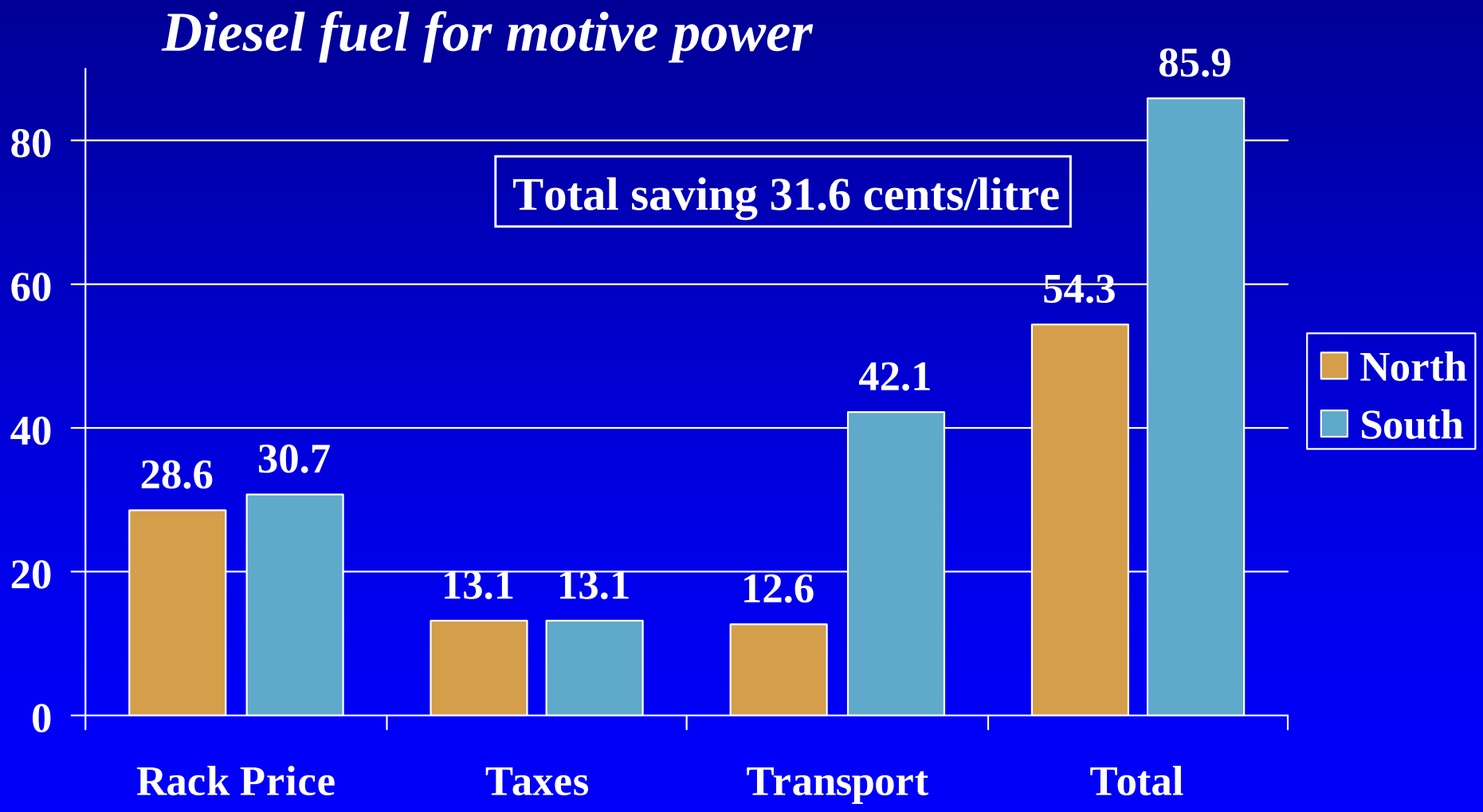
NKSL Confidential

Estimated fuel cost for Ekati/Diavik (Cents per litre)



Based on P40 pricing January 2002

Estimated fuel cost for Cambridge Bay (Cents per litre)



Based on P40 pricing January 2002

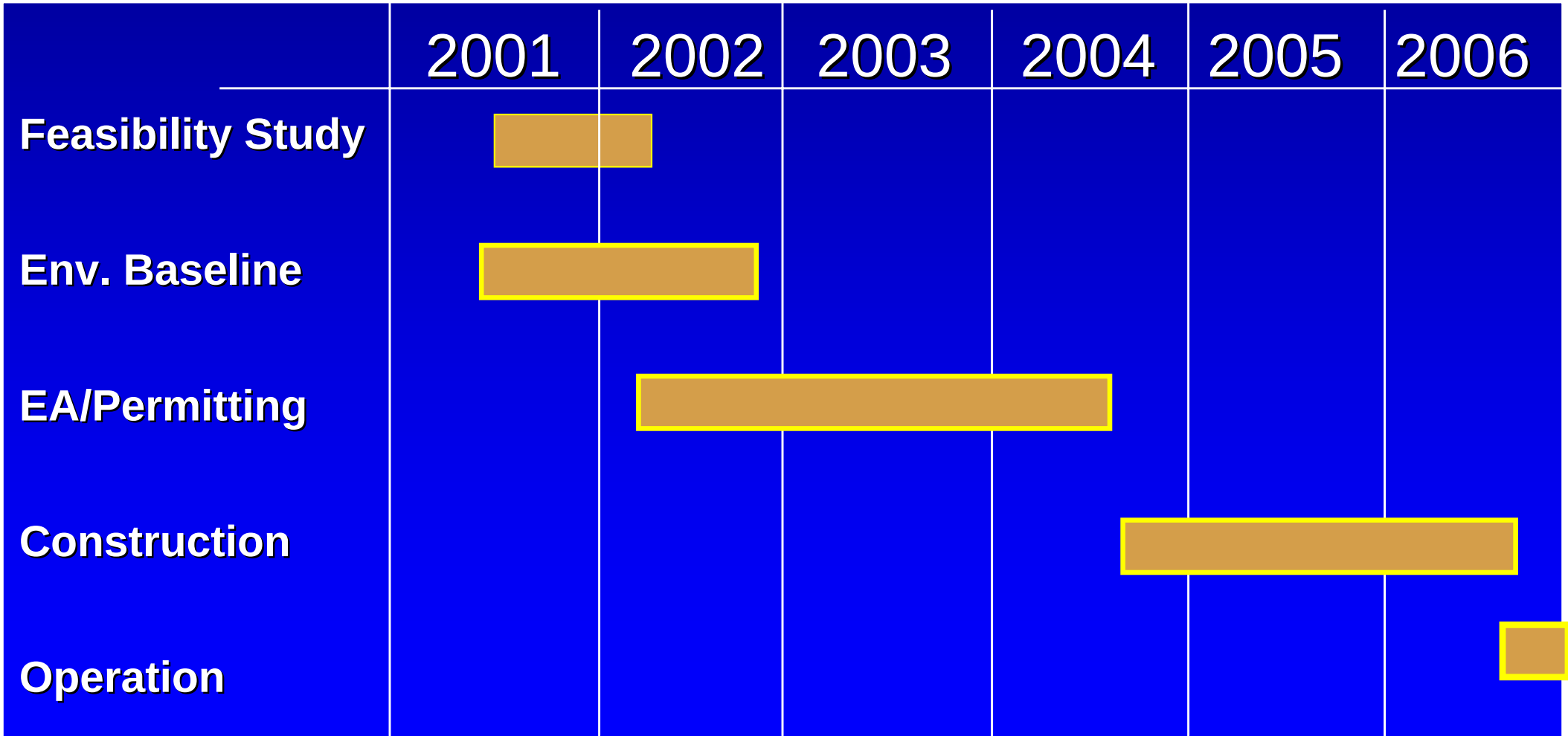
Project Financing - Examples

	Option 1	Option 2
Total Capital ($M)	175	216
Govt. funding ($M	143	86
Private funding ($M)	32	130
Percent private	18%	60%
Interest rate	8%	8%
Project IRR	12.5%	12.3%
Equity IRR	15.0%	15.1%

Option 1: Lupin, Ekati, Diavik & Kitikmeot communities.

Option 2: Option 1 plus Izok.

Project Schedule



Baseline Studies

- Heritage Studies
- Environmental Studies
- Traditional Knowledge
- Socio-economic

Baseline Studies

Studies underway 2001:

- Heritage/Archaeology
- Vegetation/terrain/ecosystem classification
- Geology/ARD
- Fresh water environment
- Marine environment
- Wildlife (continues into 2002)
- Atmospheric (to 200)
- Community consultation
- Socio-economic studies

Baseline Studies

Studies in 2002:

- Further archaeology/cultural
- Further fisheries studies
- Traditional Knowledge
- Marine mammals
- Waterfowl, birds, raptors
- Socio-economic
- More community consultations

Heritage Studies

Heritage Resource Studies will provide an inventory of heritage sites along the road route and at the port site.

- **2001 Program**
  - ➔ File search of previously recorded sites
  - ➔ Review of reports and papers on the area
  - ➔ Assess previously recorded sites and record new sites
  - ➔ Elders tour of main sites
- **2002/3 Program**
  - ➔ Impact assessment of project
  - ➔ Mitigation of sites, if necessary
  - ➔ Reporting to Regulatory agencies

Community Consultations

- **Kugluktuk.** January 14/02; two meetings, one with council. Other with the public. Over 70 people attended.
- **Bathurst Inlet.** January 15/02; met with the BI residents in Cambridge Bay, 14 attended.
- **Cambridge Bay.** January 15/02; public meeting, over 80 people attended.
- **Taloyoak.** March4/02, council meeting, also public meeting, 40 people attended.
- **Kugaaruk.** March 5/02, 15 people attended.
- **Gjoa Haven.** March 6/02, 50 people attended.

Project Proponent

- A 50/50 Joint Venture between the Kitikmeot Corporation and Nuna Logistics Limited.
- Both companies are registered Inuit owned companies

Project Status

- Feasibility study complete.
- Baseline environmental studies complete summer 2002
- Preliminary Project Description sent to DIAND and KIA April 5, 2002.
- EIS complete December 2002

AN ECONOMIC DEVELOPMENT PROJECT FOR THE KITIKMEOT REGION, JUNE 2002

Bathurst Inlet Port and Road Project

An Economic Development Project for the Kitikmeot Region.

June, 2002

Introduction

- The Slave Geological Province (SGP) is rich in mineral resources. About 40% of the SGP is in Nunavut (Kitikmeot).
- Full potential of SGP has not been developed because of a lack of transportation infrastructure.
- The only road access is by winter road from Yellowknife to Lupin Mine (630km).
- An arctic sea port and connecting roads would lead to significant growth in the area.

Infrastructure Solution

- Studies indicate the best option is a port on Bathurst Inlet and all-weather road to the Izok mineral deposit.
- Project built and operated by a public/private partnership of Inuit, industry and governments.
- The port and road would provide revenues from user fees or tolls to cover capital and operating costs.

The Project

- A port site on Bathurst Inlet, capable of handling 50,000 tonne ice class vessels.
- Facilities at the port for handling base metal concentrates, fuel and bulk supplies.
- All weather road Bathurst port site to Contwoyto Lake - 211km.
- Winter ice road and summer barge on Contwoyto Lake.
- All weather road - Lupin to Izok - 79km. (Izok to be the major customer.)

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NUNAVUT
NWT

Project Benefits

- Reduced cost of fuel and supplies for the Kitikmeot communities.
- Reduced capital and operating costs for mining exploration and development.
- Significant increase in local employment
- Increased economic activity and taxation revenues to Nunavut and Canada.

Benefits to Northwest Territories

- The Arthur Anderson Study prepared for GNWT Transportation in 1999 states:

"….. The construction of an all-weather road in the north and a port on Bathurst Inlet will be to the Western NWT's eventual benefit. It will lower costs and spur development both east and west of the border…"

Project Management

- Technical Committee

- Kitikmeot Corporation.

- Nuna Logistics Limited.

- Inmet Mining Corporation.

- Government of Nunavut (DSD & CG&T).

- Kitikmeot Inuit Association

- Cambridge Bay & Kugluktuk

Project manager reporting to the committee.

Feasibility Study

- Analysis of port and road users.
- Site selection for the port site.
- Route selection for the all weather road.
- Dock site selection and route selection for the Contwoyto Lake barge.
- Brief review of environmental effects and mitigation methods, including abandonment and reclamation.
- Capital and operating costs for the project.
- Economic analysis of the project, including estimates of tariffs and user fees.
- Review of financing options.
- Analysis of labour resources and employment.

Port and Road Users

Potential users (existing)

- **Lupin, Diavik, Ekati**
- **Nunavut communities**
  - **Cambridge Bay**
  - **Kugluktuk**
  - **Gjoa Haven**
  - **Taloyoak**

Possible users (future)

- **Izok**
- **Jericho**
- *George Lake, Goose Lake, Hope Bay*
- *Hackett River, Gondor*

All-weather Road

- **Bathurst Inlet to Contwoyto Lake - 211 km**
- **Lupin Mine to Izok - 79 km**

- **Road connections to mines from the all-weather road:**
  - **Ekati - 98 km (existing ice road)**
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  - Jericho - 28 km
  - Gondor - 10 km
  - Hackett River - 25 km
  - George Lake - 19 km
  - Goose Lake - 55 km

Operating Seasons

- **Shipping:**

  - normal “open water” season, mid July to mid/late October.

- **Road operation:**

  - Winter, January 15 to April 30.

  - Summer, July 15 to October 15.

  (Note: based on Contwoyto Lake seasons).

Potential Employment Opportunities

- Operation (average)
  - **Administrative** **6**
  - **Operation & Maintenance** **72**
  - **Trucking (contract to mining companies)** **150**
- Construction (peak)
  - **Administration & Supervision** **35**
  - **Labour & Equipment Operators** **265**

Capital Cost

	$(Millions)
Bathurst Inlet Port	49
Bathurst/Contwoyto Lake Road - 211 km	83
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Sub-total	$161 million
Bathurst Inlet Fuel Storage	50
Contwoyto Barge sites	4
Total	**$ 215 million**

Revenue

- **Tariffs/User Fees.**

Road (travel over road network)

- Fuel, supplies/concentrates @ $ per tonne -km.

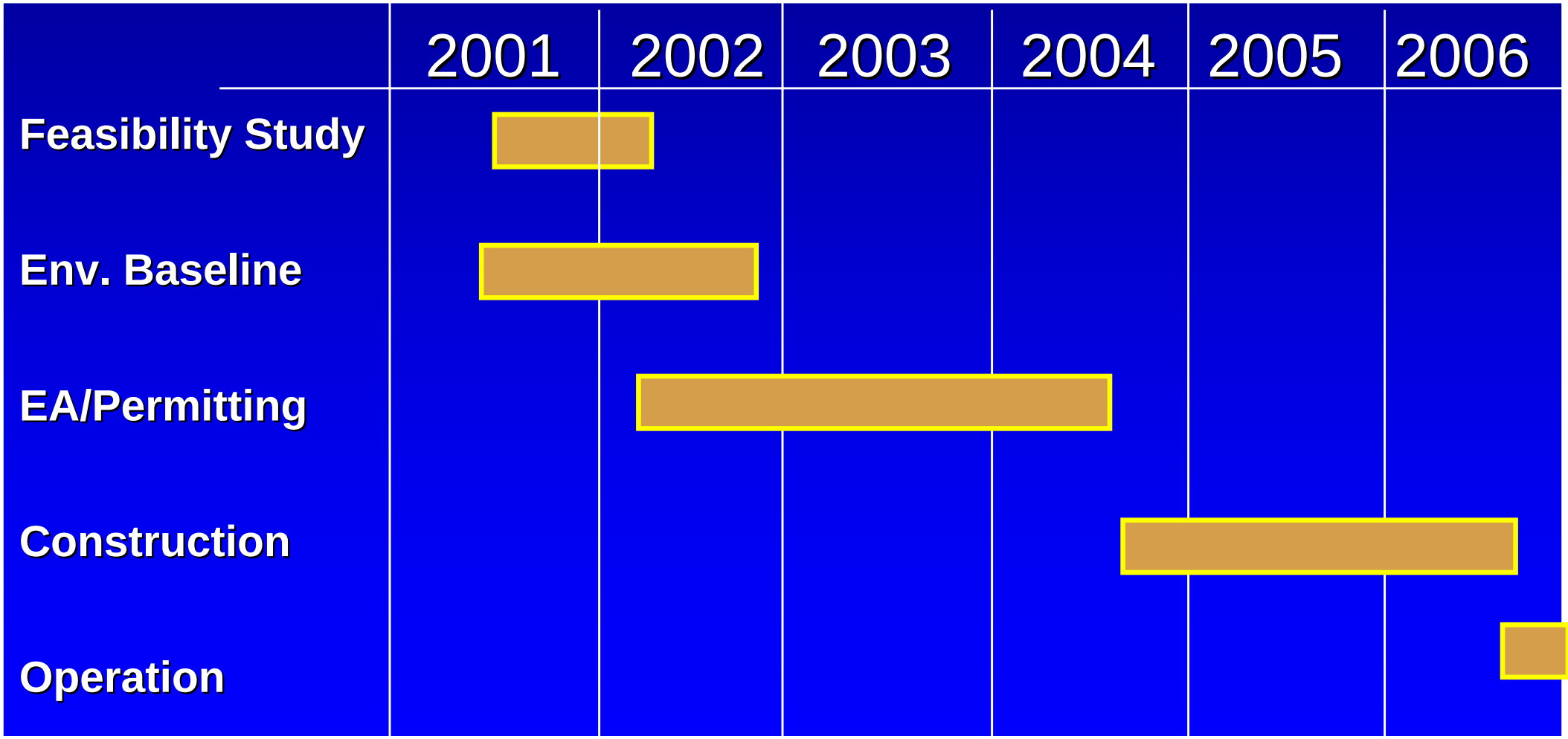
Barge on Contwoyto Lake

- Rates $ per tonne.

Port (handling and storage)

- Fuel, supplies/concentrates @ $ per tonne.

Project Schedule



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- **Kugluktuk.** January 14/02; two meetings, one with council. Other with the public. Over 70 people attended.
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Project Status

- Feasibility study complete.
- Baseline environmental studies complete summer 2002
- Preliminary Project Description sent to DIAND and KIA April 5, 2002.
- EIS complete December 2002

PRESENTATION TO BATHURST INLET, JULY 20, 2002

Bathurst Inlet Port and Road Project

Presentation

to

Bathurst Inlet

July 20, 2002.

Introduction

- The Slave Geological Province (SGP) is rich in mineral resources. About 40% of the SGP is in Nunavut (Kitikmeot).
- Full potential of SGP has not been developed because of a lack of transportation infrastructure.
- The only road access is by winter road from Yellowknife to Lupin Mine (630km).
- An arctic sea port and connecting roads would lead to significant growth in the area.

Infrastructure Solution

- Preliminary studies indicate the best option is a port on Bathurst Inlet and all-weather road to the Izok mineral deposit.
- Project built and operated by a partnership of Inuit, industry and government.
- The port and road would provide revenues from user fees or tolls.
- This infrastructure is part of the Nunavut “Transportation Strategy” Vision.
- Strong support from Kitikmeot Inuit Association and Kitikmeot Corporation.

The Project

- A port site on Bathurst Inlet, capable of handling 50,000 tonne OBO vessels.
- Facilities at the port for receiving, storing and shipping of base metal concentrates; fuel storage; bulk supply storage.
- All weather road to Contwoyto Lake(211km)
- Winter ice road and summer barge on Contwoyto Lake.
- All weather road - Lupin to Izok (79km). Izok is the major customer for the project.

Ulu
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Bathurst Inlet
PROPOSED PORT
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Mara R.
George Lake
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Itchen Lake
Contwoyto Lake
Winter Road
Summer Barge
Nose Lake
EKATI™
Diavik
Lac de Gras
NUNAVUT
NWT

Project Benefits

- Reduced capital and operating costs for mining exploration and development.
- Increased exploration activity.
- Reduction in cost of fuel and supplies for the Kitikmeot communities.
- Significant increase in local employment
- Increased economic activity and taxation revenues in Nunavut.

Port Location

- Bathurst Inlet was selected over a Coronation Gulf site as the best location for the port :

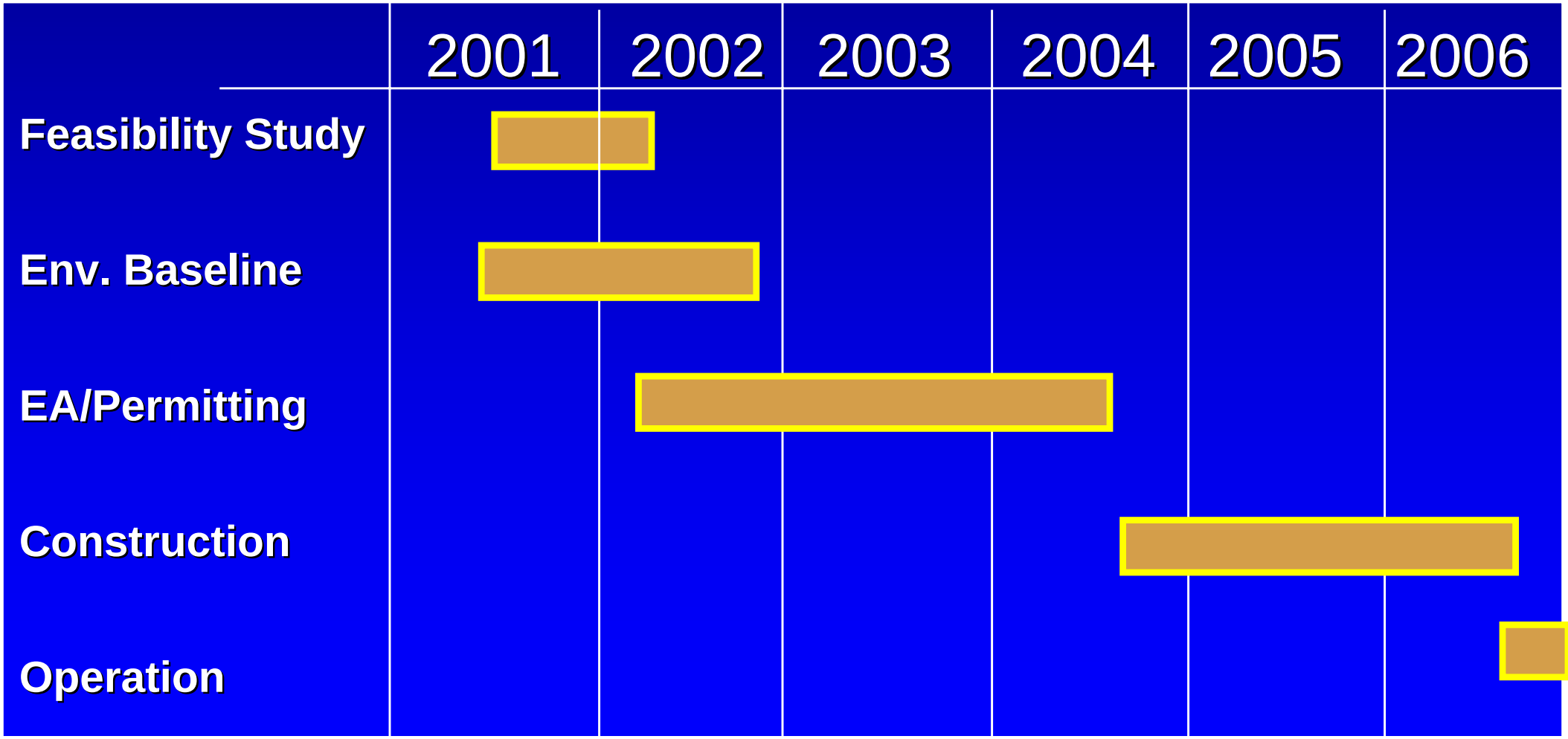
- lower capital and operating costs for the all weather road from Izok to the coast.
- potential to service more mineral deposits and prospects.
- the Coronation Gulf site would require another road to access mineral deposits

Table of Contents

Project Phases

- Phase 1 - Scoping Studies - *completed.*
- Phase 2 - Feasibility Study and Environmental baseline, socio-economic, Traditional Knowledge, archaeology studies - *in progress*.
- Phase 3 - Environmental assessment and permitting process.
- Phase 4 - Construction.
- Phase 5 - Operation.

Project Schedule



Feasibility Study

- Analysis of port and road users.
- Site selection for the port site.
- Route selection for the all weather road.
- Route selection for the Contwoyto Lake barge.
- Capital and operating costs for the project.
- Economic analysis of the project, including estimates of income from user fees.
- Review of financing options.
- Analysis of labour resources and employment.

Port and Road Users

Potential users (existing)

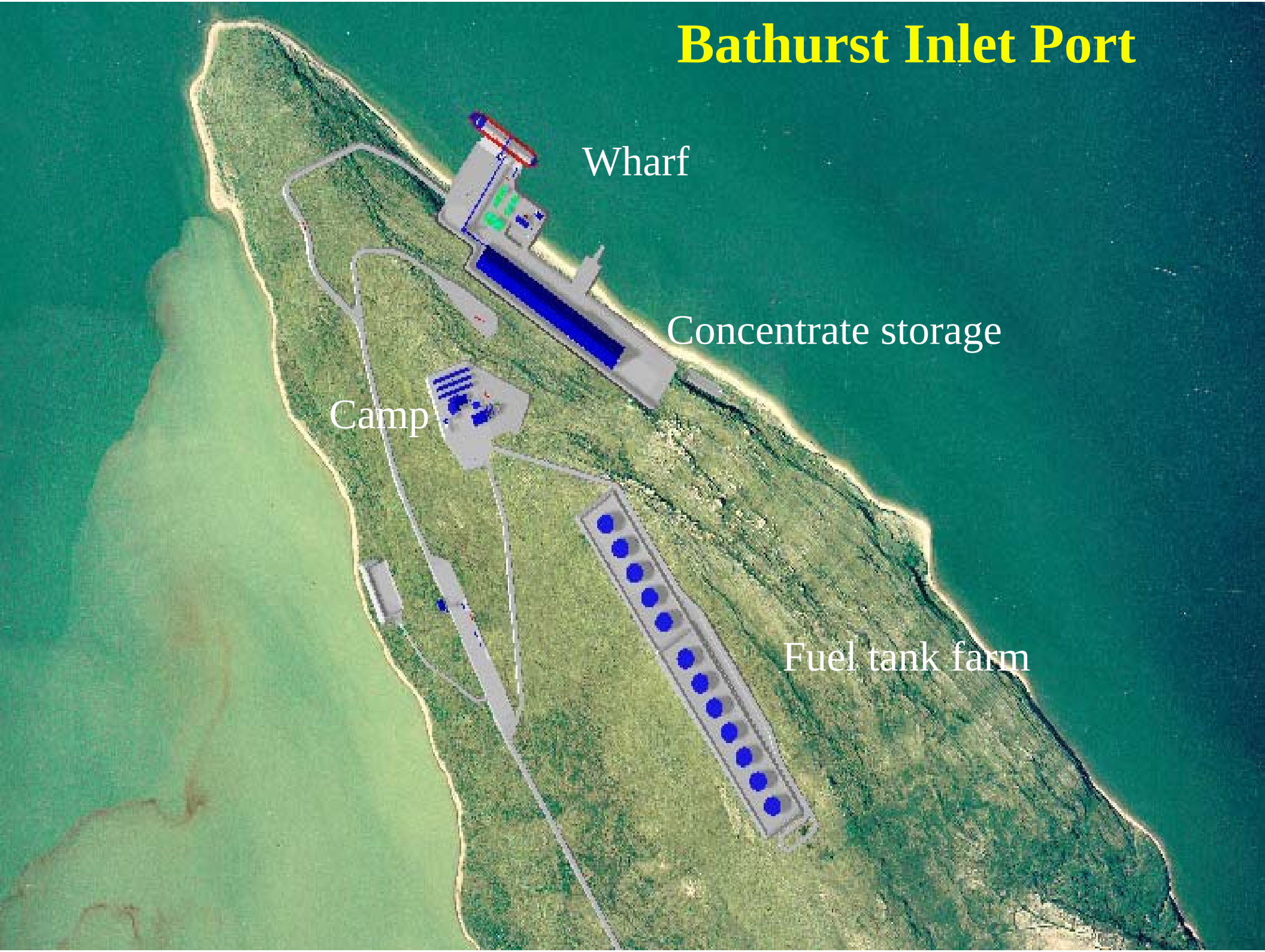
- **Lupin, Diavik, and Ekati mines.**
- **Nunavut communities**
  - **Cambridge Bay**
  - **Kugluktuk**
  - **Gjoa Haven**
  - **Taloyoak**
  - **Bathurst Inlet**

Possible users (future)

- **Izok**
- **Jericho**
- *George Lake, Goose Lake, Hope Bay*
- *Hackett River, Gondor*

Bathurst Inlet Port

- Dock suitable for handling 50,000 tonne vessels and ocean going barges;
- Fully enclosed mineral concentrate receiving and storage facilities owned by mines
- Ship unloading/loading equipment;
- 220 million litre fuel storage tank farm, barge and truck loading facilities;
- Accommodation, maintenance shops, airstrip and site services;


Bathurst Inlet Port
Wharf
Concentrate storage
Camp
Fuel tank farm

Bathurst Inlet Port

Community Barging Distances

- **Hay River to Bathurst Inlet and /or Cambridge Bay - 2500 km.**

- **Barge routes to Nunavut Communities and Mines, from Bathurst Inlet:**
  - Gjoa Haven - 840 km
  - Cambridge Bay - 400 km
  - Kugluktuk - 440 km
  - Taloyoak - 960 km
  - Hope Bay - 180 km

All-weather Road

- **Bathurst Inlet to Contwoyto Lake - 211 km**
- **Lupin Mine barge terminal site to Izok - 79 km**
- Road connections to mines from the all-weather road:
  - Ekati - 98 km (existing ice road)
  - Diavik - 127 km (existing ice road)
  - Jericho - 28 km
  - Hackett River - 25 km
  - George Lake - 19 km
  - Goose Lake - 55 km

Road Route Selection

- Three routes assessed using existing topo maps and aerial photos;
- Tried to locate route close to known and potential mines;
- Selected shortest route to reduce construction and trucking costs;
- Maximize route on bedrock and avoid poorly drained areas; follow smooth terrain, minimize road cuts;
- Minimize water crossings. Only 3 major river crossings (Amagog Creek, Mara River, Itchen Narrows);
- Construction materials, (quarried rock);
- Height of fill above land to average 1.6 m;
- Avoid cultural/heritage use area.

Contwoyto Lake Barge

- 69 km long barge route with minimum 5 m depth;
- Tug and barge to carry 10 - 90 tonne trailers at 20 km/hr;
- 90 day ice-free period;
- Vessel unloading/loading mobile equipment;
- Docks, accommodation, spill response, barge fuelling, maintenance shop, airstrip and site services at Lupin and South Contwoyto.

Land Ownership

- Inuit Owned Lands, total of 4,500 ha.
  - **142 km of road plus associated quarry sites.**
  - **South barge dock site on Contwoyto Lake.**
- Crown Land, total of 4,600 ha.
  - **Bathurst Inlet port site.**
  - **148 km of road and associated quarry sites.**
- Lupin Mine.
  - **12 km of existing roads, plus the north barge dock site.**

Shipping

- Ocean barge and tug to Kitikmeot communities;
- Normal shipping season during open ice period, mid-July to mid/late October (similar to existing shipping at Polaris and Nanisivik Mines);
- Majority of concentrate shipping will be via eastern route.

Shipping

Number of vessel return trips into Bathurst Inlet each summer:

- Concentrate/fuel ships 8 trips.
- Tug and barge to communities 2/3 trips.
- Other ships, coast guard etc 2/3 trips.

Operating Seasons

- Shipping: normal “open water” season, mid July to mid/late October.
- Road operation:

  - Winter, January 31 to April 30.

  - Summer, July 15 to October 15.

(Note: based on Contwoyto Lake ice road and barge shipping seasons).

Capital Cost

	$(Millions)
Bathurst Inlet Port	50
Bathurst to Contwoyto Lake Road - 210 km	83
Lupin to Izok Road - 80 km	29
Sub-total	**$162 million**
Bathurst Inlet Fuel Storage	49
Contwoyto Barge sites	4
Total	**$ 215 million**

*direct and indirect costs included

*includes royalties on borrow (approx. $8.3 million)

Revenue

- Tariffs/User Fees.

Road (travel over road network)

- Fuel @ $ per tonne - km.
- Operating supplies/concentrates @ $ per tonne -km.

Barge on Contwoyto Lake

- $ per tonne.

Port (handling and storage)

- $ per tonne

(The capital and operating costs for the project will be recovered through tariffs paid by the system users.)

Potential Employment Opportunities

- Operation (average)
  - **Administrative** **6**
  - **Operation & Maintenance** **72**
  - **Trucking (contract to mining companies)** **150**
- Construction (peak)
  - **Administration & Supervision** **35**
  - **Labour & Equipment Operators** **265**

Community Consultations

- **Kugluktuk.** January 14/02; two meetings, one with council. Other with the public. Over 70 people attended.
- **Bathurst Inlet.** January 15/02; met with the BI residents in Cambridge Bay, 14 people attended.
- **Cambridge Bay.** January 15/02; public meeting, over 80 people attended.
- **Taloyoak.** March4/02, council meeting, also public meeting, 40 people attended.
- **Kugaaruk.** March 5/02, 15 people attended.
- **Gjoa Haven.** March 6/02, 50 people attended.

- Will be more meetings through the next two years.

Comments from Communities

- Education/Training/Employment.
- Need development to provide a future for our children.
- Cost of living benefits to the Inuit in the Kitikmeot.
- Oil/concentrate spills.
- Caribou.
- Ice breaking.
- Project economics.

Project Proponent

- A 50/50 Joint Venture between the Kitikmeot Corporation and Nuna Logistics Limited.
- Kitikmeot Corporation owns 25% of Nuna Logistics.
- Both companies are registered Inuit owned companies

Project Status

- Feasibility study complete.
- Preliminary Project Description has been submitted to KIA, DIAND and NWB.
- Project referred to NIRB.
- NIRB has forwarded recommendations to Minister Nault.
- Waiting for response and EIS guidelines from NIRB.

Next Steps

- Complete review of project funding options.
- Complete current field studies and reports.
- Submit EIS in December 2002.

Major Components of the Project

- Port site at Bathurst inlet.
- All weather road to Contwoyto Lake.
- Barge system on Contwoyto Lake.
- All weather road Lupin to Izok.
- Provide fuel and supplies to the Kitikmeot communities by barge, and fuel via the existing winter road to Lupin, Ekati and Diavik. Followed by service to Izok on start up.

BATHURST INLET PORT AND ROAD PROJECT
POSTERS 2002

Bathurst Inlet Port and Road Project

Welcome to the Bathurst Inlet Port and Road Project

Project Technical Committee

Kitikmeot Corporation

Kitikmeot Inuit Association

Nuna Logistics Limited

Government of Nunavut
Community Government and Transportation
Department of Sustainable Development

Inmet Mining Corporation

Communities of Kugluktuk and Bathurst Inlet

Project Consultants

NISHI-KHON SNC•LAVALIN

SNC•LAVALIN Capital

Rescan

FMA

Kugluktuk Hunter's & Trapper's Organization

GEOWEST

Kitikmeot Corporation

Bathurst Inlet Port and Road Project

We wish to recognize our financial supporters:

Department of Indian Affairs and Northern Development
– Resource Partnership Program

Government of Nunavut
– Department of Sustainable Development
– Department of Community Government and Transportation

Coast Guard Canada

Inmet Mining Corporation

BHP Billiton Diamonds Inc., Ekati Diamond Mine™

Diavik Diamond Mines Inc.

Fednav

Northern Transportation Company Limited

Echo Bay Mines Ltd.

Nuna Logistics Limited

Hope Bay Gold Joint Venture

Tahera Corporation

Kitikmeot Corporation

Project Overview

Introduction

- The Slave Geological Province (SGP) is rich in mineral resources. About 40% of the SGP is in Nunavut (Kitikmeot).
- Full potential of the SGP has not been developed because of a lack of transportation infrastructure.
- The only road access is by winter road from Yellowknife to Lupin Mine (630 km).
- An arctic sea port and connecting roads would lead to significant growth in the area.

Infrastructure Solution

- Studies indicate the best option is a port on Bathurst Inlet and all-weather road to the Izok mineral deposit.
- Project built and operated by a public/private partnership of Inuit, industry and governments.
- The port and road would provide revenues from user fees or tolls.

Project Overview

The Project

- A port site on Bathurst Inlet, capable of handling 50,000 tonne ice class vessels
- Facilities at the port for handling base metal concentrates, fuel and bulk supplies
- All-weather road to Contwoyto Lake (211 km)
- Winter ice road and summer barge on Contwoyto Lake
- All-weather road, Lupin to Izok 79 km.

Bathurst Inlet Port Site

Operating Season

Operating Season Schedule

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Shipping												
Road Operation												

Note: Based on Contwoyto Lake ice road and barge shipping seasons.

Bathurst Inlet Port Site

Land Ownership

Inuit Owned Lands (total of 4,500 ha)

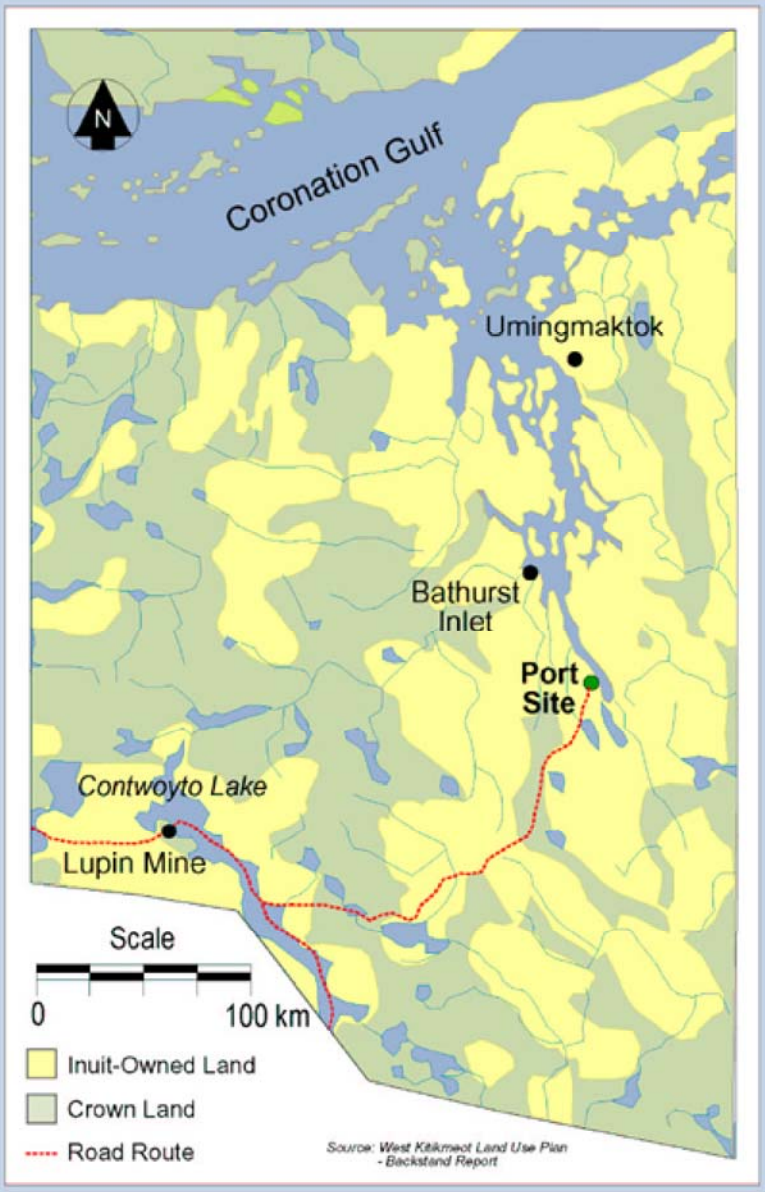
- 142 km of road plus associated quarry sites
- South barge dock site on Contwoyto Lake

Crown Land (total of 4,600 ha)

- Bathurst Inlet Port site
- 148 km of road and associated quarry sites

Lupin Mine

- 12 km of existing roads, plus the north barge dock site



West Kitikmeot Planning Region

Map of Road Route

Proposed Shipping Route and Ice Data

Proposed Shipping Route

LEGEND:
- Proposed Shipping Route
- Gold Deposit
- July 5 — Average Date of Ice Break-up (1975-1991)

Detail of Proposed Shipping Route in Bathurst Inlet

Project Benefits/Socio-Economics

Project Benefits

- Reduced cost of fuel and supplies for the Kitikmeot communities.
- Reduced capital and operating costs for mining exploration and development.
- Significant increase in local employment, Inuit businesses and capacity building in Nunavut.
- Increased economic activity and taxation revenues to Nunavut and Canada.

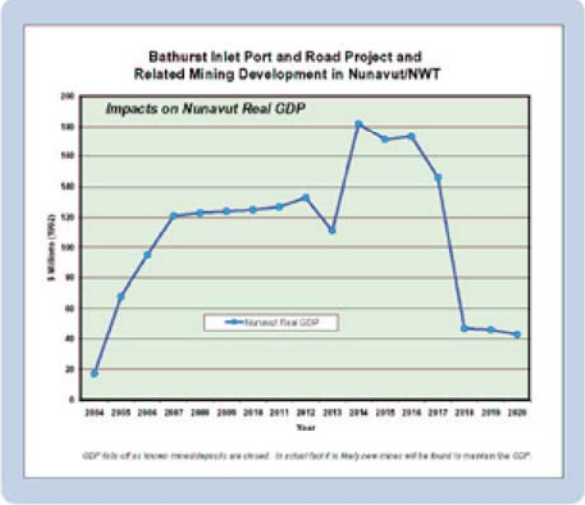
Community Consultation and Socio-Economic Studies

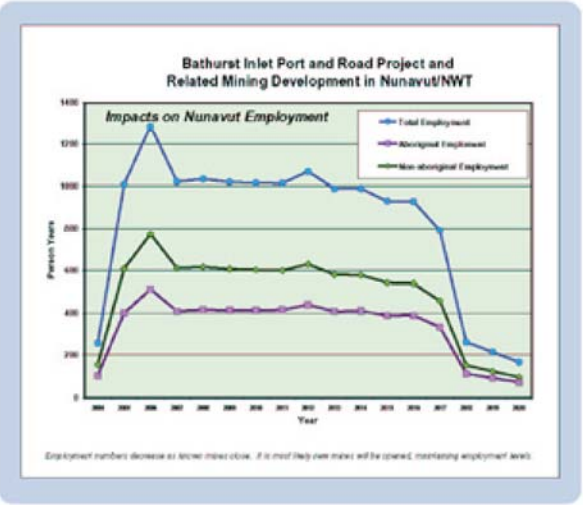
- Public meetings and presentations were held in six communities in the Kitikmeot region of Nunavut in 2002 - Bathurst Inlet, Cambridge Bay, Kugluktuk, Gjoa Haven, Taloyoak and Kugaaruk.
- The prospects for training and direct employment for community members was the most commonly mentioned issue of public concern in these communities.
- A socio-economic study involving the six Kitikmeot communities has been prepared.

Benefits for the Economy of Nunavut and Canada

Impacts of the Bathurst Inlet Port and Road Project and related mining development between 2004 and 2020:

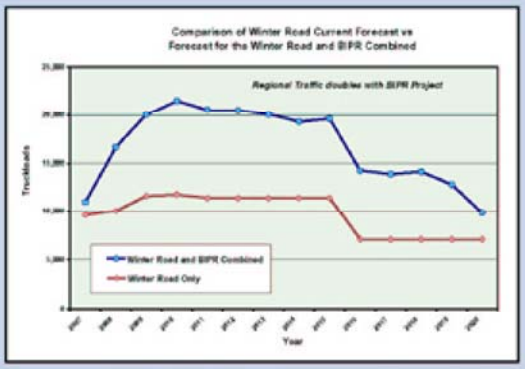
- Cumulative impact on the Real GDP of Nunavut is forecast at $1,905 million (1992 $).
- Total employment in Nunavut is forecast to rise by 14,000 person years of which about 6,000 person years will be aboriginal employment.
- The total impact on the Provinces is forecast to be an increase in Real GDP of $1,195 million (1992 $).





Impacts of the Project on the Existing Winter Road and Yellowknife

- The Project will have a positive effect on the whole region. The existing Winter Road will continue to be an essential component of the regional transportation infrastructure, linked to the BIPR Project. The economic impact on Yellowknife will be positive.
- With the BIPR Project in place, the annual trucking volumes in the region will double when the Izok Mine is in production.
- An increase in the number of mines in the region and the ability to re-supply the Kitikmeot communities will provide potential for an increase in purchasing, manpower requirements, expediting and other services being supplied through Yellowknife.
- It will be possible to move freight, such as construction materials for the Kitikmeot communities, from Yellowknife to Bathurst Inlet during the winter season. This freight can then be barged into the communities 4 to 6 weeks earlier than the existing sealift.
- A 1999 GNWT study stated "...The construction of an all-weather road in the north and a port on Bathurst Inlet will be to the Western NWT's eventual benefit. It will lower costs and spur development both east and west of the border.

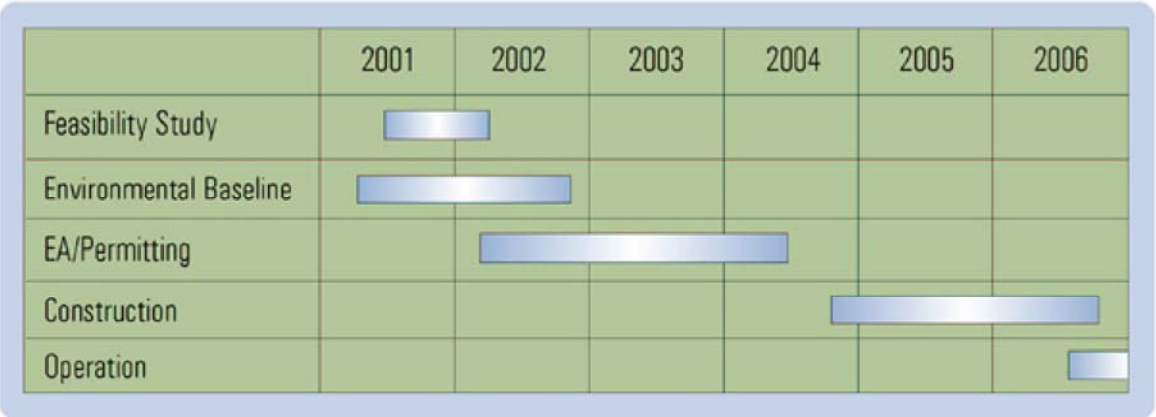


Project Status and Schedule

Project Status

- Feasibility study complete.
- Baseline environmental studies essentially complete summer 2002, some monitoring work required for 2003.
- Preliminary Project Description sent to DIAND, KIA and NWB April 5, 2002.
- EIS and Final Project Description complete April 1, 2003.
- Target construction start September 2004.
- Operations begin August 2006.

Schedule



Capital Cost/Employment Opportunities

Capital Cost	$ (million)
Bathurst Inlet Port	$50
Bathurst/Contwoyto Lake Road (211 km)	83
Bathurst Inlet Fuel Storage	50
Subtotal	183
Lupin to Izok Road (80 km)	29
Contwoyto Barge Sites	4
Total	$216

Employment Opportunities

Construction (peak)

Administration and Supervision = 35 people

Labour and Equipment Operators = 265 people

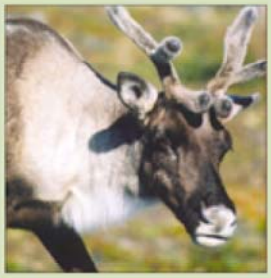
Operation (average)

Administrative = 6 people

Operation and Maintenance = 72 people

Trucking (contract to mining companies) = 150 people

Bathurst Caribou Herd



- The road route lies within the spring and summer range of the Bathurst caribou herd, which is shared by NWT and Nunuvut. With a population of 350,000 animals, it is the second largest caribou herd in NWT/Nunavut.

- Aerial surveys and ground observations of caribou distribution within a 10 km corridor along the proposed road route were carried out between July 2001 and July 2002.

- Road operations are scheduled to be suspended during spring break-up, between April 30 and July15, which coincides with spring migration, calving and post-calving movements in the Project area.

Other Wildlife

- Aerial surveys were conducted in four seasons for large mammals within a 10 km corridor along the proposed road route (*e.g.* grizzly bears, muskox, wolves, *etc.*)

- Grizzly bear habitat along the route has been assessed.

- Incidental wildlife sightings were collected during field work in July-August 2001 and April, 2002, including mammals, waterfowl, and song birds.

- Esker complexes have been ground-surveyed for wildlife use.

- Denning sights were located by helicopter or esker ground surveys. Wolf, fox, grizzly bear, and wolverine dens were recorded and assessed.

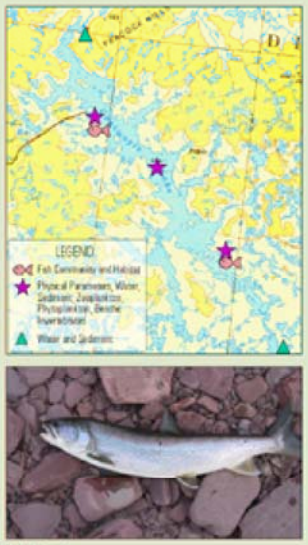
- Small mammal populations were assessed by trapping (*e.g.* voles, lemmings).

- Raptor territory and nest surveys were completed in July, 2002 (*e.g.* rough-legged hawks, peregrine falcons, gyrfalcons).

Freshwater Environment

Contwoyto Lake

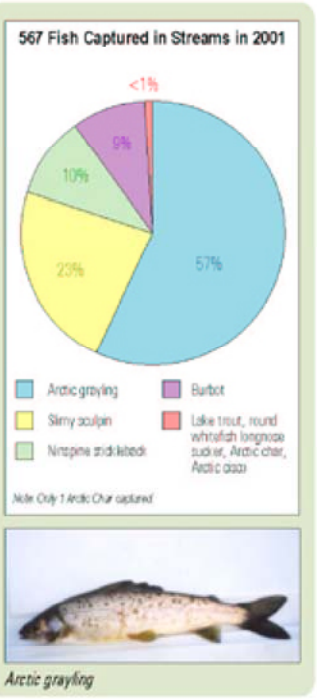
- **Fish Community**
  - gillnetting, seining, minnow traps (lake trout is the dominant species)
- **Fish Habitat**
  - aerial and ground survey
- **Aquatic Biology and Chemistry**
  - Physical parameters (temperature, DO, light penetration)
  - Water quality (physical parameters, nutrients, metals, petroleum hydrocarbons)
  - Sediment quality (description, nutrients, metals, petroleum hydrocarbons, and particle size)
- **Phytoplankton**
- **Zooplankton**
- **Benthic Invertebrates**



Lake trout

Streams Along the Road Route

- **Fish Community and Fish Habitat**
  - Aerial assessment of 156 streams in July 2001
  - Detailed surveys of 75 streams in August 2001
  - Additional work conducted in 2002
- **Aquatic Biology and Chemistry**
  - Water quality (physical parameters, nutrients, metals)
  - Sediment quality (description, nutrients, metals, particle size)
  - Periphyton
  - Benthic invertebrates



Arctic grayling

Marine Environment

Fish and Fish Habitat Studies

Fish Community

- Various equipment used to sample (gillnets, beach seines, long lines and minnow traps)
- 11 fish species captured (Arctic cisco, starry flounder, Arctic cod, Arctic flounder, Pacific herring, broad whitefish, rainbow smelt, Arctic char, ogac, and lake trout

Arctic cod

Broad whitefish

Starry flounder

Beach Seining at Port Site in Bathurst Inlet

Fish Habitat

- Aerial Survey
- Ground Survey

Marine Sampling Sites

Physical/Biological Oceanography

- 5 stations near port site
- Physical parameters collected:
  - temperature
  - dissolved oxygen
  - conductivity
  - water quality
  - sediment quality
- Biological parameters collected:
  - phytoplankton
  - chlorophyll *a*
  - zooplankton
  - benthic invertebrates

Sampling Water at Port Site

Surficial and Bedrock Geology/Terrestrial Ecosystem Mapping/Atmospheric Environment

Surficial Geology and Terrestrial Ecosystem Mapping

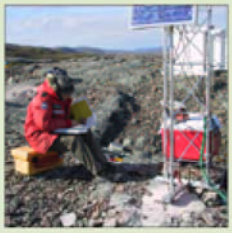
- Mapping was conducted at 1:15,000 scale using aerial photographs.
- Nearly 4,500 terrain units were delineated along the road route for the surficial geology and soils mapping.
- More than 700 vegetation plots were established along the road route.

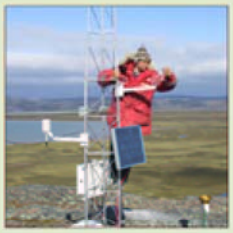
Bedrock Geology Characterization

- Completed bedrock geology mapping at 1:60 000 scale across a 1 km wide corridor along the entire proposed route.
- Collected 38 representative bedrock samples that underwent acid base accounting analysis to determine the potential for acid rock drainage.
- Prospected for soapstone occurrences along the route. The Inuit continue to use soapstone for traditional carvings throughout many areas in Nunavut and the Northwest Territories.

Atmospheric Environment

- Meteorological station set-up near the Bathurst Inlet Port location.
- Data collected from August 2001 to August 2002.
- Data collected include:
  - Air temperature
  - Relative humidity
  - Rain
  - Wind Speed
  - Wind direction
  - Solar radiation
  - Snow depth





Heritage Resource Studies

Heritage resources survey for the proposed route of the Bathurst Inlet Port and Road project was conducted under permit of the Nunavut Government and the Department of Culture, Language, Elders and Youth

- In 2001, 100 heritage resources sites were identified by an archaeological team.
- In 2002, a team conducted mitigation of the sites considered to be in danger of impact due to road construction. During that project an additional 34 heritage resources sites were identified.
- During both surveys, community assistants participated as team members in the identification of heritage resources. Elders from local communities were given the opportunity to visit sites and comment on the impacts of the proposed project on heritage sites and how the impacts could be resolved.

Tony Akoluk and Alan Youell working on artifact collection at LjPb-33 overlooking Itchen Lake narrows. Mitigating this site will preserve the data for use in the regional database of heritage sites.

Tent Ring at Bathurst Peninsula. A number of tent rings are located along the shoreline of the Bathurst Inlet port site that indicate previous seasonal occupations of the area.

Artifacts such as this projectile point are used to identify previous occupants of the study area and to try and tie them into a time period.

PRESENTATION TO NIRB SCOPING MEETINGS, JUNE 2004

the BATHURST INLET PORT AND ROAD PROJECT

Bathurst Inlet Port and Road Project

(An Economic Development Project for the Kitikmeot Region of Nunavut)

Presentation to NIRB
Scoping Meetings
June 22/23/24, 2004

FMA Rescan™ NISHI-KHON SNC·LAVALIN

Presenters

- M. Hempenstall, Bathurst Inlet Port and Road JV.

  (Bathurst Inlet Port and Road JV is a 50/50 Joint Venture between Kitikmeot Corporation and Nuna Logistics Ltd.)
- Tony Wachmann, Nishi Khon SNC Lavalin
- Francois Landry, Rescan Environmental Services
- Ben Hubert, Hubert and Associates
- Gloria Fedirchuk, FMA

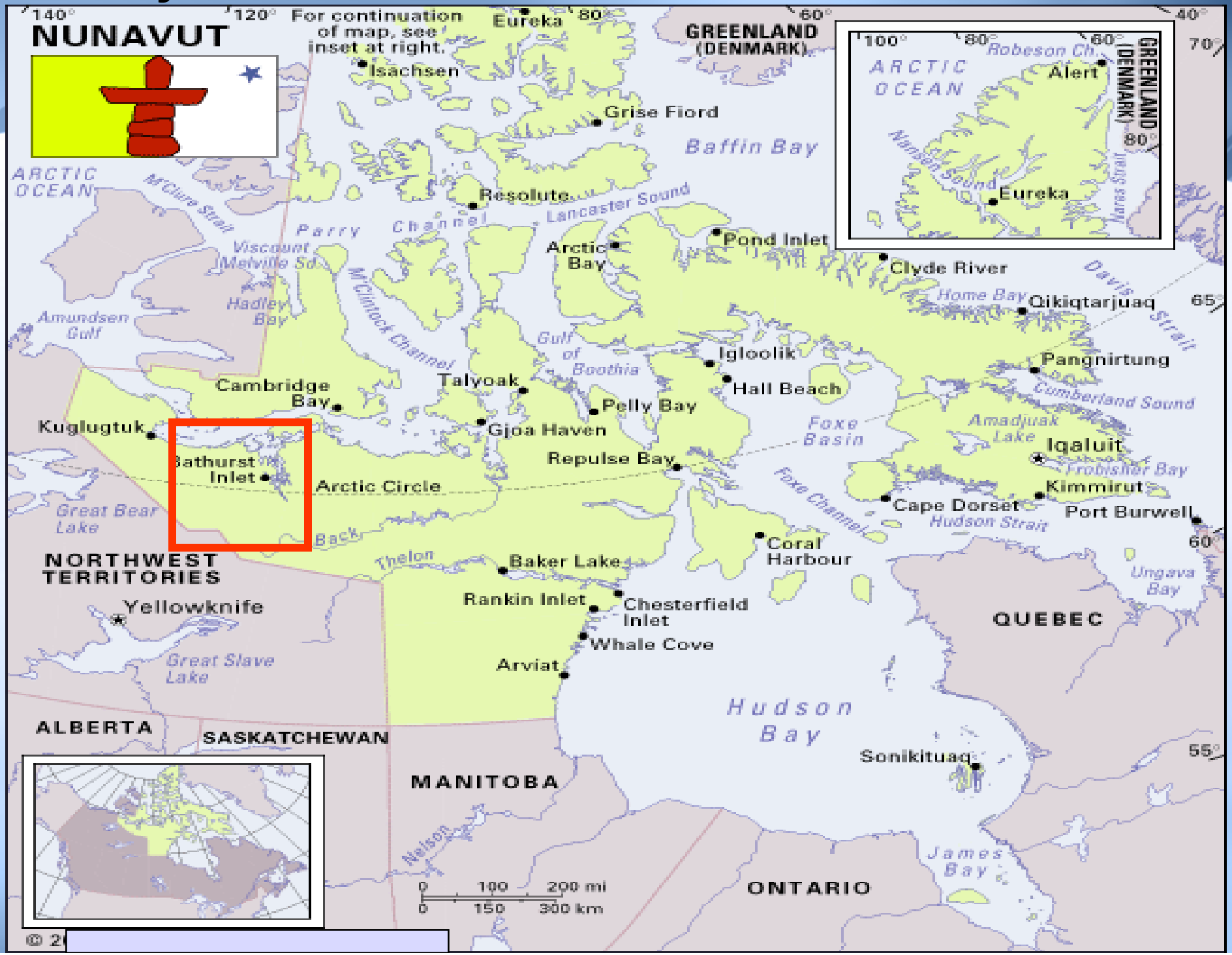
Contents

- Introduction
- Project Description
- Engineering
- Environmental and Socio-Economics
- Archaeology
- Conclusion

Project Technical Committee

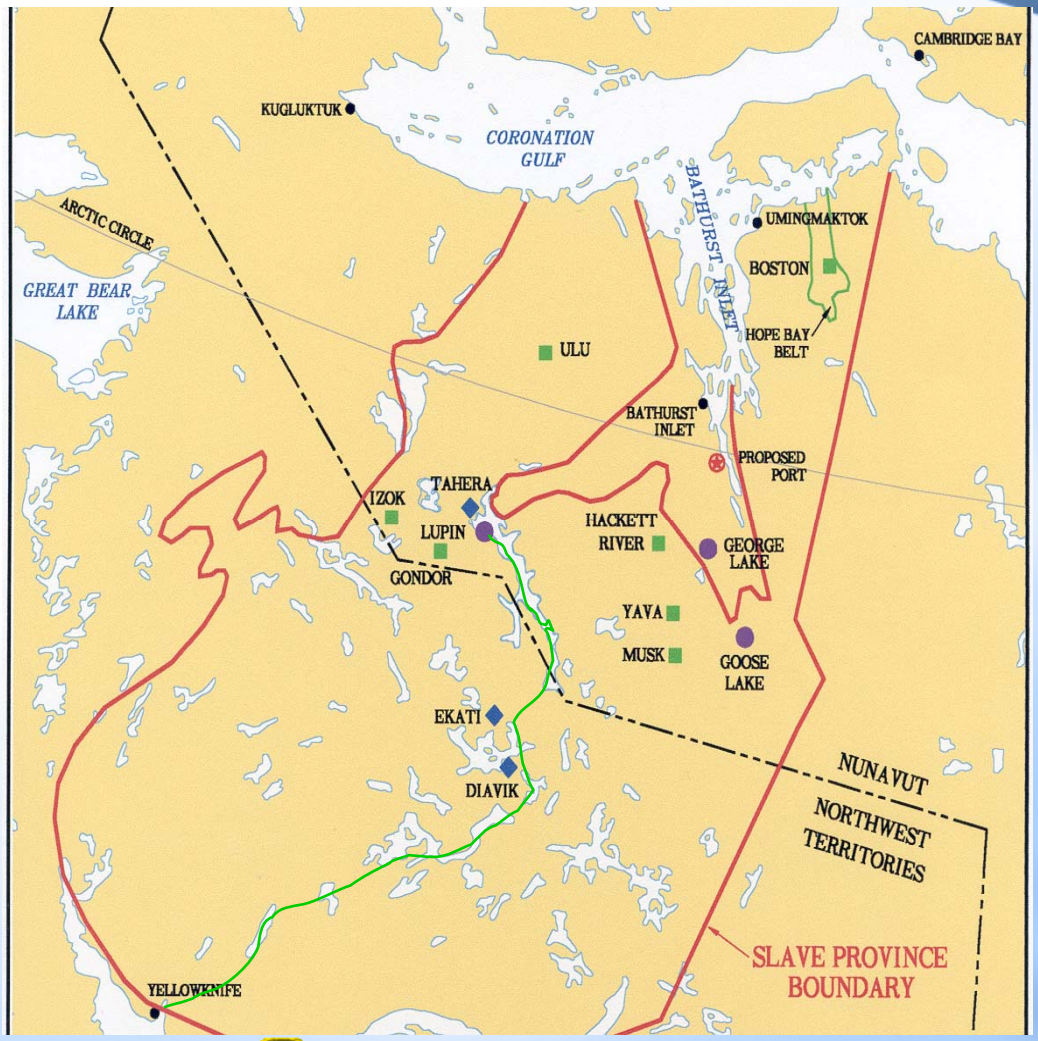
- Kitikmeot Corporation
- Kitikmeot Inuit Association
- Nuna Logistics Ltd
- Inmet Mining Corporation
- Government of Nunavut (2)
- Communities of Kugluktuk, Cambridge Bay and Bathurst Inlet

Project Location



Introduction

- **The Slave Geological Province (SGP) is rich in mineral resources.**
- **Full potential of SGP has not been developed because of a lack of transportation infrastructure.**
- **The only road access is a winter road Yellowknife to Lupin Mine (630km).**



the BATHURST INLET PORT AND ROAD PROJECT

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Infrastructure Solution

- Studies indicate the best option is a port on Bathurst Inlet and all-weather road to Contwoyto Lake, (211km), connecting with the existing winter road from Yellowknife to Lupin.

- This infrastructure is included in the Nunavut Transportation Strategy Vision.

- There is strong support from Kitikmeot Inuit Association, Government of Nunavut and DIAND.

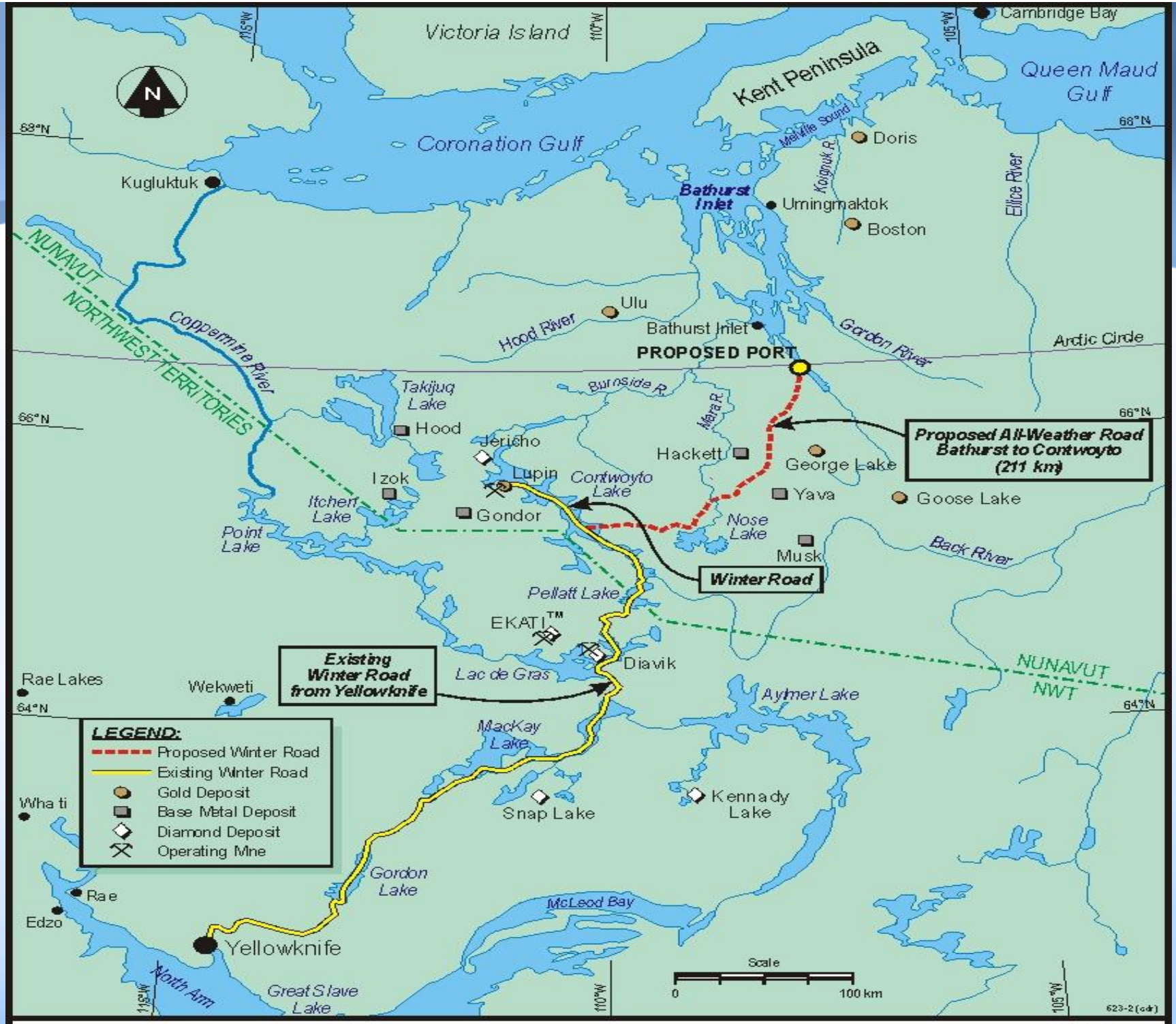


FIGURE 1

Bathurst Inlet Port and Road Project - Location Map

Land Ownership

The project will occupy:

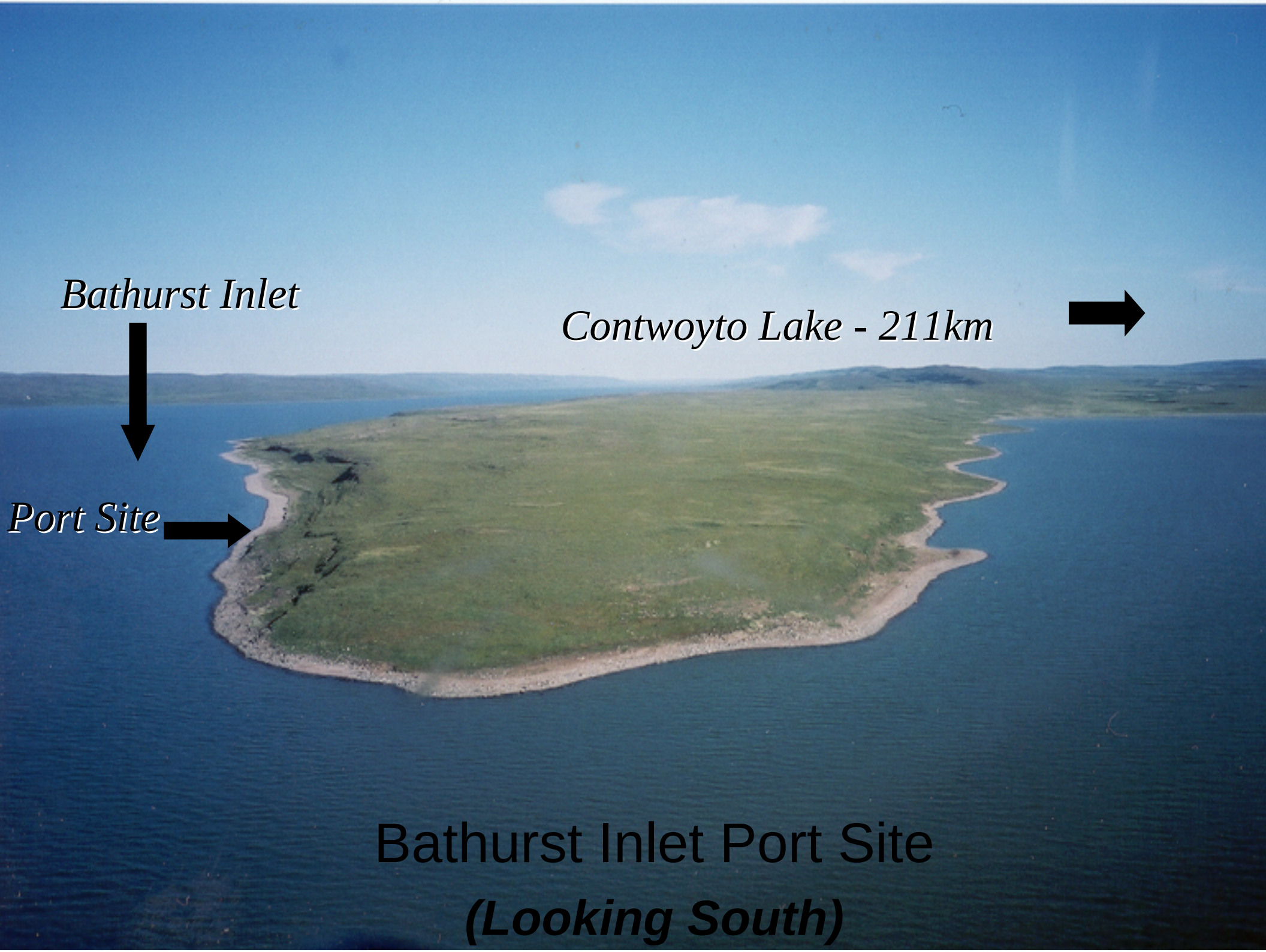
- Inuit Owned Land (IOL) 143 ha
  - Contwoyto camp 2 ha
  - 82.3km of road (& quarries) 141 ha
- Crown Land 370 ha
  - Port site camp and airstrip 159 ha
  - 128.9 km of road (&quarries) 211 ha

Capital Cost

	$(Millions)
Bathurst Inlet Port (dock, camp etc)	46
Port/Contwoyto Lake Road (211km)	76
Bathurst Inlet Fuel Storage	42
TOTAL	164

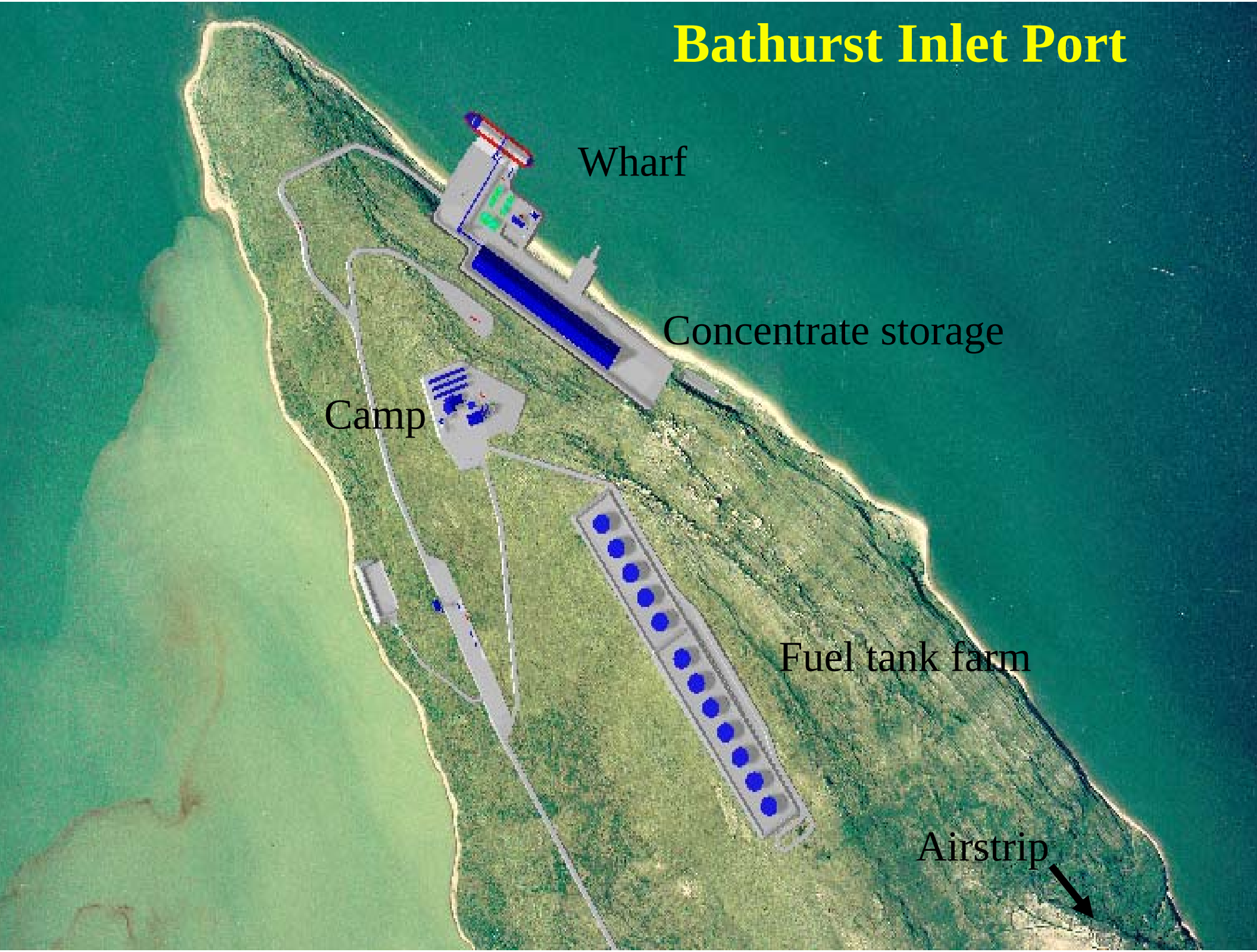
Project Financing

- **Project would be built and operated by a public-private partnership (3P) of Inuit organizations, governments and the private sector.**
- **The Project would provide revenues from port and road user fees or tolls to cover costs.**
- **Financial studies show that a 3P project is viable.**



Bathurst Inlet Port Site

(Looking South)

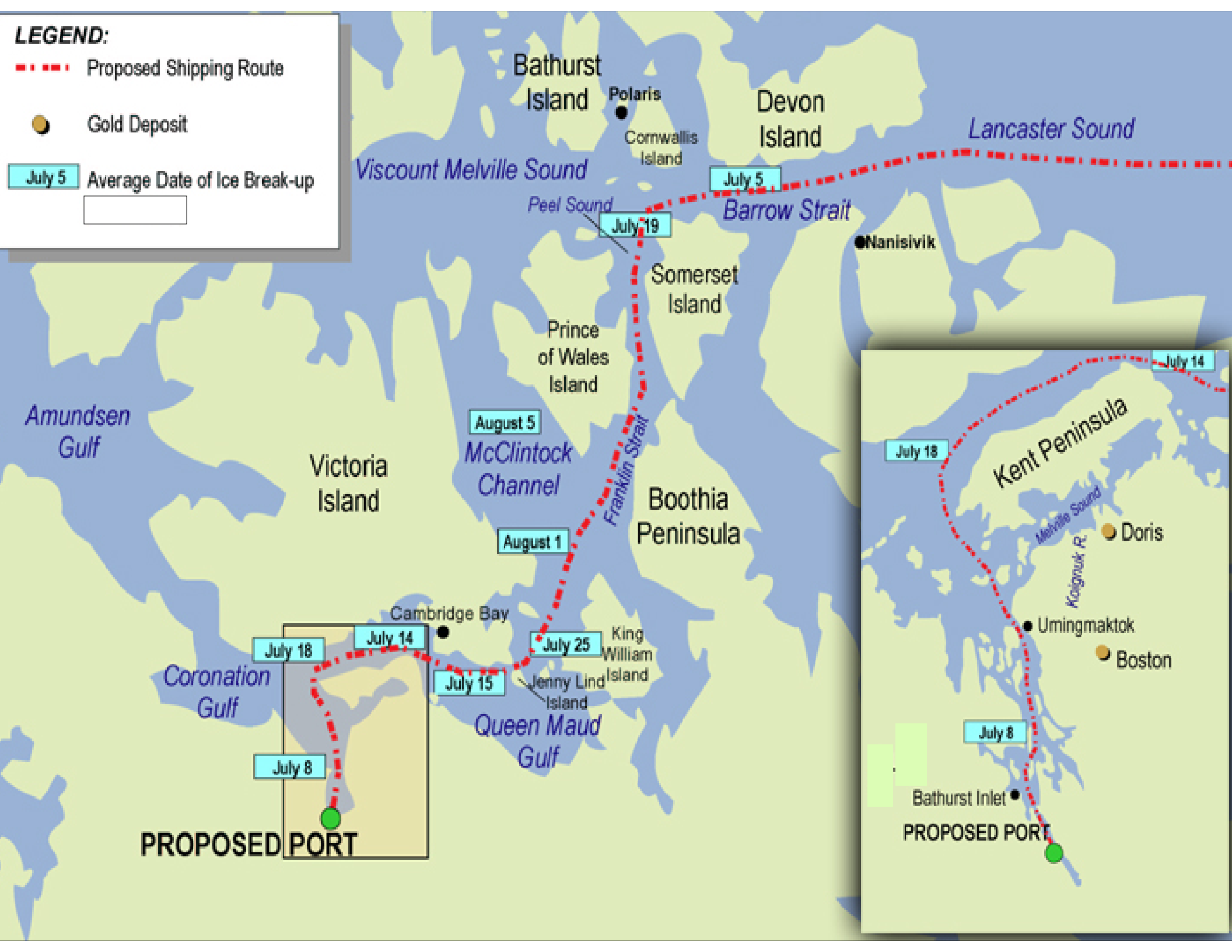

Bathurst Inlet Port
Wharf
Concentrate storage
Camp
Fuel tank farm
Airstrip

Shipping

- Independent studies have shown that the route to the proposed port site is suitable for vessels up to 50,000 tonnes.

- Vessels are allowed to enter Canadian Arctic waters as long as they comply with the Arctic Waters Pollution Prevention Act.

- Fuel and supplies would be shipped from eastern Canada or offshore into Bathurst Inlet during the open ice period, mid-July to mid/late October, (90 to 100 days, similar to existing shipping at Polaris and Nanisivik Mines).


LEGEND:
Proposed Shipping Route
Gold Deposit
July 5
Average Date of Ice Break-up
Bathurst Island
Polaris
Cornwallis Island
Devon Island
Lancaster Sound
Viscount Melville Sound
Peel Sound
July 19
July 5
Barrow Strait
Nanisivik
Somerset Island
Prince of Wales Island
Amundsen Gulf
August 5
McClintock Channel
Franklin Strait
Victoria Island
Boothia Peninsula
August 1
Cambridge Bay
July 18
July 14
July 25
King William Island
July 15
Jenny Lind Island
Coronation Gulf
Queen Maud Gulf
July 8
PROPOSED PORT
July 14
July 18
Kent Peninsula
Melville Sound
Doris
Kugaruk R.
Umingmaktok
Boston
July 8
Bathurst Inlet
PROPOSED PORT

Project Operations

- Summer shipping as described above
- Fuel and supplies delivered to Kitikmeot communities by barge during summer.
- The “all weather” road would operate in winter only, between January and April, to deliver supplies by truck to mines in Nunavut and NWT. Trucks would be both captive to the project and also come from the South as necessary.
- Water use is for domestic purposes only. No industrial wastes, sewage would be treated for disposal.

Project Benefits

- Reduced cost of fuel and supplies for the Kitikmeot communities.
- Reduced capital and operating costs for mining exploration and development.
- Significant increase in Inuit businesses and local employment.
- Increased economic activity in Nunavut, NWT (especially Yellowknife)

Project Schedule

- If guidelines for the EIS are received from NIRB by September 2004, the EIS could be complete by early 2005.
- If permitting is complete by spring 2006, then mobilization can begin summer 2006.
- Construction can begin fall 2006 and be complete by summer 2008. Then the dock site will be operational by summer 2007.
- Operations would then begin summer 2008.

the BATHURST INLET PORT AND ROAD PROJECT

Engineering and Feasibility Study

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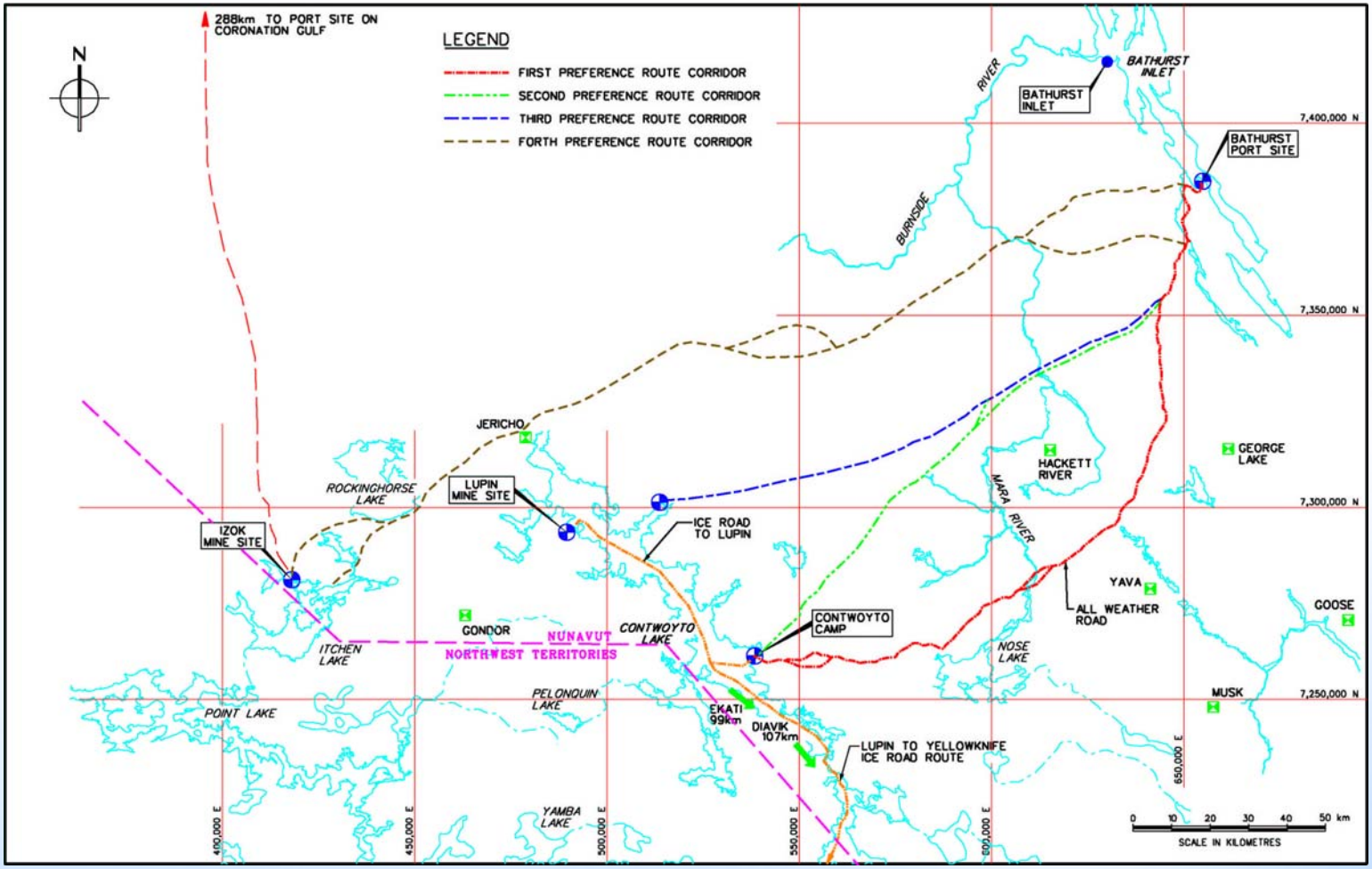
Engineering and Feasibility Study

Study Scope:

- Port and Road Users
- Bathurst Inlet Port
- All-weather Road
- Cultural Resources
- Labour Resources
- Capital and Operating Cost estimates
- Execution Plan
- Financial Evaluation

Alternate All-Weather Road Routes



the BATHURST INLET PORT AND ROAD PROJECT

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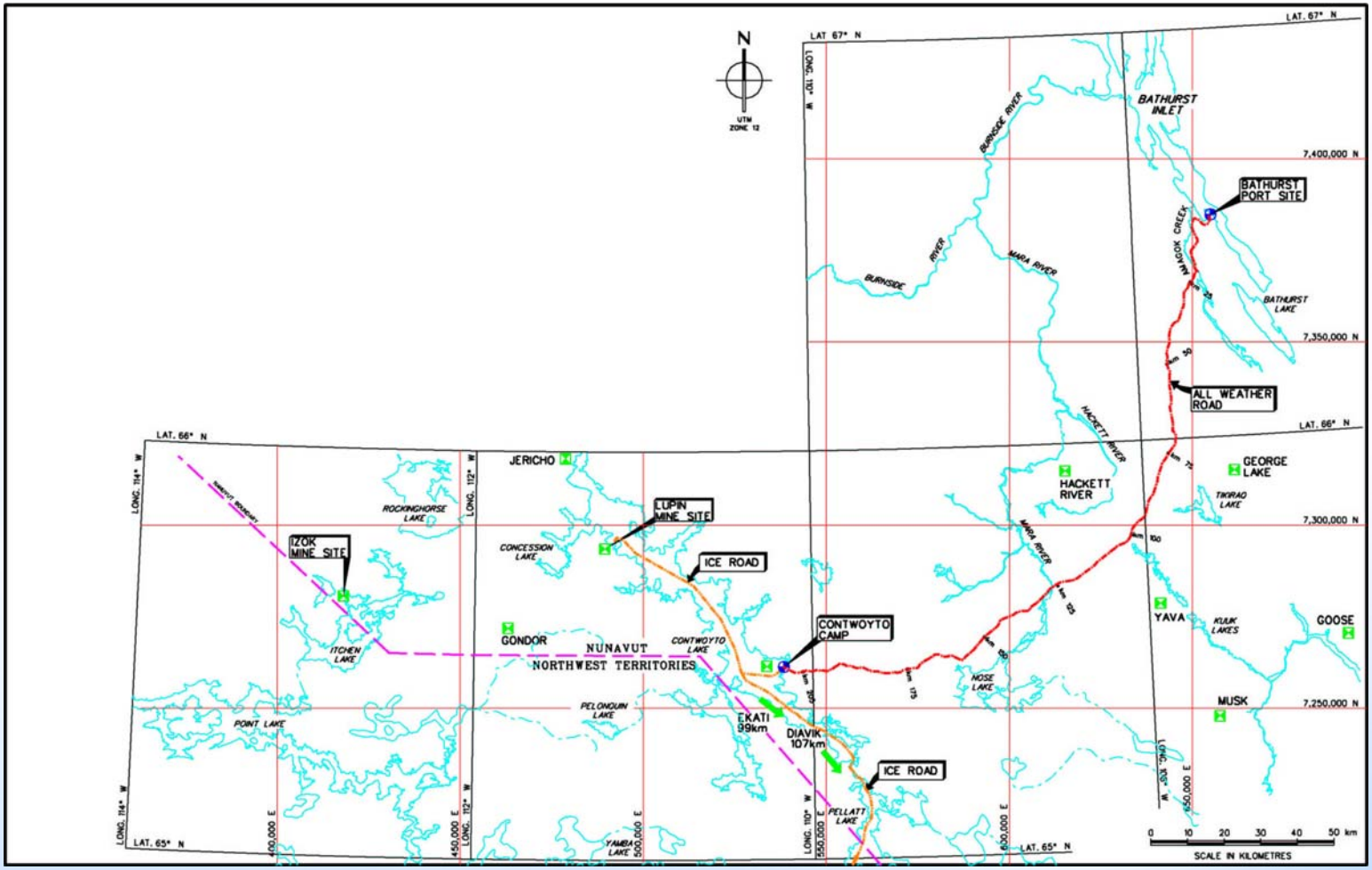
All-Weather Road Route Selection

- Locate close to known and potential mines to maximize potential use
- Select shortest route to reduce construction and trucking costs
- Follow smooth terrain with moderate grades and minimize road cuts
- Maximize route on bedrock and avoid poorly drained areas
- Minimize water crossings (rivers, creeks, fish bearing streams)
  Only 2 major river crossing(Amagok Creek, Mara River)
- Source local construction materials (eskers, rock outcroppings/quarry), keep haul distances under 7 km
- Maintain road embankment fills to average 1.6 m
- Avoid environmentally sensitive and cultural/heritage use area

Preferred All-weather Road Route



the BATHURST INLET PORT AND ROAD PROJECT

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All-Weather Road

- Bathurst Inlet to Contwoyto Lake – 211 km
- Road connections constructed and maintained by each mine:

• Ekati	-	98 km (existing ice road)
• Diavik	-	127 km (existing ice road)
• Lupin	-	69 km (existing ice road)
• Jericho	-	28 km (from Lupin)
• George Lake	-	19 km
• Goose Lake	-	55 km

All-Weather Road Criteria

- 70 km/hr all-weather road;
- 90 tonne design vehicle (55 tonne on ice roads);
- 8 m gravel running surface with 12 m wide turnouts every km and at bridges and stream crossings;
- modular single lane steel bridges over rivers, arch culverts or rock fords in non-fish bearing creeks;
- 1.0 to 1.8 m rock fill road embankment;
- Construction quantities
  - Bathurst inlet to Contwoyto lake - 4.6 million m3
- 30 km/hr on ice roads

Typical All-Weather Road

the BATHURST INLET PORT AND ROAD PROJECT

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Typical River Crossing

the BATHURST INLET PORT AND ROAD PROJECT

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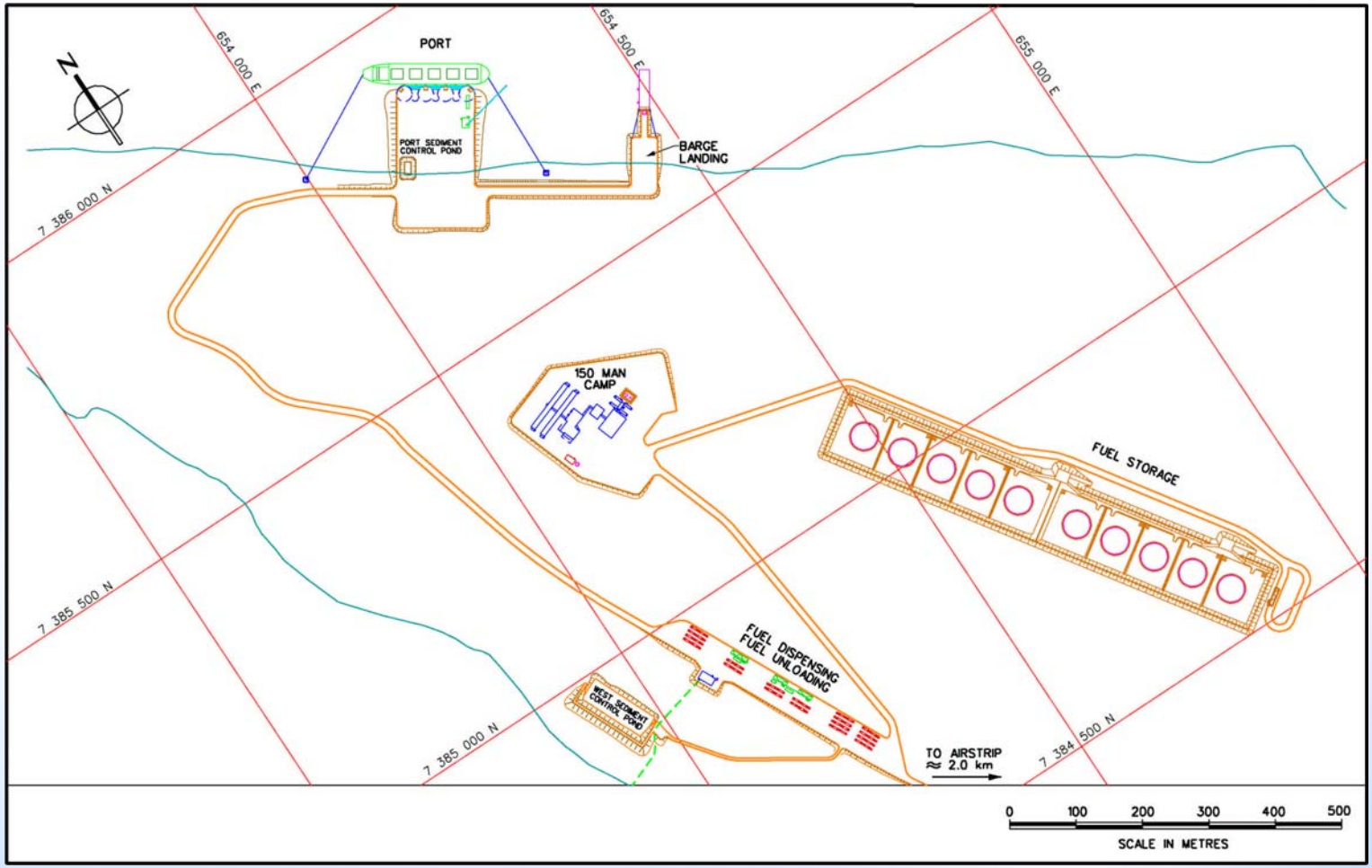
Bathurst Inlet Port Site

- Wharf suitable for handling 50,000 tonne vessels and ocean barges carrying fuel and general cargo
- Lay down and container storage areas
- Vessel unloading/loading mobile equipment
- 180 million liter fuel storage tank farm, vessel unloading and truck loading facilities
- Accommodation, maintenance shops, airstrip and site services

Bathurst Inlet Port Site



the BATHURST INLET PORT AND ROAD PROJECT

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Bathurst Inlet Port Site Selection

- 13.5 m water depth close to shore, with steep drop-off Bathymetry of Bathurst Inlet and seaward approach was completed in 1998
- Sufficient vessel turning area - 1400 m
- Marine geotechnical conditions were determined by drilling off the ice in may 2001. Bottom sediments are soft clays approx. 15 m thick to bedrock
- Rock foundations for major shore side structures
- Local source of construction materials (eskers, rock outcroppings/quarry), keep haul distances under 10 km
- Airstrip located on esker at south end of peninsula
- Room for future expansion

Ocean Shipping and Barging

- Cambridge Bay to Hay River - 2500 km
- Bathurst Inlet to Europe - 7200 km
- Bathurst Inlet to Montreal - 5900 km
- Barge routes to Nunavut Communities and Mines:
  - Cambridge Bay - 400 km
  - Gjoa Haven - 840 km
  - Kugluktuk - 440 km
  - Taloyoak - 960 km
  - Hope Bay - 180 km

Caribou

Bathurst Caribou Herd:

- Range over the entire SGP
- Now calving West of Bathurst Inlet, but to date not in the area of the road or port.
- Spring migration March 16 to May 25, coincides with the road closure for breakup
- During summer haulage season, caribou density at lowest point, interaction will be brief and infrequent
- GN management status of this herd is “secure”

Caribou

Victoria Island Caribou (also referred to as the Dolphin and Union Herd):

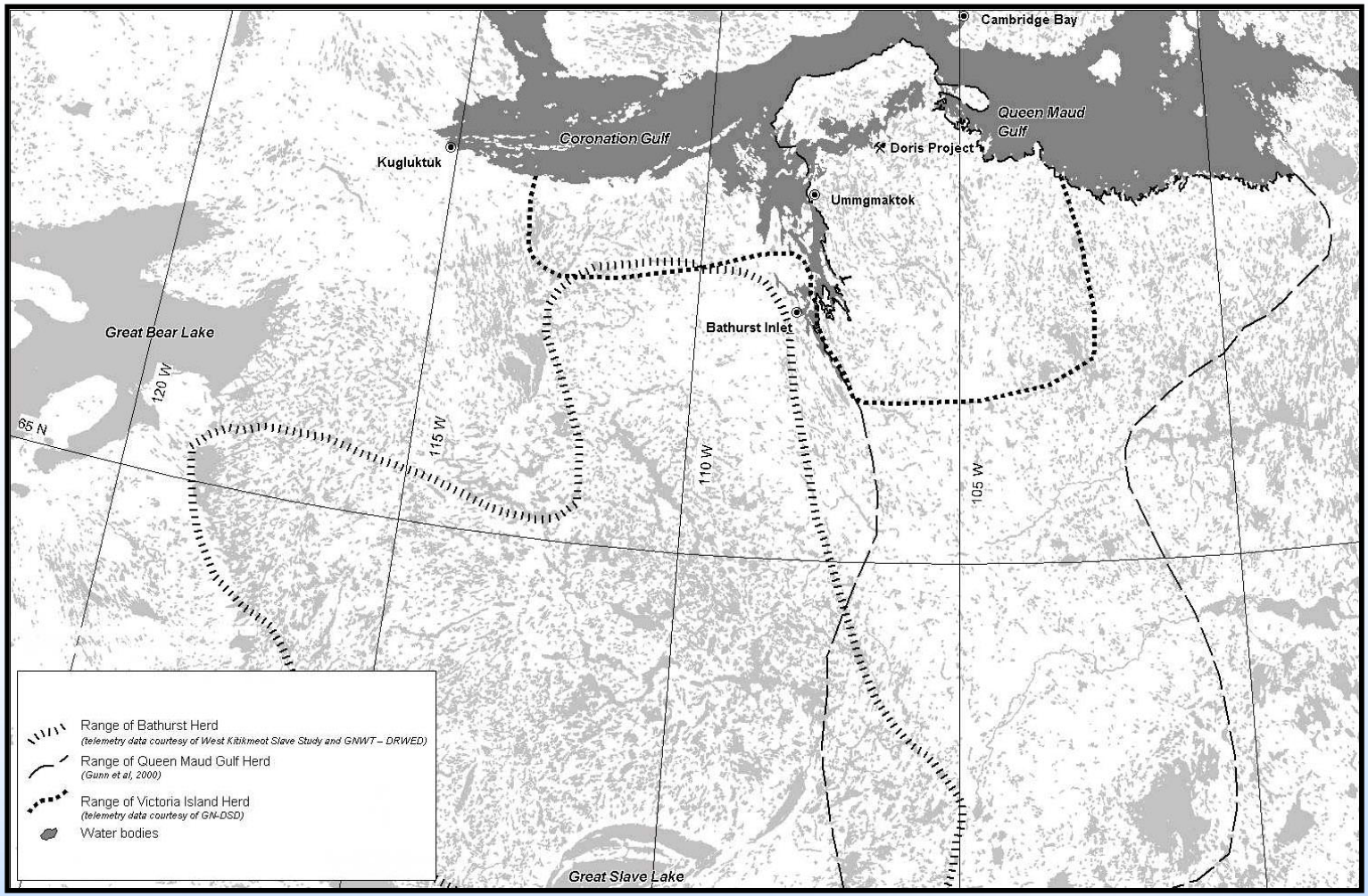
- GN management
- Summers on Victoria Island, including calving
- Migrates to the mainland for winter, across Dease Strait when ice is only 6 to 10 cm (mid to late October)
- GN management status, “sensitive”
- COSEWIC status, threatened

Caribou

Queen Maud Caribou:

- Western periphery of the summer and winter ranges includes the road route area around Nose Lake
- Calving is in the Queen Maud Gulf Bird Sanctuary to the east of Bathurst Inlet
- GN management status, “secure”

Caribou Range



the BATHURST INLET PORT AND ROAD PROJECT

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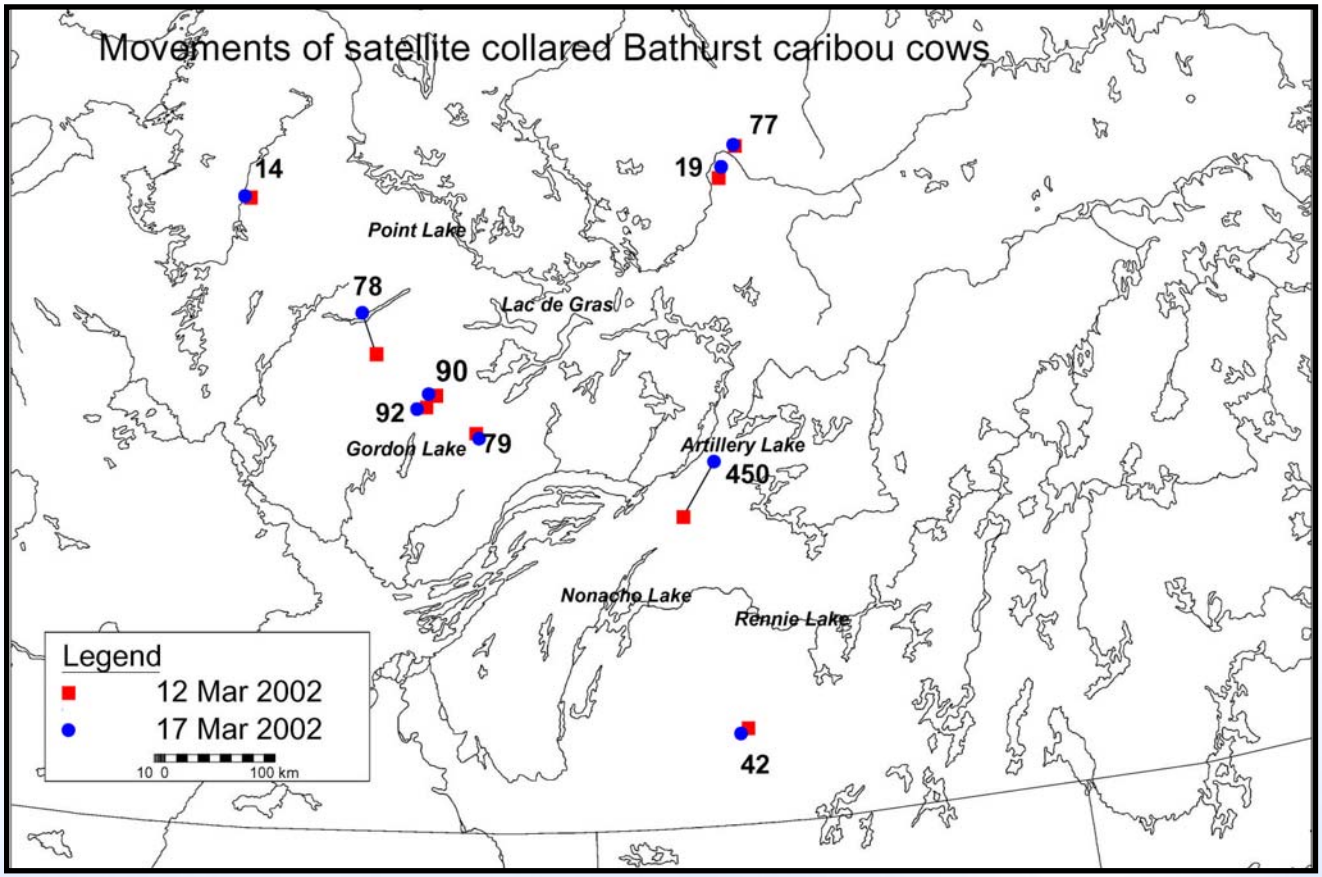
Caribou Movements March 2002



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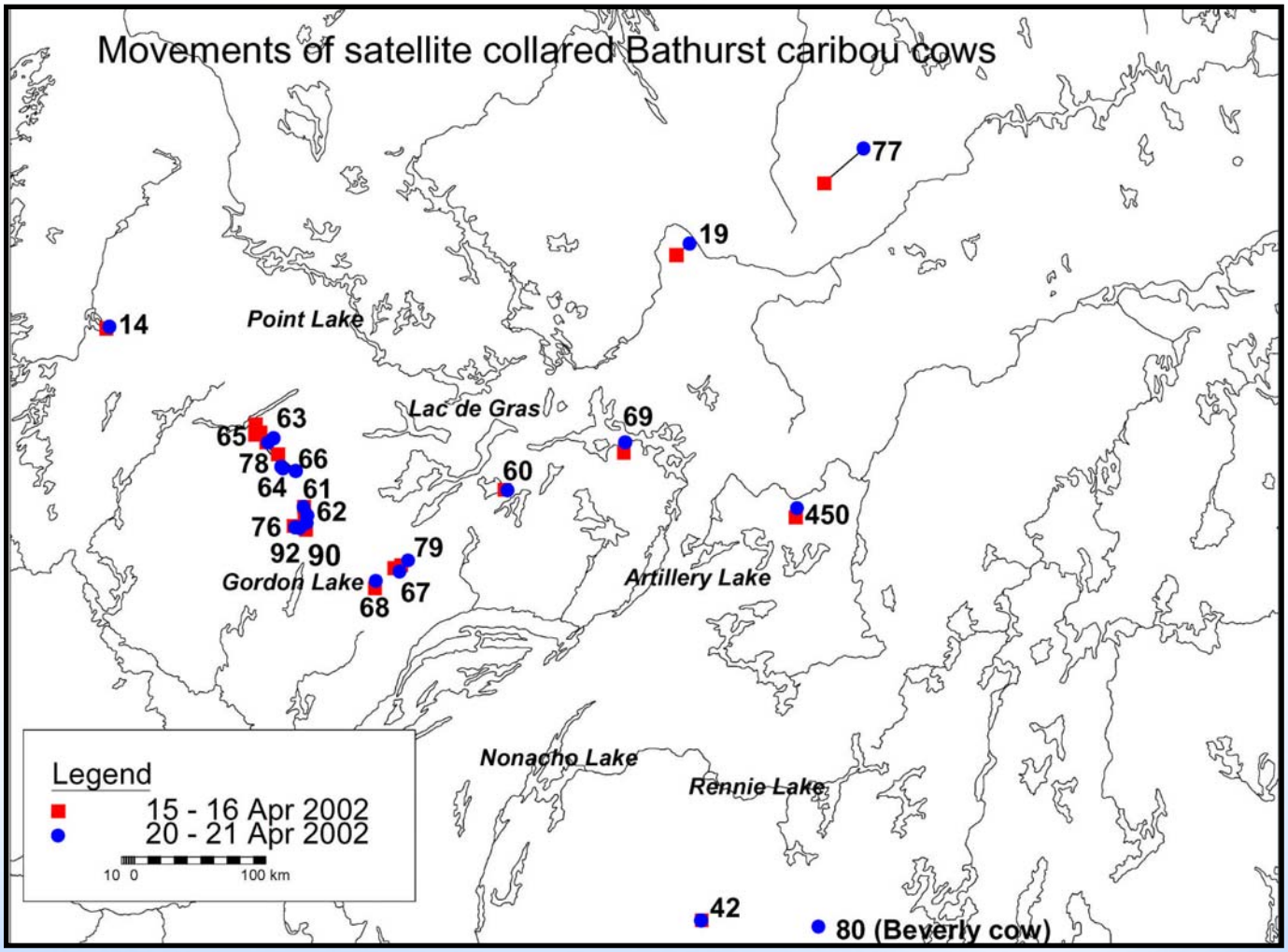
Caribou Movements April 2002



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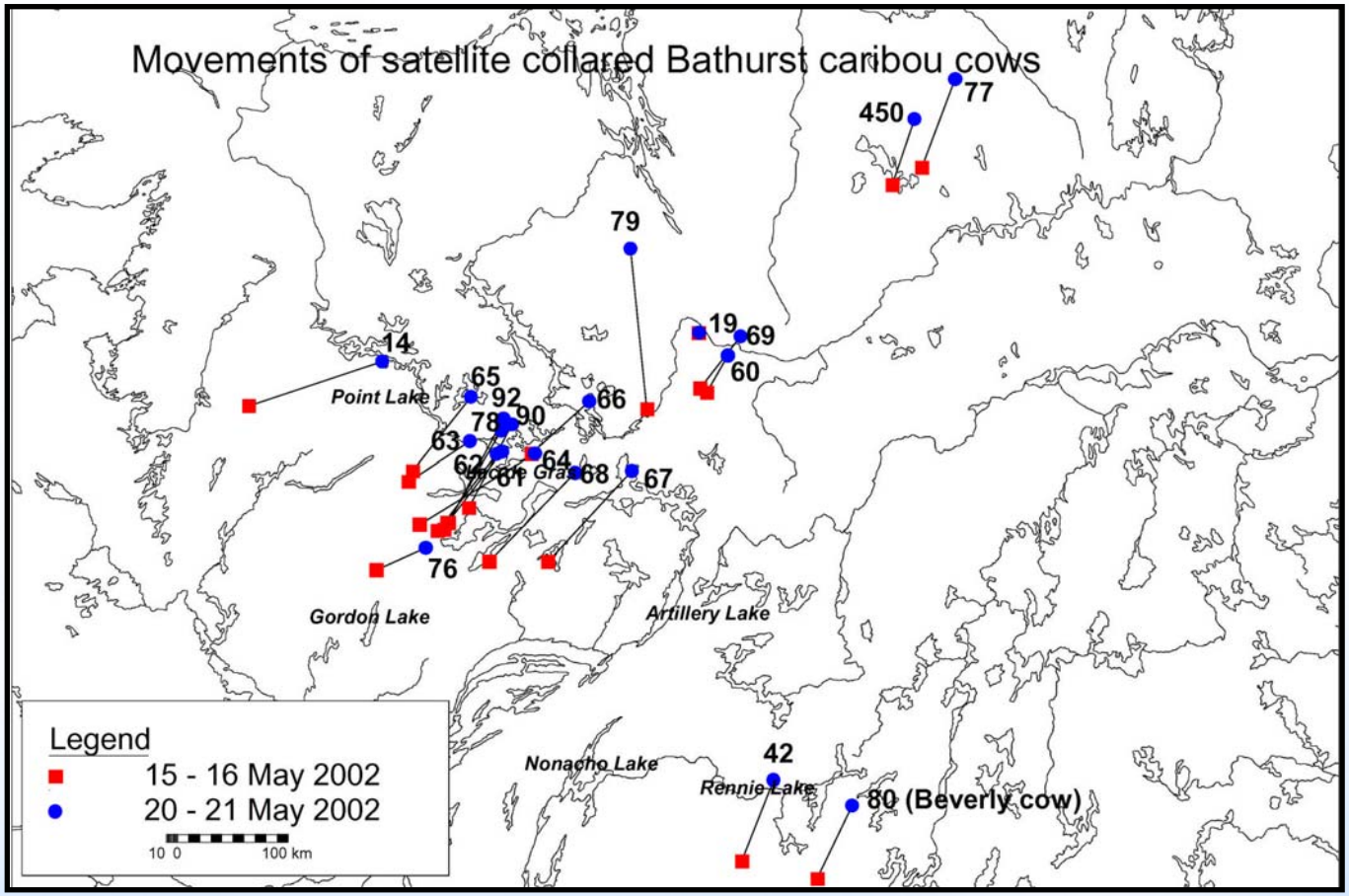
Caribou Movements May 2002



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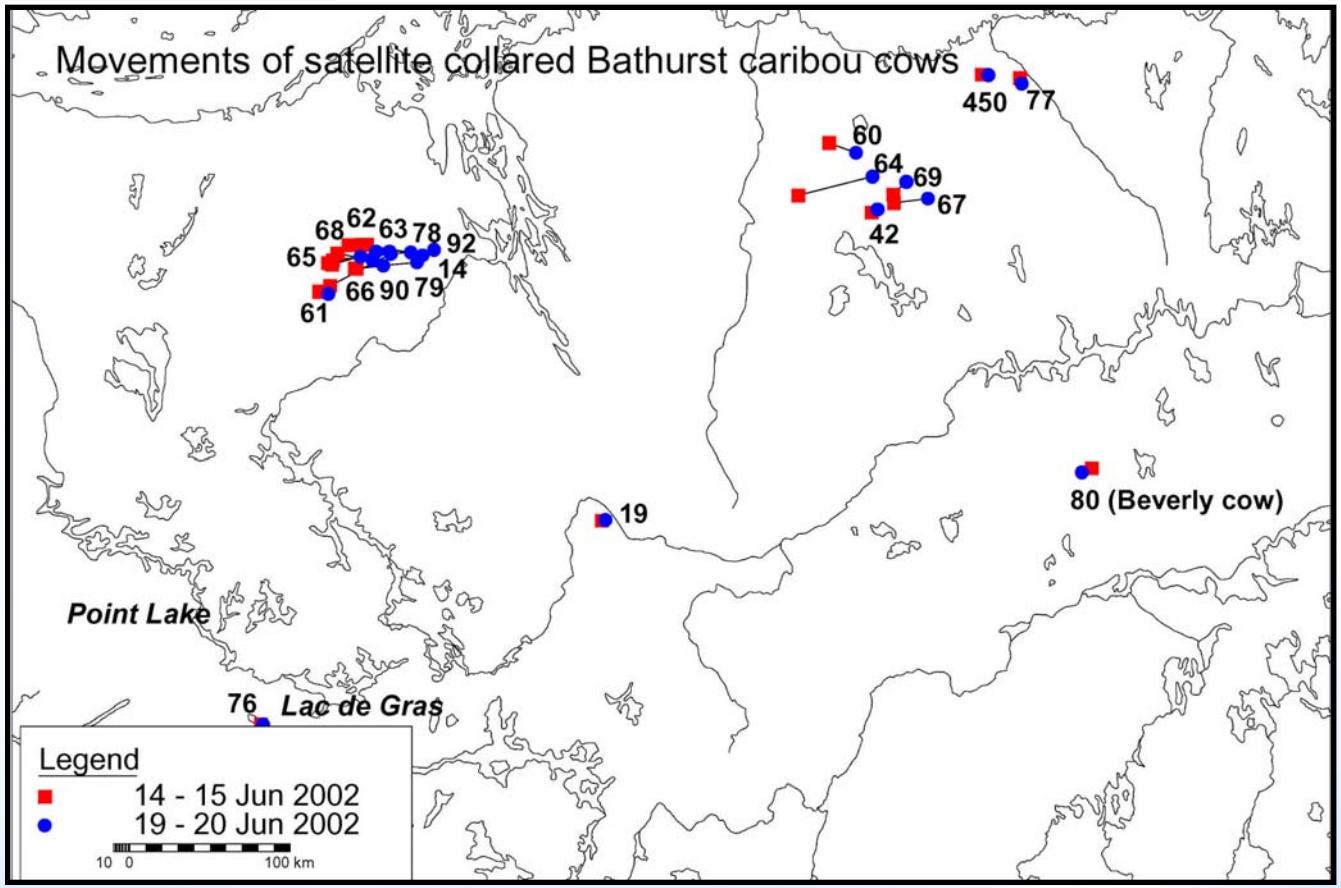
Caribou Movements June 2002



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the BATHURST INLET PORT AND ROAD PROJECT

Environmental and Socio-Economic Baseline Studies

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Study Components

- Freshwater Environment
- Marine Environment
- Wildlife
- Meteorology
- Bedrock Geology and ARD
- Surficial Geology, Soils and Ecosystem Mapping
- Traditional Knowledge
- Socio-Economics
- Community Consultation

Freshwater Environment

Stream Crossings

- Fish Community
- Fish Habitat
- Aquatic Ecology

Stream Crossings
Fish Community and Fish Habitat

- Reconnaissance Survey
- Field Assessment
  - Fish community assessment
  - Habitat assessment
- Fish species captured:
  - Arctic grayling
  - slimy sculpin
  - ninespine stickleback
  - burbot
  - lake trout
  - round whitefish
  - longnose sucker
  - Arctic char
  - Arctic cisco

Stream Crossings
Aquatic Ecology

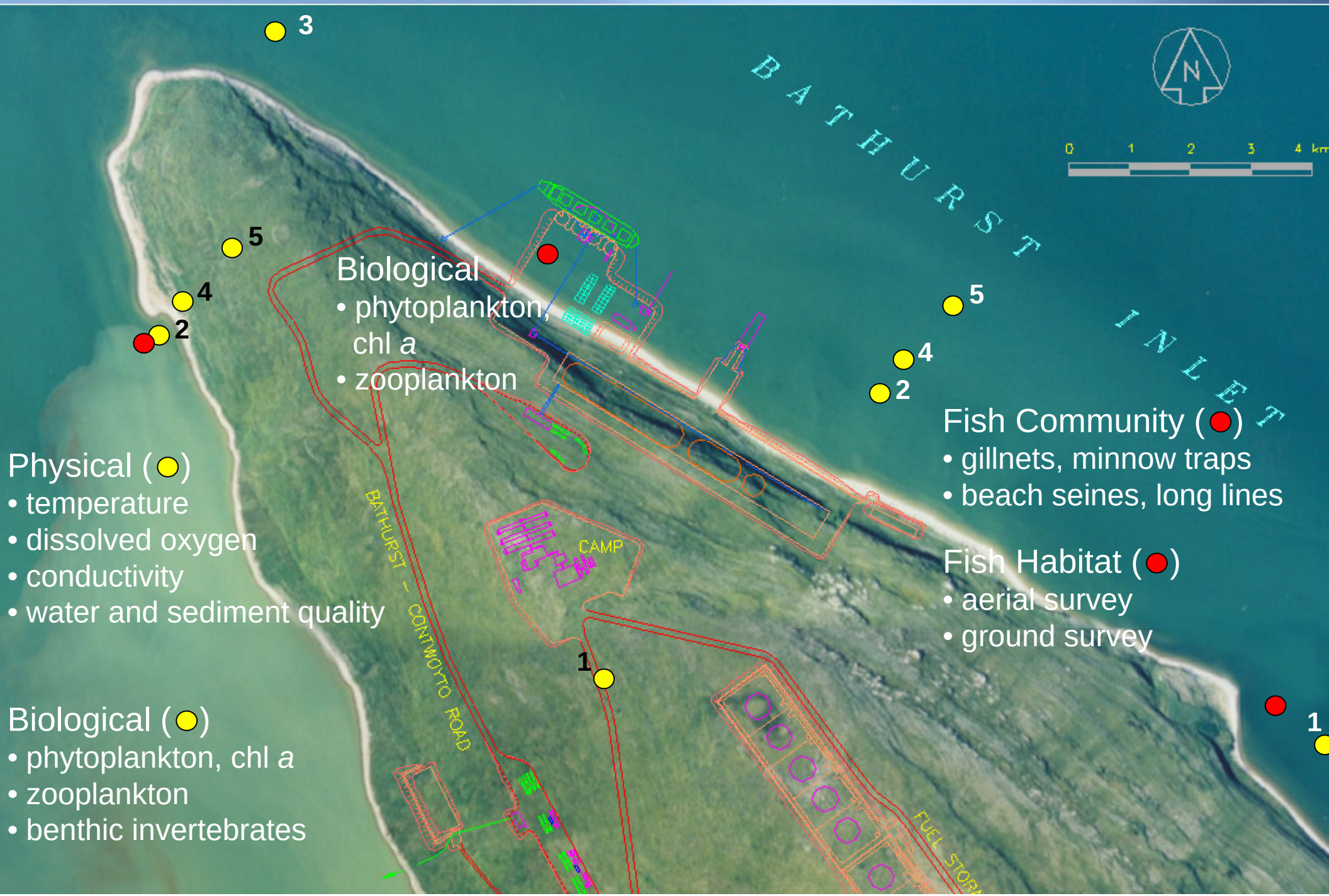
- 6 selected streams
- water
- sediment
- benthic invertebrates
- periphyton

Marine Environment

- Physical Oceanography
- Water and Sediment Quality
- Biological Oceanography

- Fish Community and Fish Habitat

Marine Port Fish and Oceanographic Study



Marine Fish Species

- Saffron cod

- Starry flounder

- Broad whitefish

- Fourhorn sculpin
- Rainbow smelt
- Pacific herring
- Arctic cisco
- Ogac
- Arctic flounder
- Arctic char

Wildlife

- Large mammal aerial surveys
- Esker and den surveys
- Small mammal trapping
- Groundwork and observations

Large Mammal Aerial Surveys

- Covered road alignment (transects)
- All wildlife seen were recorded
- 8 surveys were conducted between August 2001 and July 2002

Esker and Den Surveys

- location and assessment of dens

wolf

grizzly

Small Mammal Surveys

- traplines set in a variety of habitat
- species (red-backed vole and tundra vole)

Caribou

the BATHURST INLET PORT AND ROAD PROJECT

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Caribou

the BATHURST INLET PORT AND ROAD PROJECT

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Caribou

the Bathurst Inlet Port and Road Project

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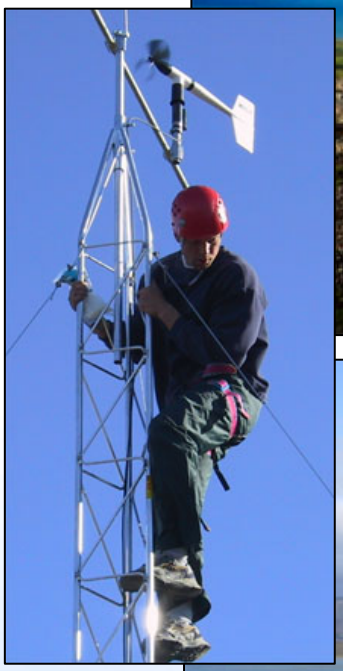
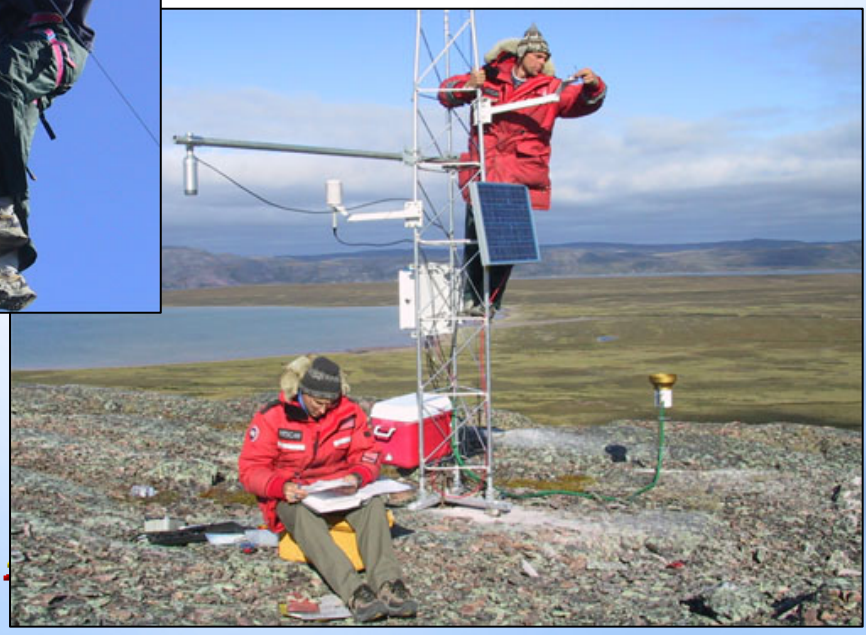
Meteorology

- Meteorological station installed in August 2001, still in operation
- Temperature and humidity probe
- Wind sensor
- Tipping rain gauge
- Pyranometer (solar radiation)
- Sonic ranger

  (snowpack depth)





Bedrock Geology and ARD Studies

- Geological mapping
- Identification of mineralized areas and carving stone deposits

Acid Rock Drainage (ARD)

- samples taken from potential quarries

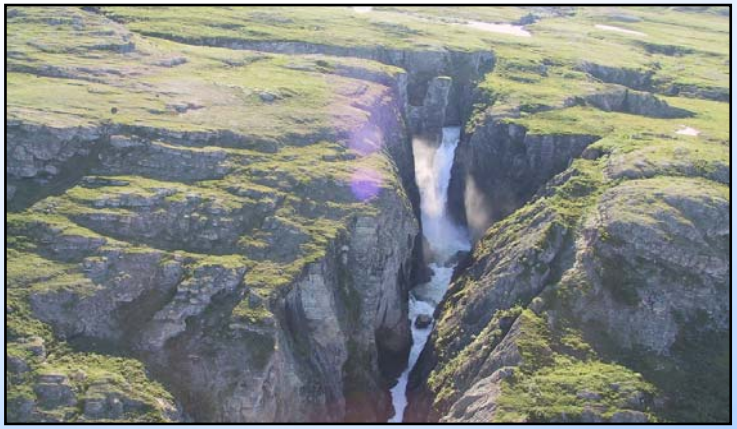
Surficial Geology and Soils

- 119 plots established
- Over 4,500 terrain units delineated
- Information collected on:
  - Parent materials
  - Texture
  - Surface expression
  - Modifying processes
  - Percent slope
  - drainage

Boulder Fields

Soil Pits

Landforms



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Vegetation Surveys

740 vegetation plots completed

- Species identification
- Percent cover for each species

Other Site Information

- Slope
- Aspect
- Moisture regime
- Nutrient regime
- Percent substrate cover
- Terrain texture
- drainage

Traditional Knowledge

Naonaiyaotit Traditional Knowledge Project (NTKP)

- Bathurst Port and Road Project within study area of the NTKP
- covers wide variety of topics, such as transportation routes, harvesting, cultural resources, wildlife, and fish
- raw data contained within a GIS database

Tuktu Nogak Project (TNP)

- Caribou and calves

Socio-Economic Studies

- Profile baseline conditions in the West Kitikmeot communities (*e.g.,* demographics, employment and income, education, training and employment skills, e*tc.*)

Methodology

- detailed literature search
- questionnaire to survey residents
- visits to communities
- interviews

Community of Bathurst Inlet

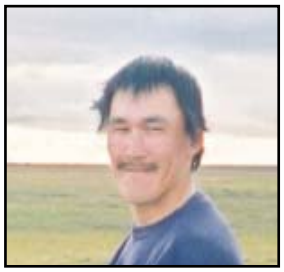
Community Consultation

Meetings in:

- Bathurst Inlet
- Cambridge Bay
- Kugluktuk
- Gjoa Haven
- Taloyoak
- Kugaaruk
- Yellowknife

Angoniatit Niovikvia Ltd. (ANL) Participants in Summer 2001 and 2002 Field Work

Patsy Avakana



George Hitkolok

David Nivingalok

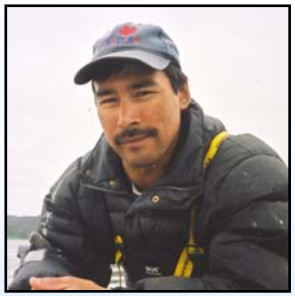
George Taptuna

Jason Bolduc

Isaac Klengenberg

David Sateana

J.F. Koudluak



Allen Kapolak

Tony Akolak

Colin Niptanatiak

Melanie Panioyak

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Heritage Resources

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Study Scope

- 2 year program – 2001 and 2002
- Program outline
  - Site file search to identify previously recorded sites
  - Literature search to provide information on site types and locations; provide regional archaeological and historical context
  - Evaluation of terrain features for archaeological site potential
  - Field survey to inventory sites
  - Evaluation of potential site values

2001 Field Program

- Overflight
  - Reviewed route and associated terrain
  - Confirmed potential of land forms
  - Finalized target areas for examination
- Field Assessment
  - Examined terrain features targeted as high potential for archaeological sites
    - lake/stream shores, eskers, knolls, ridges
  - 1km wide corridor
    - including road and potential borrow areas

2002 Field Program

- Area of focus
  - Bathurst Inlet Port
- Objectives
  - Additional field survey
  - Reassessment of site (MaNI 2) north of Tikiraq Lake
- **Elder site visits**
  - Joseph Niptanatiak and Tom Kokak of Kugluktuk
  - Contwoyto maintenance camp area; MaNI 2

Community Involvement

- Field programs – Brian Agoluk, John Franklin
- May 2002 community meetings
  - Kugluktuk – 5 Elders
  - Cambridge Bay – 8 Elders

Field Inventory Results

- Inventory – 69 heritage resource sites
- Site Types
  - 1 precontact campsite
  - 37 precontact artifact scatters
  - 13 precontact isolated finds
  - 15 stone features (caches, drive lanes)
  - 2 historic/traditional sites
  - 1 mixed site

Community Consultation Results

- Kugluktuk Comments – routing
  - Bathurst Inlet Port previously recorded archaeological sites
  - Nose Lake burials
- Cambridge Bay Comments -
  - Bathurst Inlet Port previously recorded sites and burials
  - Mara River and Burnside River burials
  - Inclusion of newly recorded sites into accessible database
  - Collection policies and protocols

Preliminary Assessment

- Site Values
  - Consideration of scientific potential and value to traditional residents as monuments to 'presence on the land'
    - No further concerns – isolated finds, some artifact scatters
    - Mitigation (i.e. further study) required
      - Bathurst Inlet Port – facilities
      - Skewer Lake – potential borrow area
    - Avoidance required
      - Burials
      - Currently used sites

Mitigative Options

- Further studies prior to construction
  - Mapping of features and site contents
  - Controlled collection of artifacts
  - Controlled excavation
  - Analyses and reporting
- Avoidance
  - Re-siting of facilities
    - selection of alternate borrow areas

Projected impacts

- Direct – potentially project related
  - less than 9% of inventory
  - Port Facilities – 4 sites (6%)
  - Alignment – 2 sites (3%)
    - 18 km Lake
  - Borrow Areas
    - Only 1 site recommended for mitigative studies associated with a potential borrow area

Projected Impacts

- Indirect – creation of access and use
  - Actual number unknown
  - Potential impacts from recreational use and increased human activity associated with road use
    - Sites at proposed Bathurst Inlet Port facility
    - Sites along lake shores at preferred recreational locales
    - Sites at good fishing locations
    - Sites at informal camping/picnicking areas

PRESENTATION TO NIRB SCOPING MEETINGS, SEPTEMBER 7, 2004

the BATHURST INLET PORT AND ROAD PROJECT

Bathurst Inlet Port and Road Project

(An Economic Development Project for the Kitikmeot Region of Nunavut)

Presentation to NIRB Scoping Meetings
September 7, 2004

FMA Rescan™ NISHI-KHON SNC·LAVALIN

Presenters

- Mervyn Hempenstall, Charlie Lyall Bathurst Inlet Port and Road JV.
  (Bathurst Inlet Port and Road JV is a 50/50 Joint Venture between Kitikmeot Corporation and Nuna Logistics Limited.)
- Tony Wachmann, Nishi-Khon SNC-Lavalin
- Francois Landry, Rescan Environmental Services
- Ben Hubert, Hubert and Associates
- Gloria Fedirchuk, FMA Heritage Resources Consultants

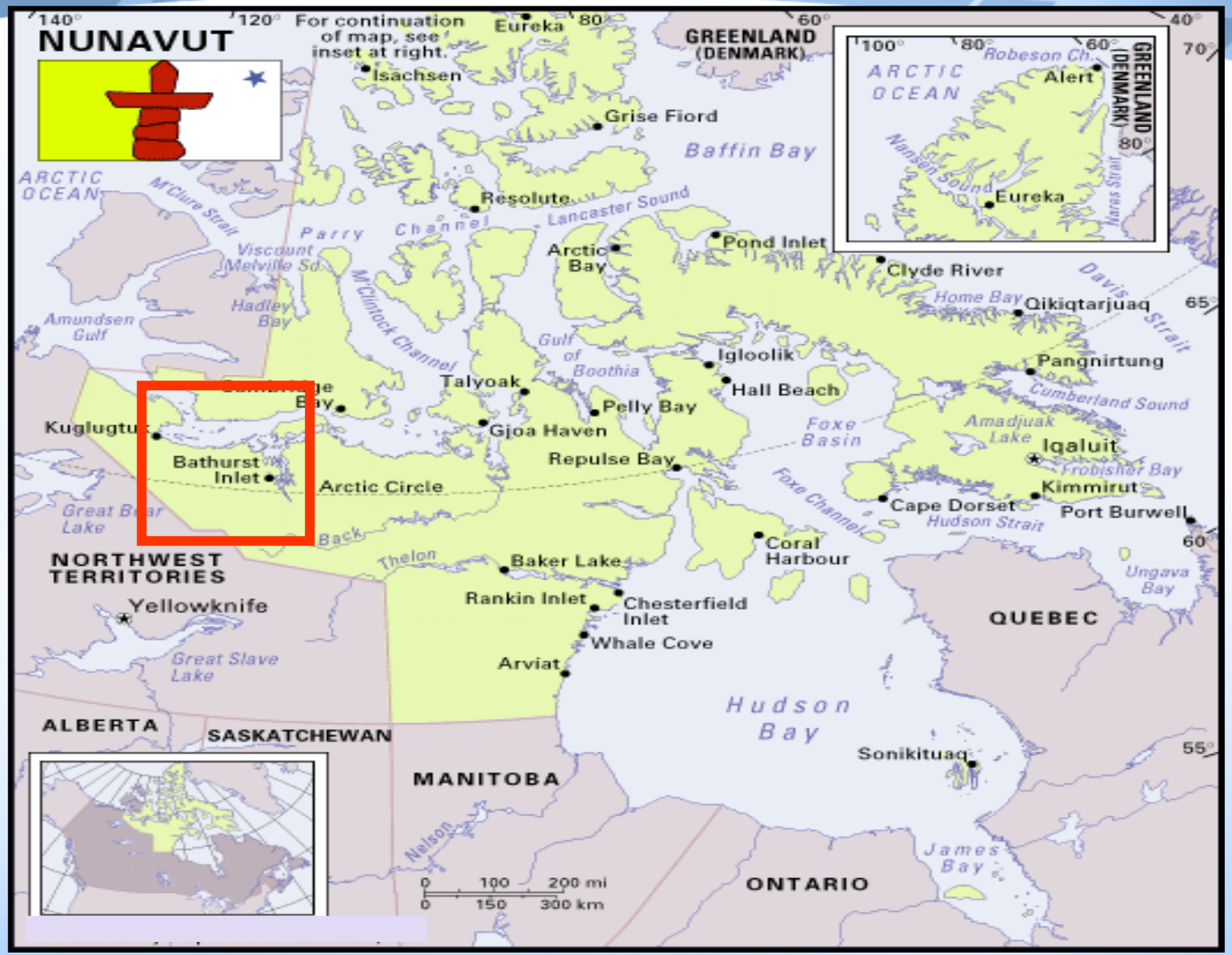
Contents

- Introduction
- Project Description
- Engineering and Feasibility Study
- Environmental and Socio-Economics
- Archaeology
- Acknowledgements

Project Technical Committee

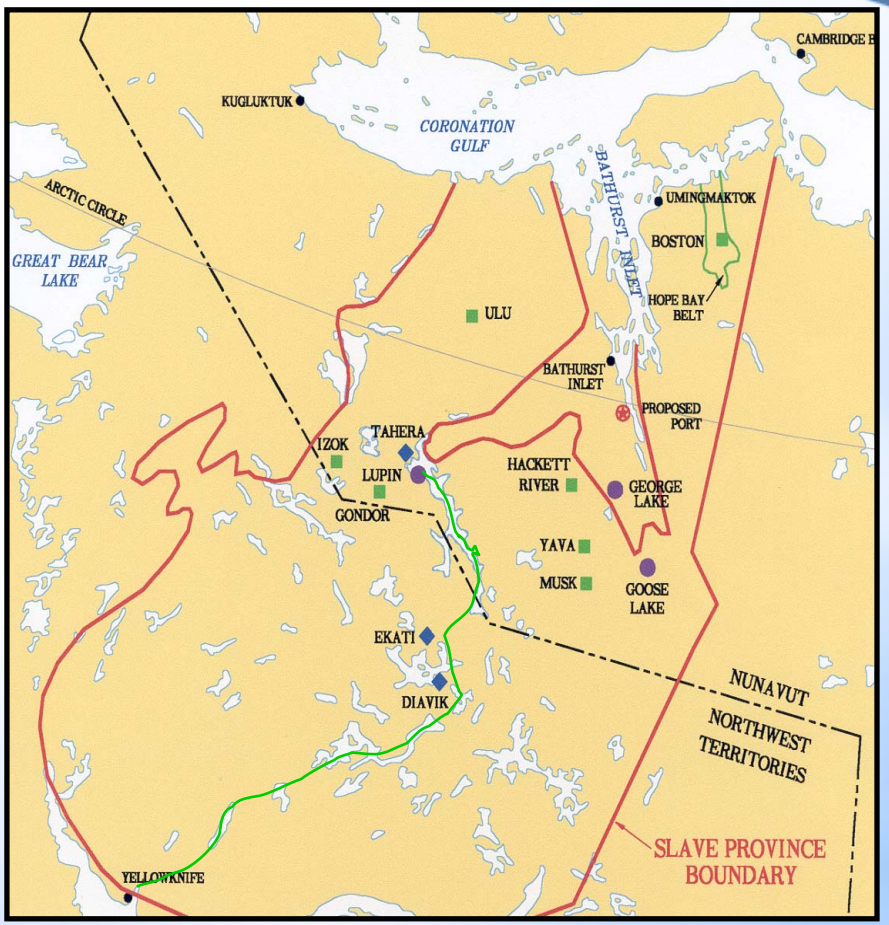
- Kitikmeot Inuit Association
- Kitikmeot Corporation
- Nuna Logistics Limited
- Inmet Mining Corporation
- Government of Nunavut (2)
- Communities of Kugluktuk, Cambridge Bay and Bathurst Inlet

Project Location



Introduction

- The Slave Geological Province (SGP) is rich in mineral resources
- Full potential of SGP has not been developed because of a lack of transportation infrastructure
- The only road access is a winter road Yellowknife to Lupin Mine (630km)



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Infrastructure Solution

- Studies indicate the best option is a port on Bathurst Inlet and all-weather road to Contwoyto Lake, (211km), connecting with the existing winter road from Yellowknife to Lupin
- This infrastructure is included in the Nunavut Transportation Strategy Vision
- There is strong support from Kitikmeot Inuit Association, Government of Nunavut and DIAND

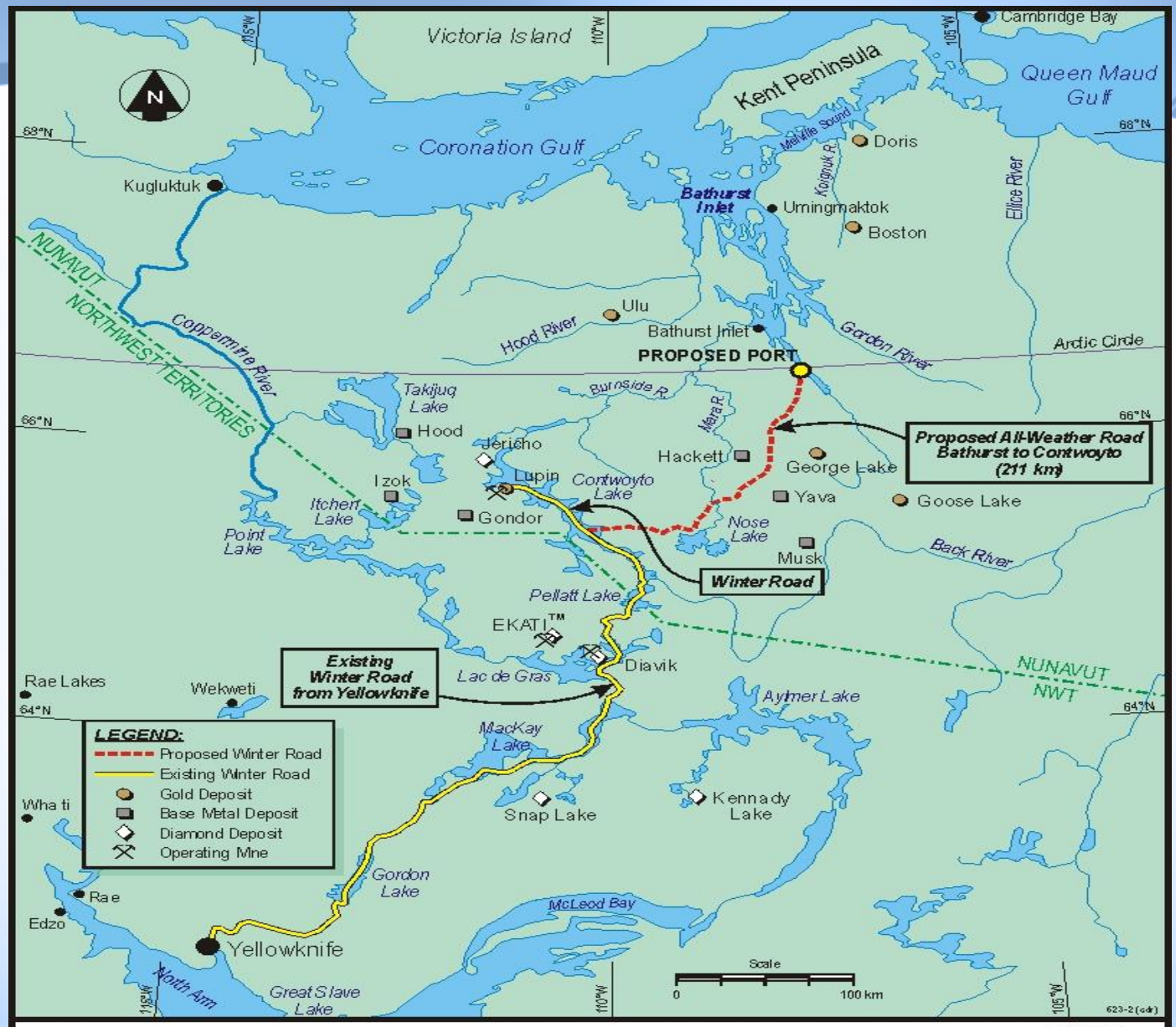

FIGURE 1

Bathurst Inlet Port and Road Project - Location Map

Land Ownership

The project will occupy:

- Inuit Owned Land (IOL) 143 ha
  - Contwoyto camp 2 ha
  - 82.3km of road (& quarries) 141 ha
- Crown Land 370 ha
  - Port site camp and airstrip 159 ha
  - 128.9 km of road (&quarries) 211 ha

Capital Cost

	$(Millions)
Bathurst Inlet Port (dock, camp etc)	46
Port/Contwoyto Lake Road (211km)	76
Bathurst Inlet Fuel Storage	42
TOTAL	164

the Bathurst Inlet Port and Road Project

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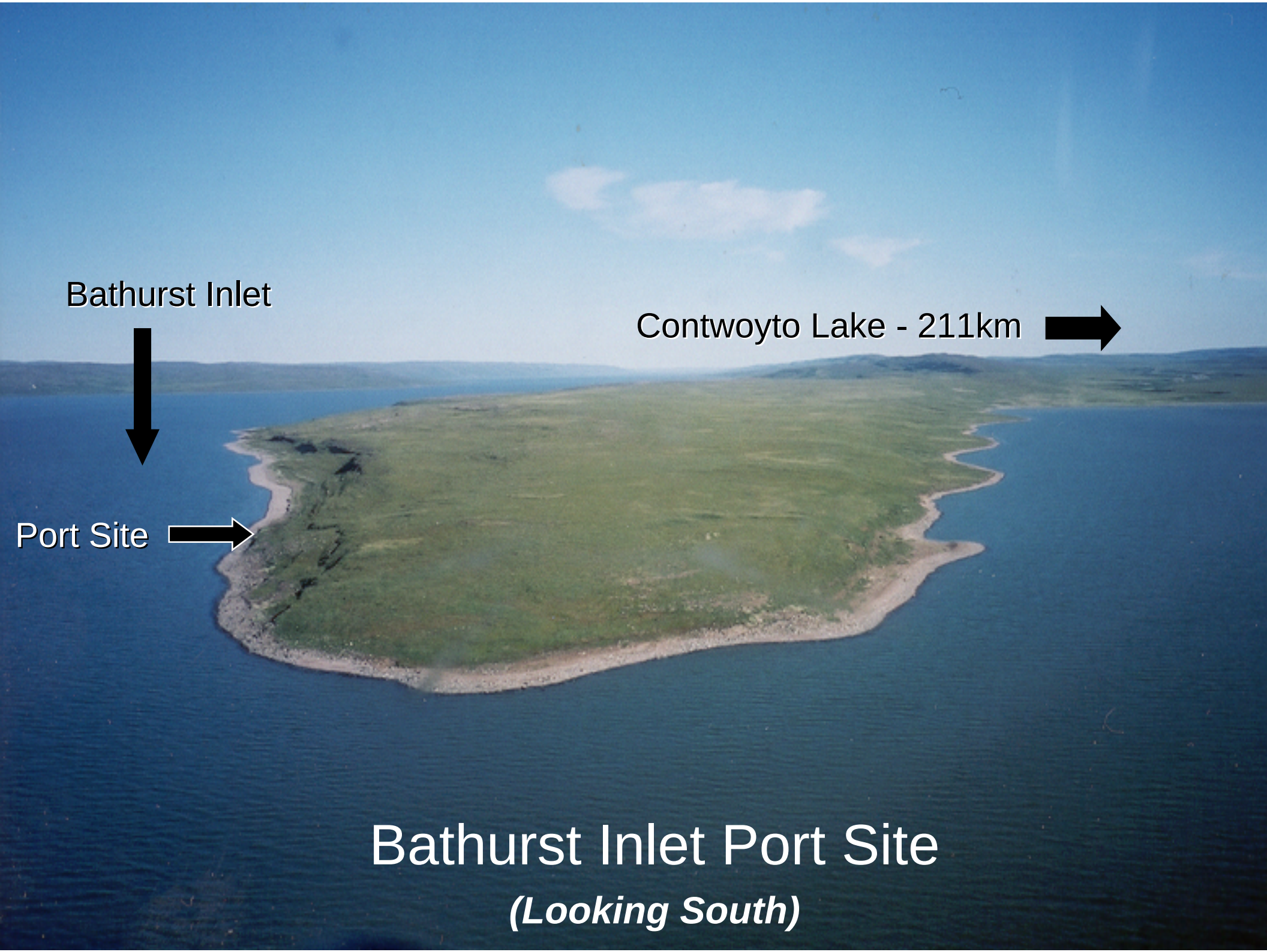
Project Financing

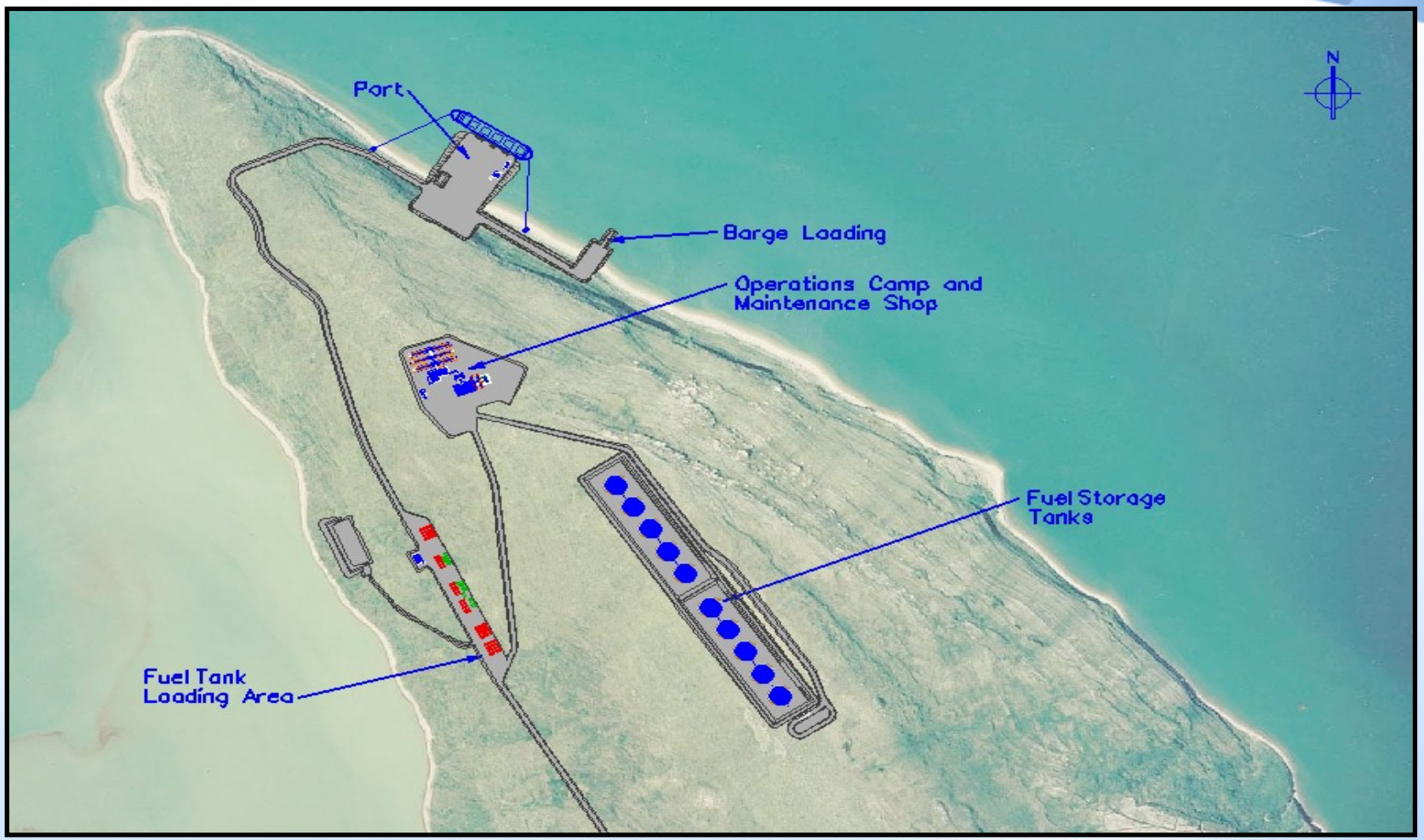
- Project would be built and operated by a public-private partnership (3P) of Inuit organizations, governments and the private sector
- The Project would provide revenues from port and road user fees or tolls to cover costs
- Financial studies show that a 3P project is viable



Bathurst Inlet Port Site

(Looking South)

Port Site Plan



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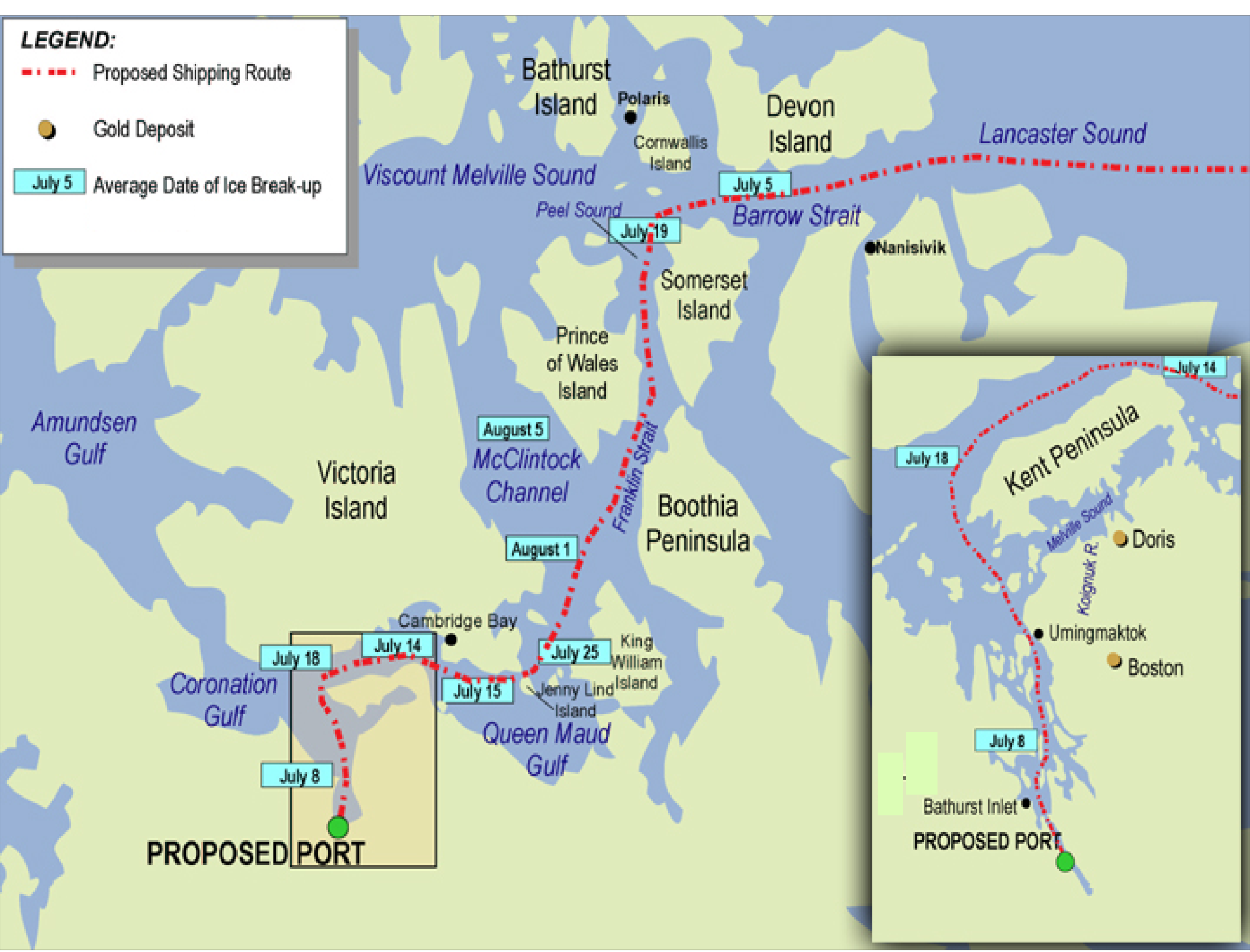
Shipping

- Independent studies have shown that the route to the proposed port site is suitable for vessels up to 50,000 tonnes
- Vessels are allowed to enter Canadian Arctic waters as long as they comply with the Arctic Waters Pollution Prevention Act. No project specific permitting is required
- Fuel and supplies would be shipped from eastern Canada or offshore into Bathurst Inlet during the open ice period, mid-July to mid/late October, (90 to 100 days, similar to existing shipping at Polaris and Nanisivik Mines)


LEGEND:
Proposed Shipping Route
Gold Deposit
July 5
Average Date of Ice Break-up
Bathurst Island
Polaris
Cornwallis Island
Devon Island
Lancaster Sound
Viscount Melville Sound
Peel Sound
July 19
July 5
Barrow Strait
Nanisivik
Somerset Island
Prince of Wales Island
Amundsen Gulf
August 5
McClintock Channel
Franklin Strait
Victoria Island
Boothia Peninsula
August 1
Cambridge Bay
July 18
July 14
July 25
King William Island
July 15
Jenny Lind Island
Coronation Gulf
Queen Maud Gulf
July 8
PROPOSED PORT
July 14
July 18
Kent Peninsula
Melville Sound
Doris
Kugmuk R.
Umingmaktok
Boston
July 8
Bathurst Inlet
PROPOSED PORT

Project Operations

- Summer shipping as described above
- Fuel and supplies delivered to Kitikmeot communities by barge during summer.
- The “all weather” road would operate in winter only, between January and April, to deliver supplies by truck to mines in Nunavut and NWT. Trucks would be both captive to the project and also come from the South as necessary.
- Water use is for domestic purposes only. No industrial wastes, sewage would be treated for disposal.

Project Benefits

- Reduced cost of fuel and supplies for the Kitikmeot communities
- Reduced capital and operating costs for mineral exploration and mine development
- Significant increase in Inuit businesses and local employment
- Increased economic activity in Nunavut, NWT (especially Yellowknife)

Project Schedule

- If guidelines for the EIS are received from NIRB by September 2004, the EIS could be complete by early 2005
- If permitting is complete by spring 2006, then mobilization can begin summer 2006
- Construction can begin fall 2006 and be complete by winter 2007. The port site could be operational by summer 2007
- Road operations could then begin February 2008

the BATHURST INLET PORT AND ROAD PROJECT

Engineering and Feasibility Study

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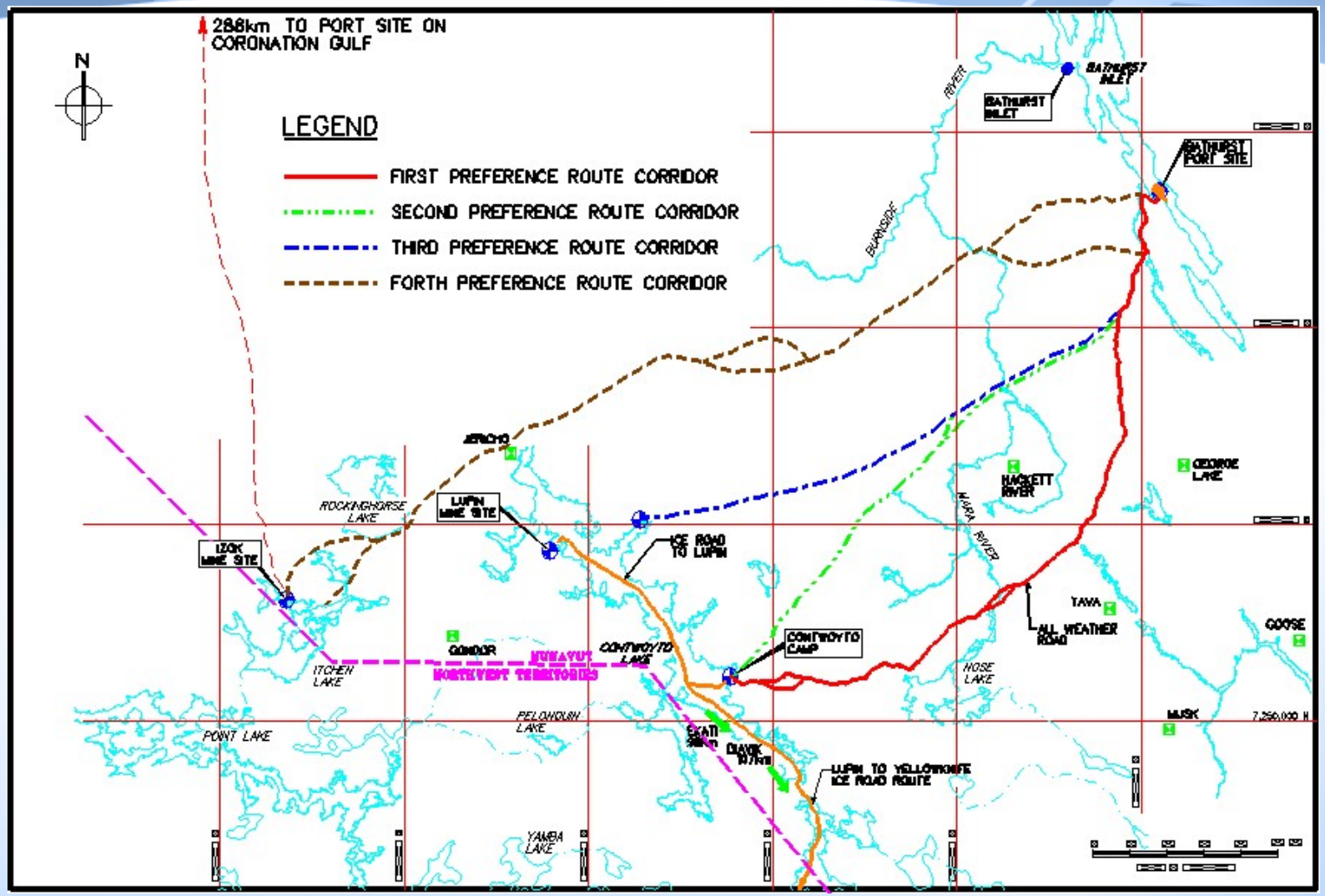
Engineering and Feasibility Study

Feasibility Study Scope:

- Port and Road Users
- Bathurst Inlet Port
- All-weather Road
- Cultural Resources
- Labour Resources
- Capital and Operating Cost estimates
- Execution Plan
- Financial Evaluation

Alternate All-Weather Road Routes



the Bathurst Inlet Port and Road Project

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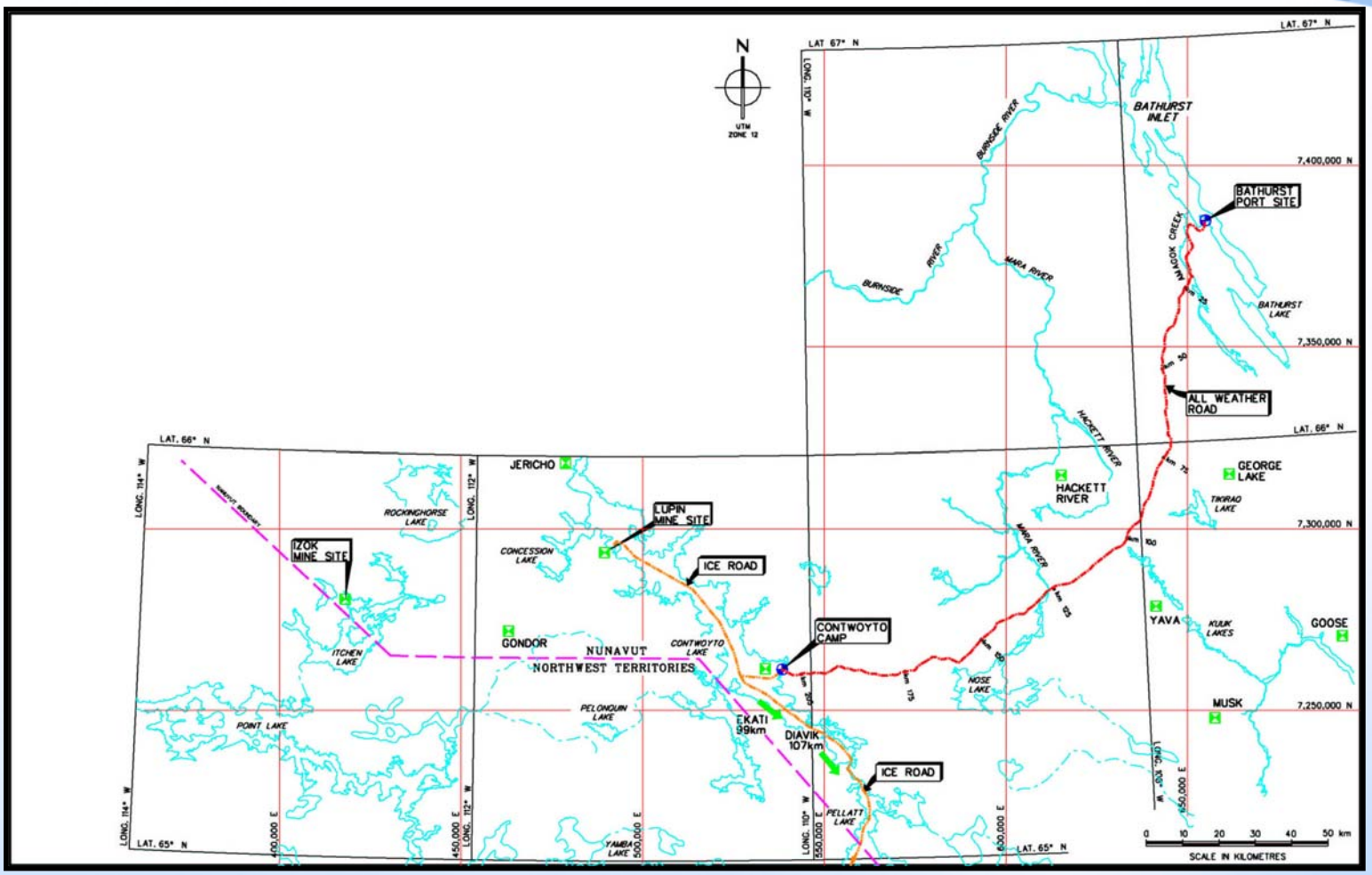
All-Weather Road Route Selection

- Locate close to known and potential mines to maximize potential use
- Select shortest route to reduce construction and trucking costs
- Follow smooth terrain with moderate grades and minimize road cuts
- Maximize route on bedrock and avoid poorly drained areas
- Minimize water crossings (rivers, creeks, fish bearing streams)
  Only 2 major river crossing (Amagok Creek, Mara River)
- Source local construction materials (rock outcroppings/quarry), keep haul distances under 7 km
- Maintain road embankment fills to average 1.6 m
- Avoid environmentally sensitive and cultural/heritage use area

Preferred All-weather Road Route



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All-Weather Road

- Bathurst Inlet to Contwoyto Lake – 211 km
- Road connections constructed and maintained by each mine:

• Ekati	-	98 km (existing ice road)
• Diavik	-	127 km (existing ice road)
• Lupin	-	69 km (existing ice road)
• Jericho	-	28 km (from Lupin)
• George Lake	-	19 km
• Goose Lake	-	55 km

All-Weather Road Criteria

- 70 km/hr all-weather road;
- 90 tonne design vehicle (55 tonne on ice roads);
- 8 m gravel running surface with 12 m wide turnouts every km and at bridges and stream crossings;
- modular single lane steel bridges over rivers, arch culverts or rock fords in non-fish bearing creeks;
- 1.0 to 1.8 m rock fill road embankment;
- Construction quantities
  - Bathurst inlet to Contwoyto lake - 4.6 million m3
- 30 km/hr on ice roads

Typical All-Weather Road

the Bathurst Inlet Port and Road Project

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Typical River Crossing

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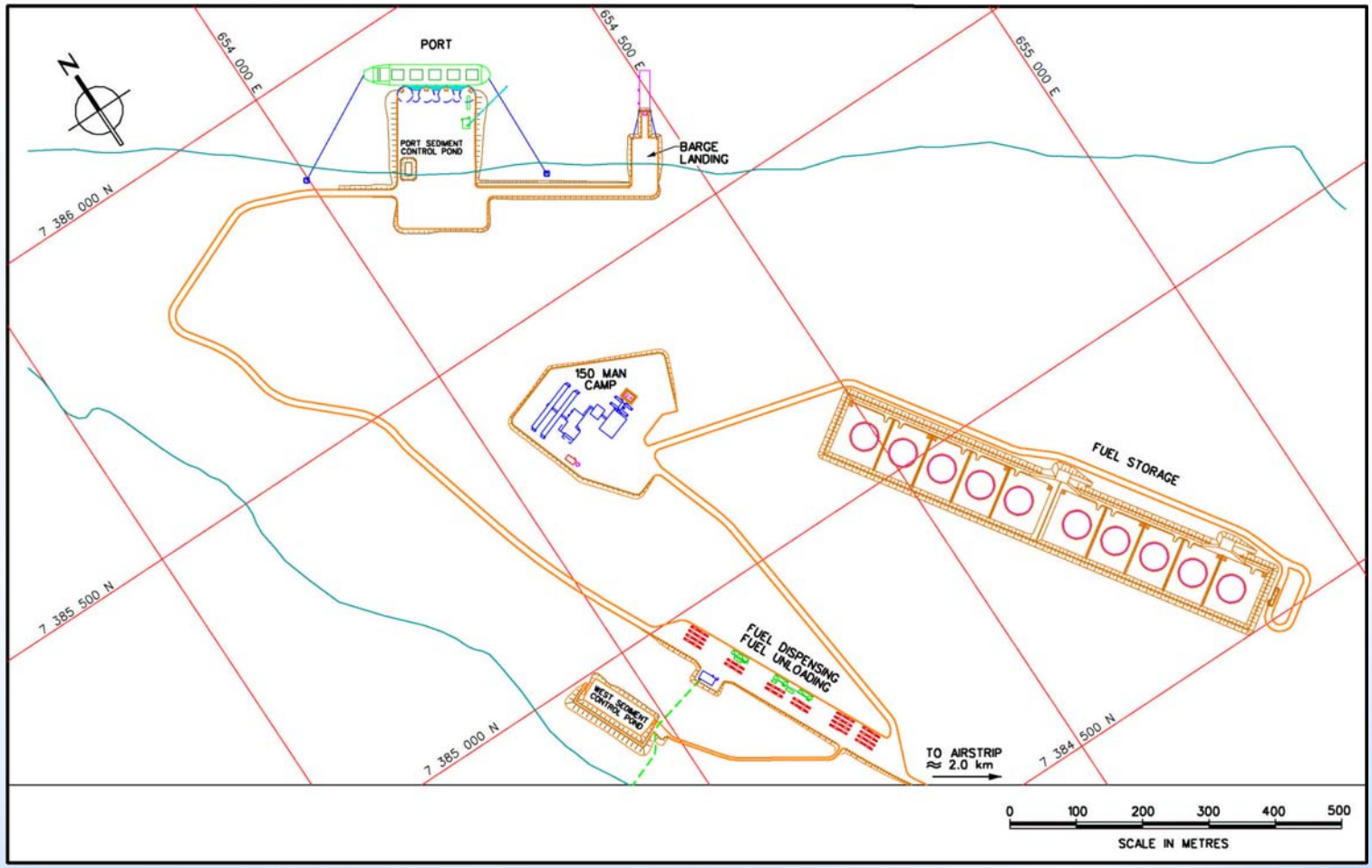
Bathurst Inlet Port Site

- Wharf suitable for handling 50,000 tonne vessels and ocean barges carrying fuel and general cargo
- Lay down and container storage areas
- Vessel unloading/loading mobile equipment
- 180 million liter fuel storage tank farm, vessel unloading and truck loading facilities
- Accommodation, maintenance shops, airstrip and site services

Bathurst Inlet Port Site



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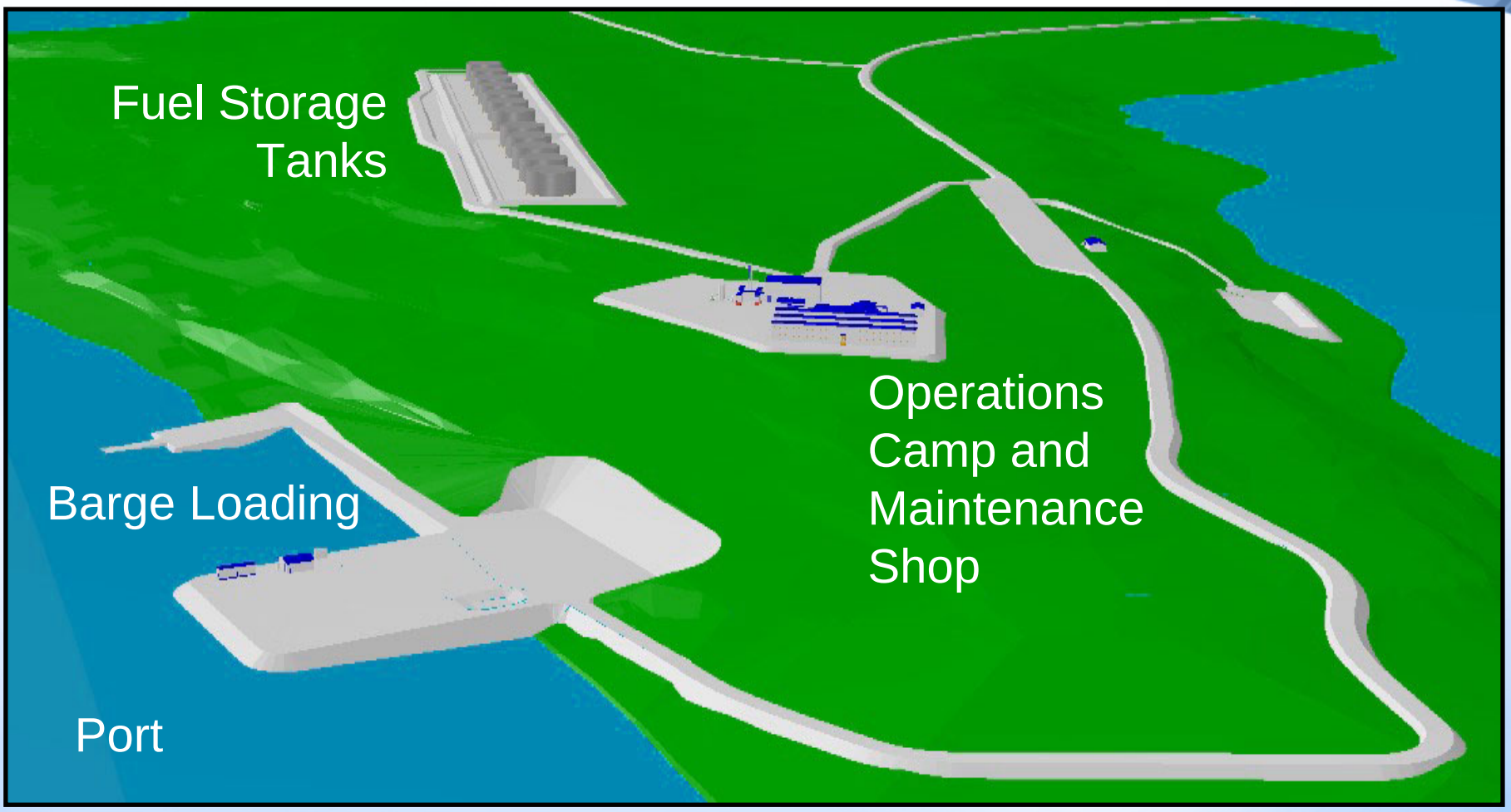
Port Site Plan



the Bathurst Inlet Port and Road Project

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Bathurst Inlet Port Site Selection

- 13.5 m water depth close to shore, with steep drop-off Bathymetry of Bathurst Inlet and seaward approach was completed in 1998
- Sufficient vessel turning area - 1400 m
- Marine geotechnical conditions were determined by drilling off the ice in May 2001. Bottom sediments are soft clays approx. 15 m thick to bedrock
- Rock foundations for major shore side structures
- Local source of construction materials (rock outcroppings, quarry), keep haul distances under 10 km
- Airstrip located on esker at south end of peninsula
- Room for future expansion

Ocean Shipping and Barging

- Cambridge Bay to Hay River - 2500 km
- Port site to Europe - 7200 km
- Port site to Montreal - 5900 km
- Barge routes to Nunavut Communities and Mines:
  - Cambridge Bay - 400 km
  - Gjoa Haven - 840 km
  - Kugluktuk - 440 km
  - Taloyoak - 960 km
  - Hope Bay - 180 km

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Environmental and Socio-Economic Baseline Studies

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Study Components

- Freshwater Environment
- Marine Environment
- Wildlife
- Meteorology
- Bedrock Geology and ARD
- Surficial Geology, Soils and Ecosystem Mapping
- Traditional Knowledge
- Socio-Economics
- Community Consultation

Freshwater Environment

Stream Crossings:

- Fish Community
- Fish Habitat
- Aquatic Ecology

the Bathurst Inlet Port and Road Project

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Stream Crossings

Fish Community and Fish Habitat:

- Reconnaissance Survey
- Field Assessment
  - Fish community assessment
  - Habitat assessment
- Fish species captured
  - Arctic grayling
  - slimy sculpin
  - ninespine stickleback
  - burbot
  - lake trout
  - round whitefish
  - longnose sucker
  - Arctic char
  - Arctic cisco

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Stream Crossings

Aquatic Ecology:

- selected streams
- water
- sediment
- benthic invertebrates
- periphyton

Marine Environment (port site)

- Physical Oceanography
- Water and Sediment Quality
- Biological Oceanography

- Fish Community and Fish Habitat

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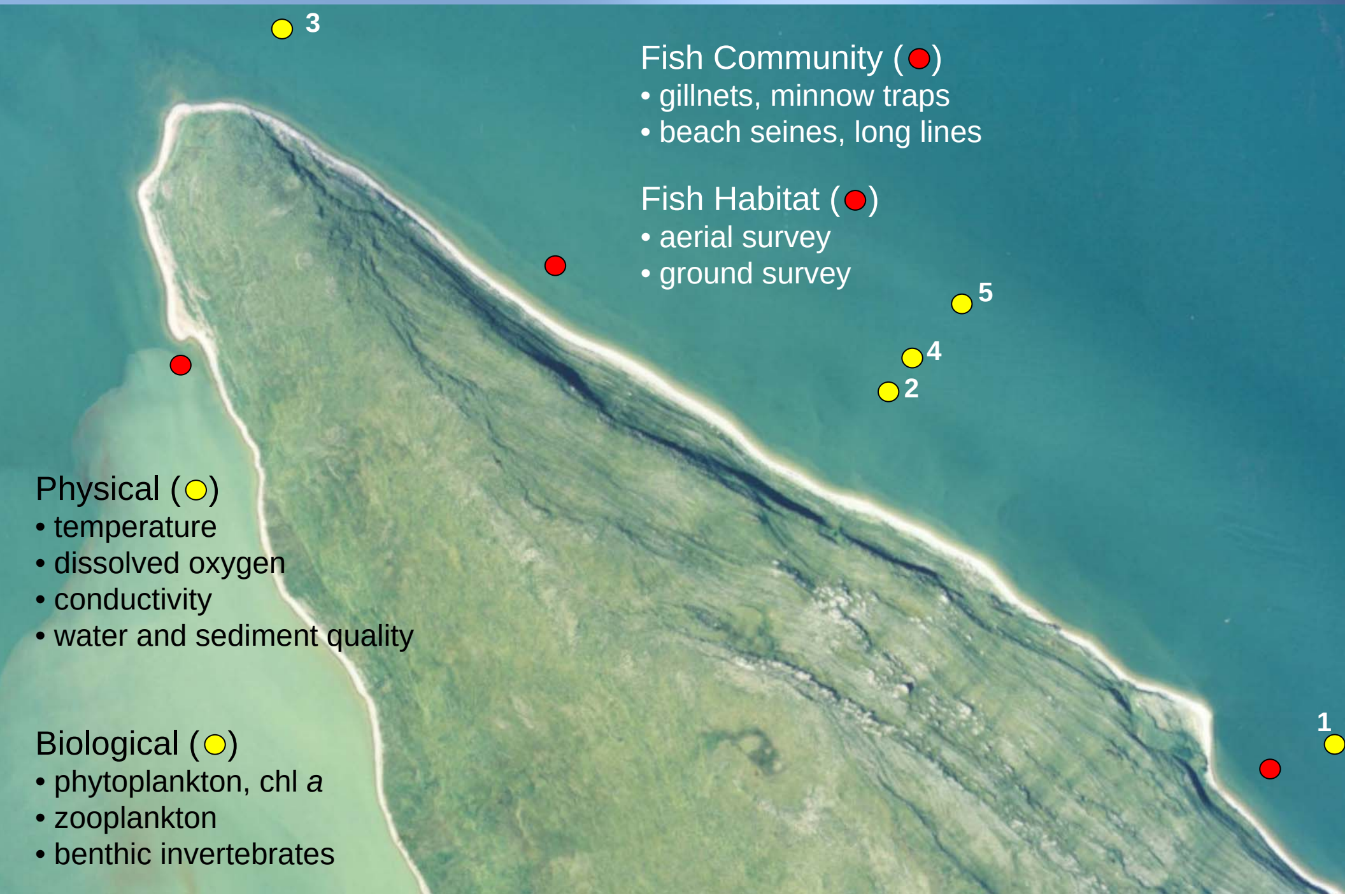
Marine Port Fish and Oceanographic Study

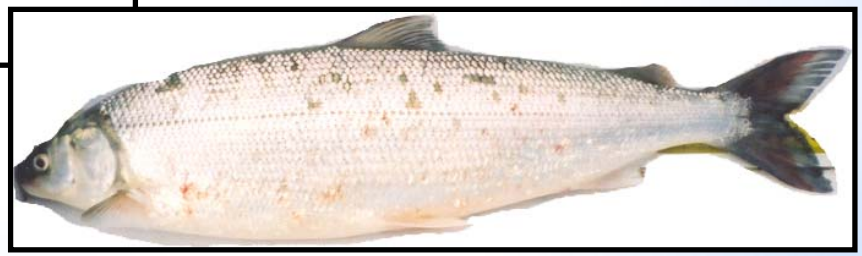


Marine Fish Species

- Saffron cod

- Starry flounder

- Broad whitefish



- Fourhorn sculpin
- Rainbow smelt
- Pacific herring
- Arctic cisco

- Ogac
- Arctic flounder
- Arctic char

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Wildlife

- Large mammal aerial surveys
- Esker and den surveys
- Small mammal trapping
- Groundwork and observations

Large Mammal Aerial Surveys

- Covered road alignment (transects)
- All wildlife seen were recorded
- 8 surveys were conducted between August 2001 and July 2002

the Bathurst Inlet Port and Road Project

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Esker and Den Surveys

- location and assessment of dens

wolf

grizzly

Small Mammal Surveys

- traplines set in a variety of habitat
- species (red-backed vole and tundra vole)

Barrenground Caribou

Bathurst Caribou herd:

- Ranges over the entire SGP in both NWT and Nunavut
- Calving ground west of Bathurst Inlet
- Spring migration coincides with the road closure for breakup

Caribou, cont'd

Queen Maud (Ahiak) Caribou herd:

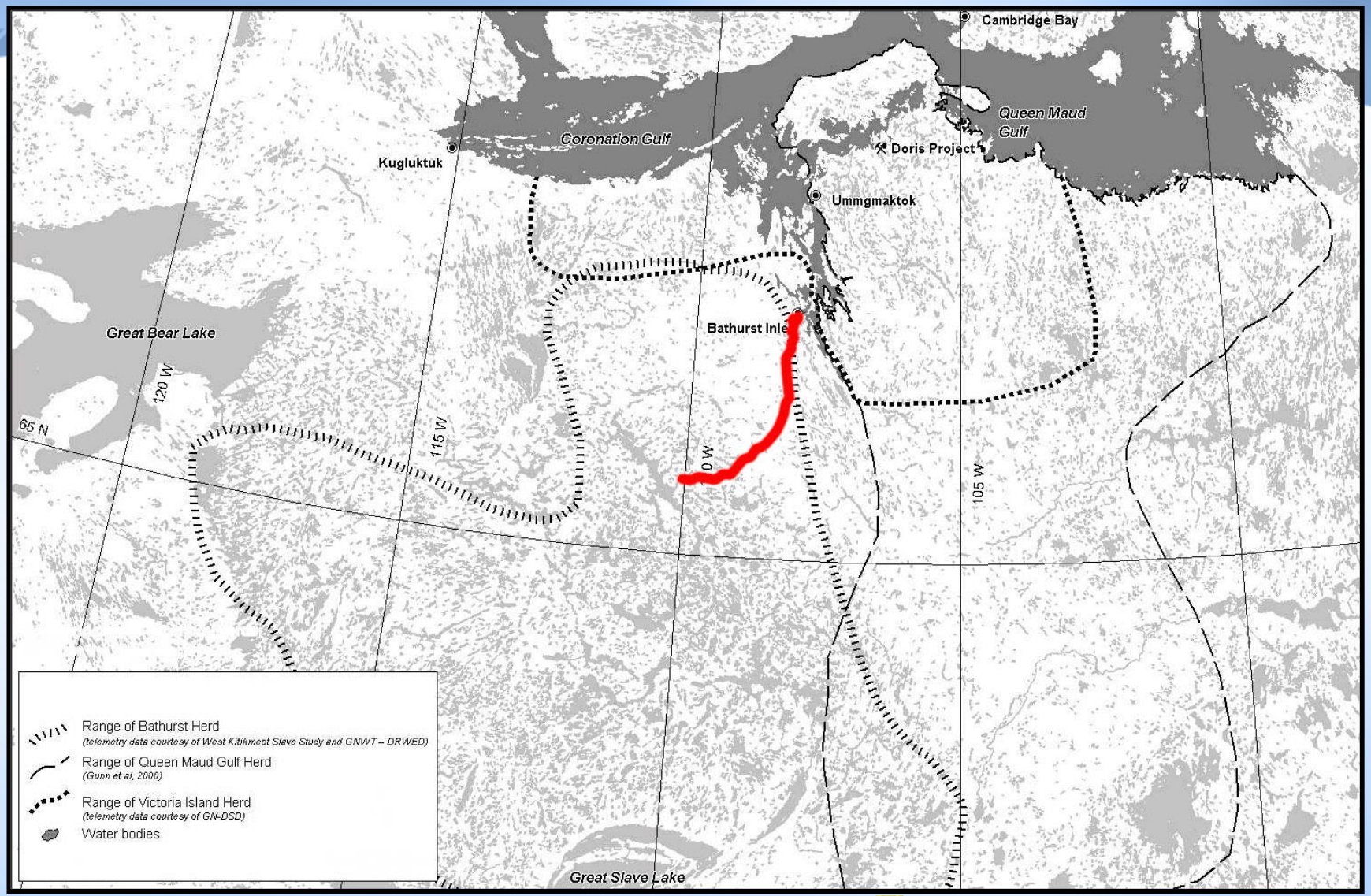
- Mainland range in both NWT and Nunavut
- Calving area in the Queen Maud Gulf Bird Sanctuary east of Bathurst Inlet
- Western margin of range may include proposed road route

Caribou, cont'd

Victoria Island Caribou (Dolphin and Union) herd:

- GN management
- Calving area and summer range on Victoria Island
- Migrates to the mainland for winter range

Mainland Caribou Ranges



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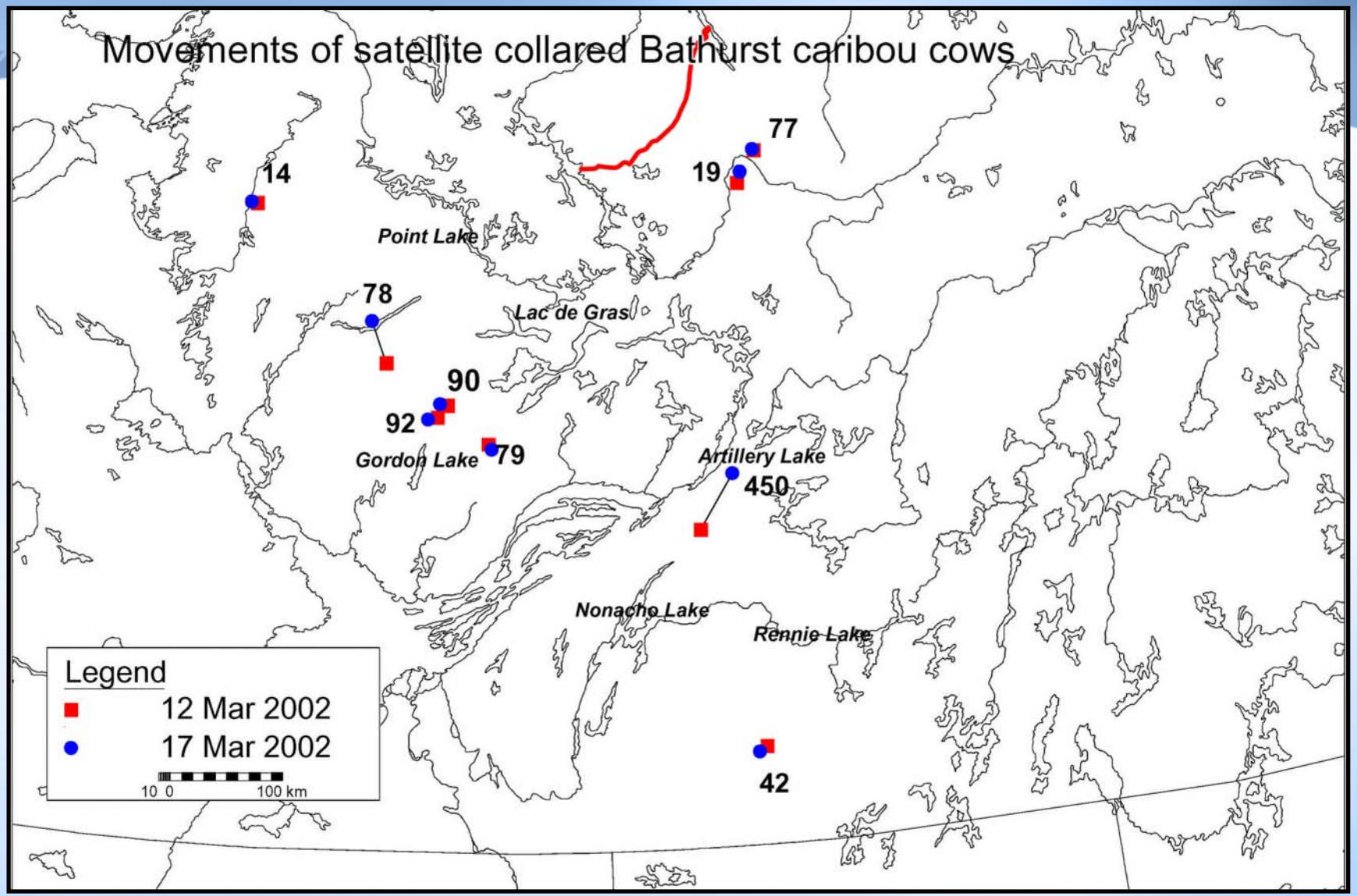
Caribou winter ranges - March 2002



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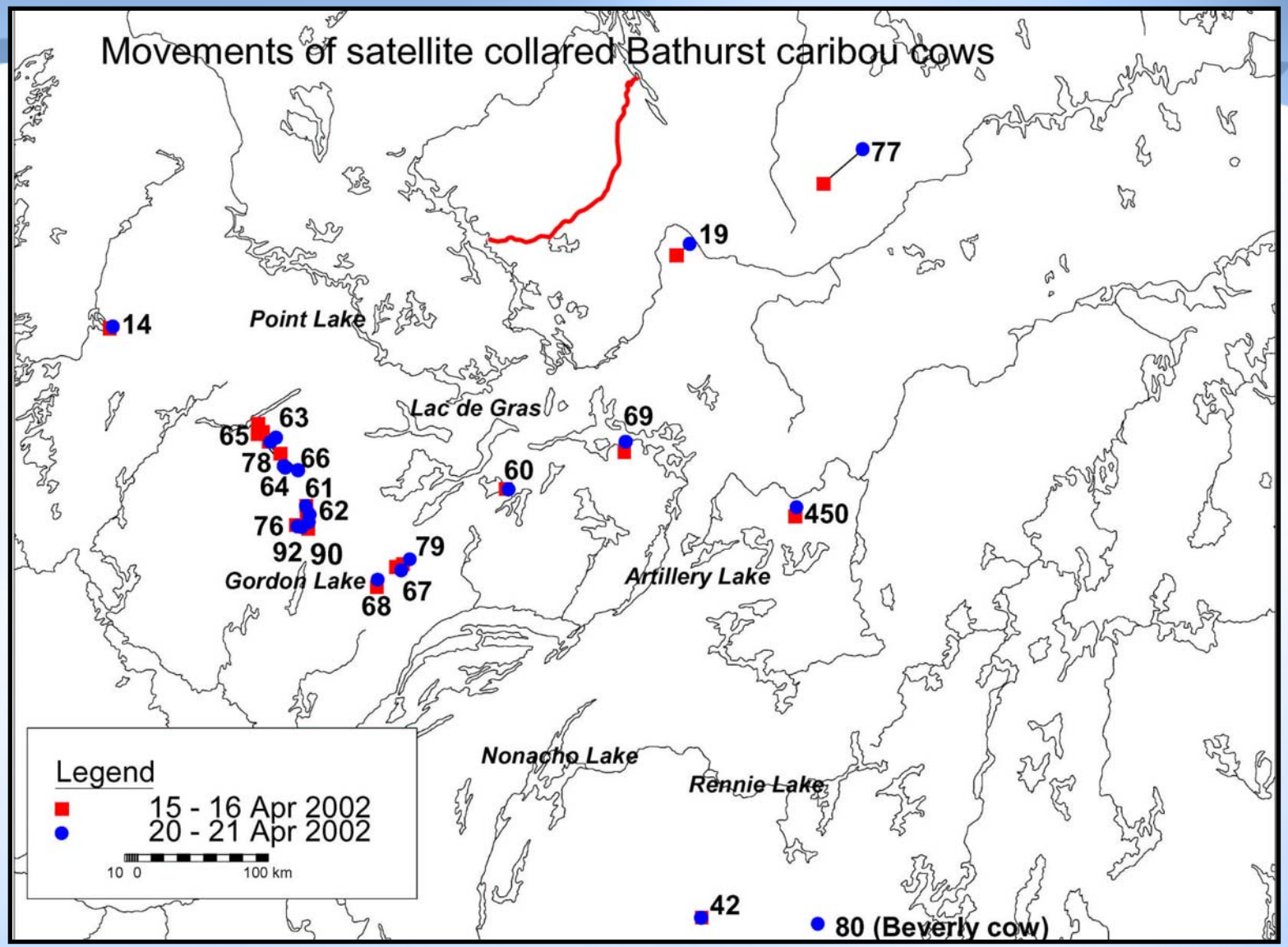
Caribou late winter ranges - April 2002



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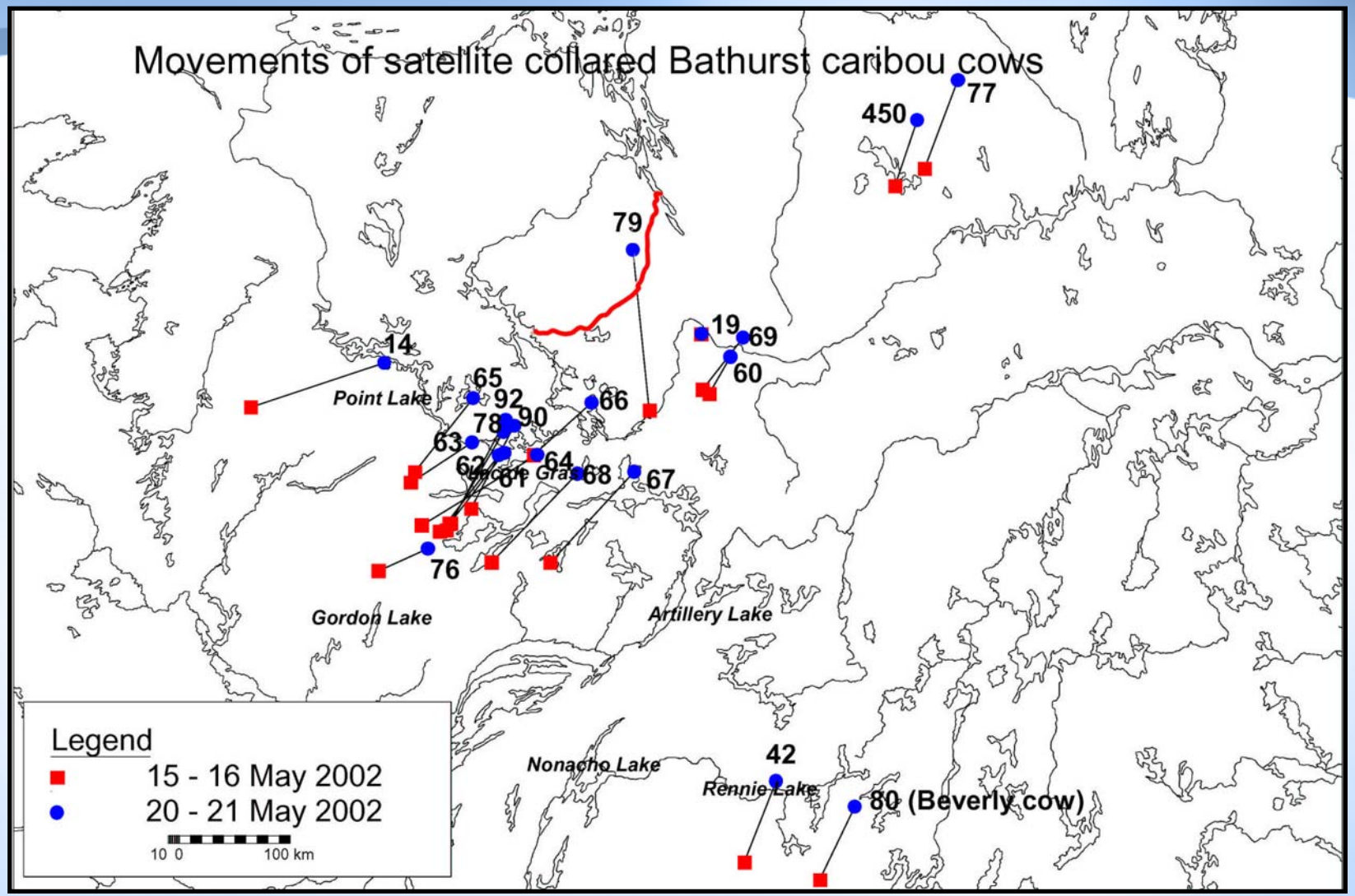
Caribou spring migration - May 2002



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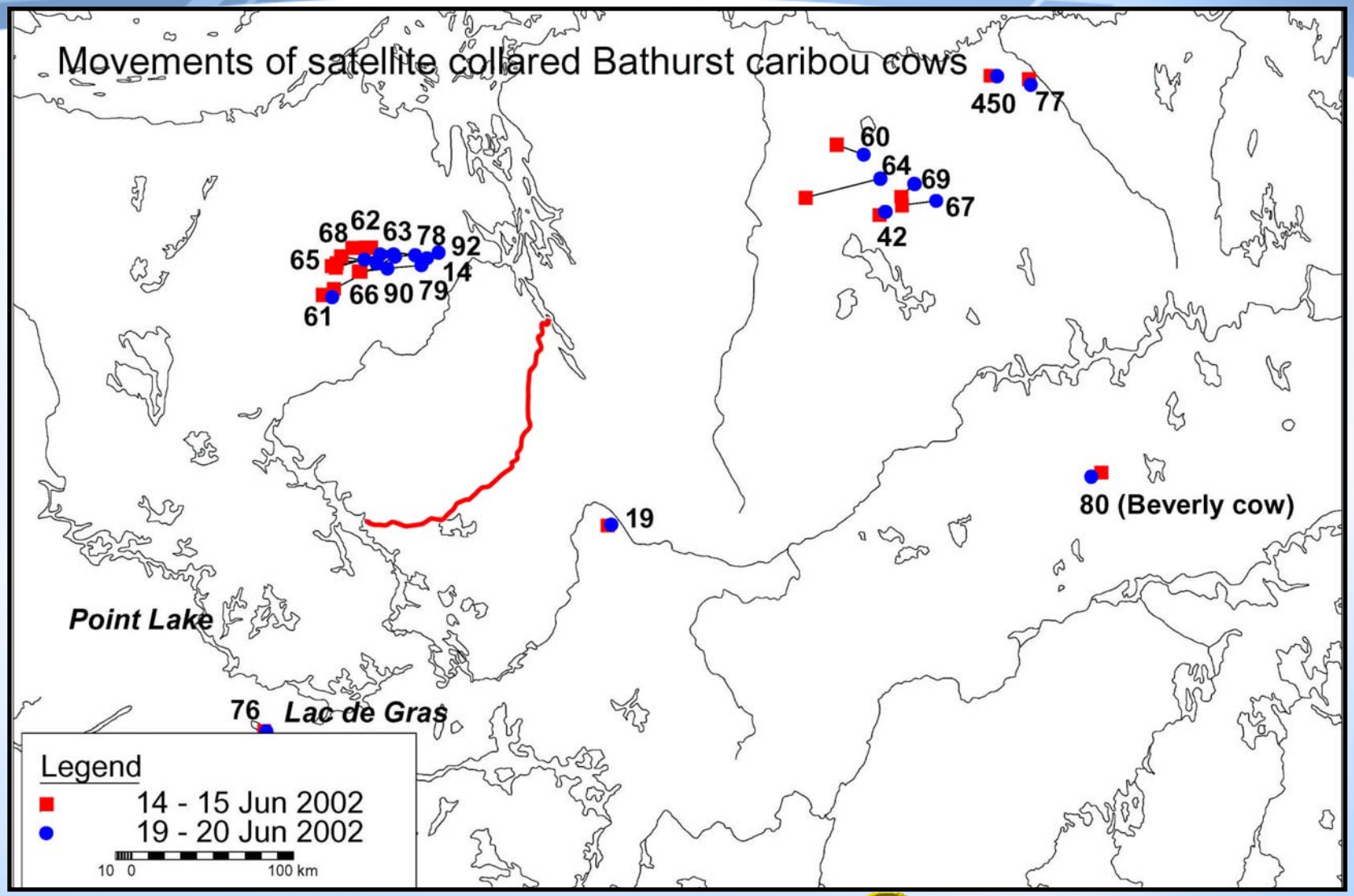
Caribou calving areas - June 2002



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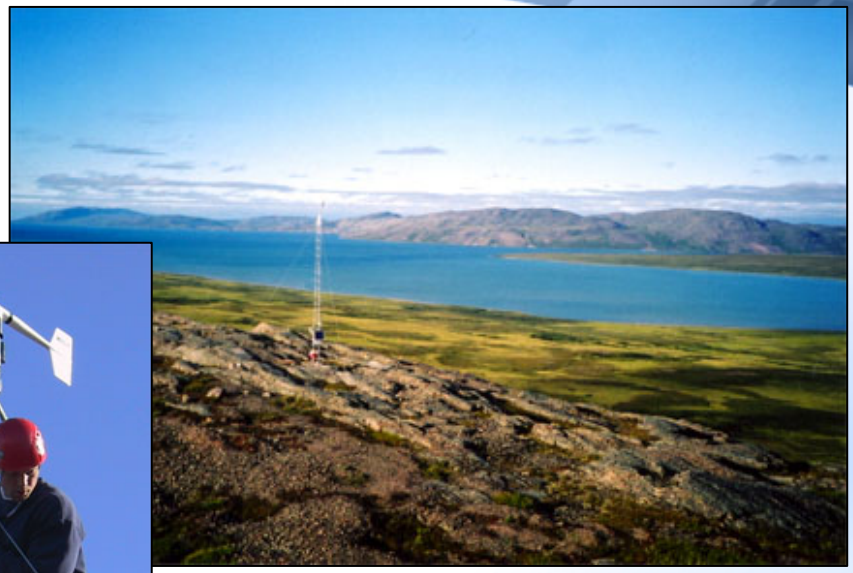
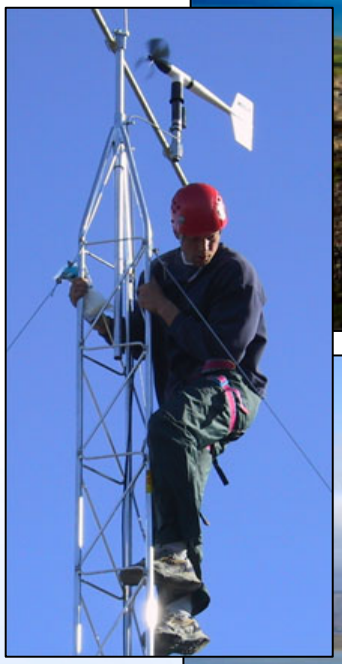
Meteorology

- Meteorological station installed in August 2001, still in operation
- Temperature and humidity probe
- Wind sensor
- Tipping rain gauge
- Pyranometer (solar radiation)
- Sonic ranger (snowpack depth)





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Bedrock Geology and ARD Studies

- Geological mapping
- Identification of mineralized areas and carving stone deposits

Acid Rock Drainage (ARD)

- samples taken from potential quarries

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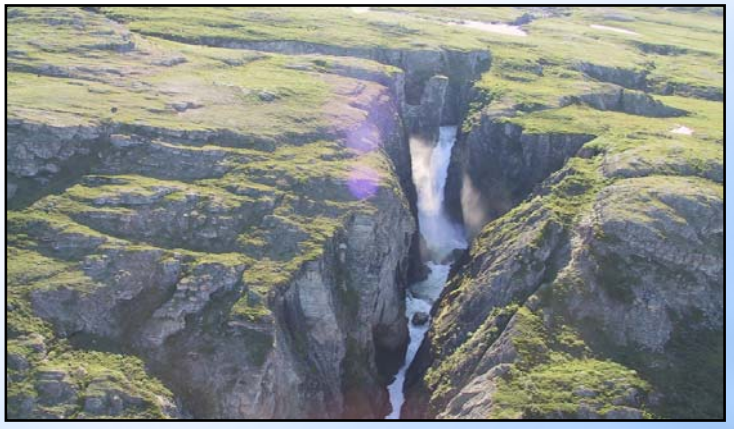
Surficial Geology and Soils

- 119 plots established
- Over 4,500 terrain units delineated
- Information collected on:
  - Parent materials
  - Texture
  - Surface expression
  - Modifying processes
  - Percent slope
  - drainage

Soil Pits

Boulder Fields

Landforms



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Vegetation Surveys

740 vegetation plots completed

- Species identification
- Percent cover for each species

Other Site Information

- Slope
- Aspect
- Moisture regime
- Nutrient regime
- Percent substrate cover
- Terrain texture
- drainage

the Bathurst Inlet Port and Road Project

NISHI-KHON SNC·LAVALIN

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- Profile baseline conditions in the West Kitikmeot communities (*e.g.,* demographics, employment and income, education, training and employment skills, e*tc.*)

Methodology

- detailed literature search
- questionnaire to survey residents
- visits to communities
- interviews

Community of Bathurst Inlet

the Bathurst Inlet Port and Road Project

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Community Consultation

- Public Meetings in:
- Bathurst Inlet (2)
- Cambridge Bay
- Kugluktuk
- Gjoa Haven
- Taloyoak
- Kugaaruk
- Yellowknife

- Presentations to Mayors and Councils:
- Cambridge Bay
- Kugluktuk
- Taloyoak
- Yellowknife
- Also several presentations to KIA Board, NTI, GN Cabinet and others

the BATHURST INLET PORT AND ROAD PROJECT

Heritage Resources

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Study Scope

- 2 year program – 2001 and 2002
- Program outline
  - Site file search to identify previously recorded sites
  - Literature search to provide information on site types and locations; provide regional archaeological and historical context
  - Evaluation of terrain features for archaeological site potential
  - Field survey to inventory sites
  - Evaluation of potential site values

2001 Field Program

- Overflight
  - Reviewed route and associated terrain
  - Confirmed potential of land forms
  - Finalized target areas for examination
- Field Assessment
  - Examined terrain features targeted as high potential for archaeological sites
    - lake/stream shores, eskers, knolls, ridges
  - 1km wide corridor
    - including road and potential borrow areas

2002 Field Program

- Area of focus
  - Bathurst Inlet Port
- Objectives
  - Additional field survey
  - Reassessment of site (MaNl 2) north of Tikiraq Lake
- Elder site visits
  - Joseph Niptanatiak and Tom Kokak of Kugluktuk
  - Contwoyto maintenance camp area; MaNl 2

Community Involvement

- Field programs – Brian Agoluk, John Franklin
- May 2002 community meetings
  - Kugluktuk – 5 Elders
  - Cambridge Bay – 8 Elders

Field Inventory Results

- Inventory – 69 heritage resource sites
- Site Types
  - 1 precontact campsite
  - 37 precontact artifact scatters
  - 13 precontact isolated finds
  - 15 stone features (caches, drive lanes)
  - 2 historic/traditional sites
  - 1 mixed site

Community Consultation Results

- Kugluktuk Comments – routing:
  - Bathurst Inlet Port previously recorded archaeological sites
  - Nose Lake burials
- Cambridge Bay Comments:
  - Bathurst Inlet Port previously recorded sites and burials
  - Mara River and Burnside River burials
  - Inclusion of newly recorded sites into accessible database
  - Collection policies and protocols

Preliminary Assessment

Site Values:

- Consideration of scientific potential and value to traditional residents as monuments to ‘presence on the land’
  - No further concerns – isolated finds, some artifact scatters
  - Mitigation (i.e. further study) required
    - Bathurst Inlet Port – facilities
    - Skewer Lake – potential borrow area
  - Avoidance required
    - Burials
    - Currently used sites

Mitigative Options

- Further studies prior to construction
  - Mapping of features and site contents
  - Controlled collection of artifacts
  - Controlled excavation
  - Analyses and reporting
- Avoidance
  - Re-siting of facilities
    - selection of alternate borrow areas

Projected impacts

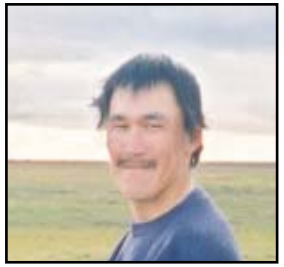
- Direct – potentially project related
  - less than 9% of inventory
  - Port Facilities – 4 sites (6%)
  - Alignment – 2 sites (3%)
    - 18 km Lake
  - Borrow Areas
    - Only 1 site recommended for mitigative studies associated with a potential borrow area

Projected Impacts

- Indirect – creation of access and use
  - Actual number unknown
  - Potential impacts from recreational use and increased human activity associated with road use
    - Sites at proposed Bathurst Inlet Port facility
    - Sites along lake shores at preferred recreational locales
    - Sites at good fishing locations
    - Sites at informal camping/picnicking areas

Angoniatit Niovikvia Ltd. (ANL) Participants in Summer 2001 and 2002 Field Work

Patsy Avakana



George Hitkolok

David Nivingalok

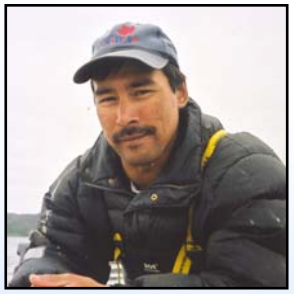
George Taptuna

Jason Bolduc

Isaac Klengenberg

David Sateana

J.F. Koudluak



Allen Kapolak

Tony Akolak

Colin Niptanatiak

Melanie Panioyak

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Acknowledgements

- Nuna Logistics Limited
- Nishi-Khon, SNC-Lavalin Inc.
- Rescan™ Environmental Services Ltd.
- Kugluktuk Angoniatit Association
- Geowest Environmental Consultants Ltd.
- FMA Heritage Resources Consultants Inc.
- Hubert and Associates Ltd.
- Nunasi Helicopters
- Kitnuna Expediting
- Kitikmeot Corporation
- Government of Nunavut
- DIAND
- Inmet Mining Corporation
- BHP Billiton Diamonds Inc
- Diavik Diamond Mines Inc
- Tahera Corporation
- Fednav
- NTCL
- Echo Bay Mines Ltd.
- Hope Bay Gold JV
- Canadian Coast Guard

COMMUNITY CONSULTATIONS, MAY 2007

the BATHURST INLET PORT AND ROAD PROJECT

Bathurst Inlet Port and Road Project

(An Economic Development Project for the Kitikmeot Region of Nunavut)

Community Meetings
May 2007

Project Status

- Project Proponent/owner is the Bathurst Inlet Port and Road Joint Venture Ltd.

  (An Inuit company, a 50/50 JV between Kitikmeot Corporation and Nuna Logistics)

- In December 2004 NIRB issued guidelines for the Draft Environmental Impact Statement (DEIS)

- The project now has funding to proceed with the DEIS

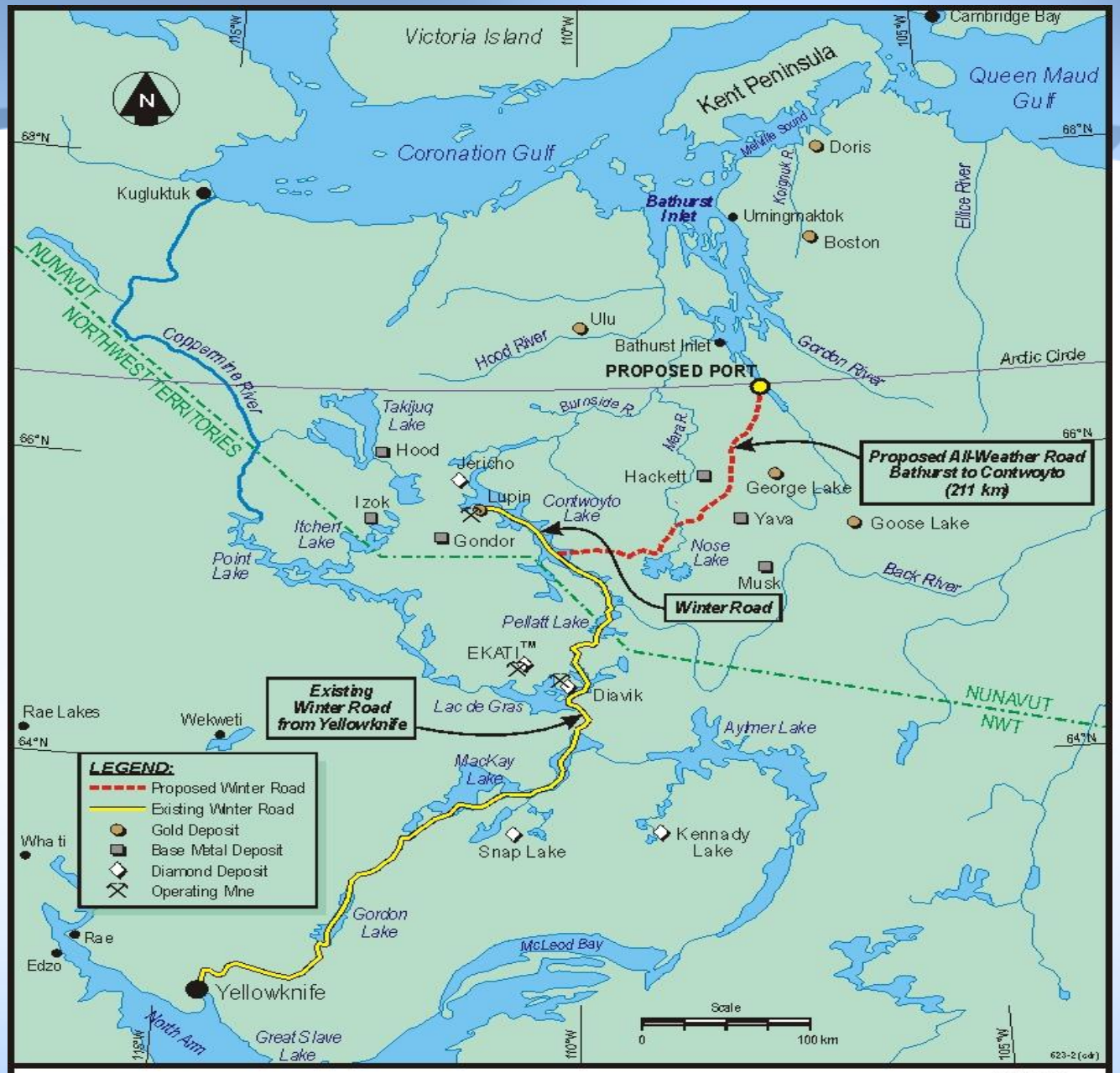

FIGURE 1

Bathurst Inlet Port and Road Project - Location Map

The Project

- Port site on Bathurst Inlet
  - Dock to serve large ice class vessels delivering fuel and bulk cargo to the port
  - Dock to handle barges serving the Kitikmeot Communities
  - 150 person camp and services
  - 180 million litre fuel tank farm
  - Truck and trailer repair shop
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- Road 211 km to Contwoyto Lake
  - Maintenance camp at Contwoyto Lake

Project Schedule

- Draft EIS to NIRB fall of 2007
- If permitting is complete by mid 2009, then mobilization can begin summer/fall 2009
- Construction can begin fall 2009 and be complete by winter 2011. The port site could be operational by summer 2011
- Road operations could then begin February 2012

Land Ownership

The project will occupy:

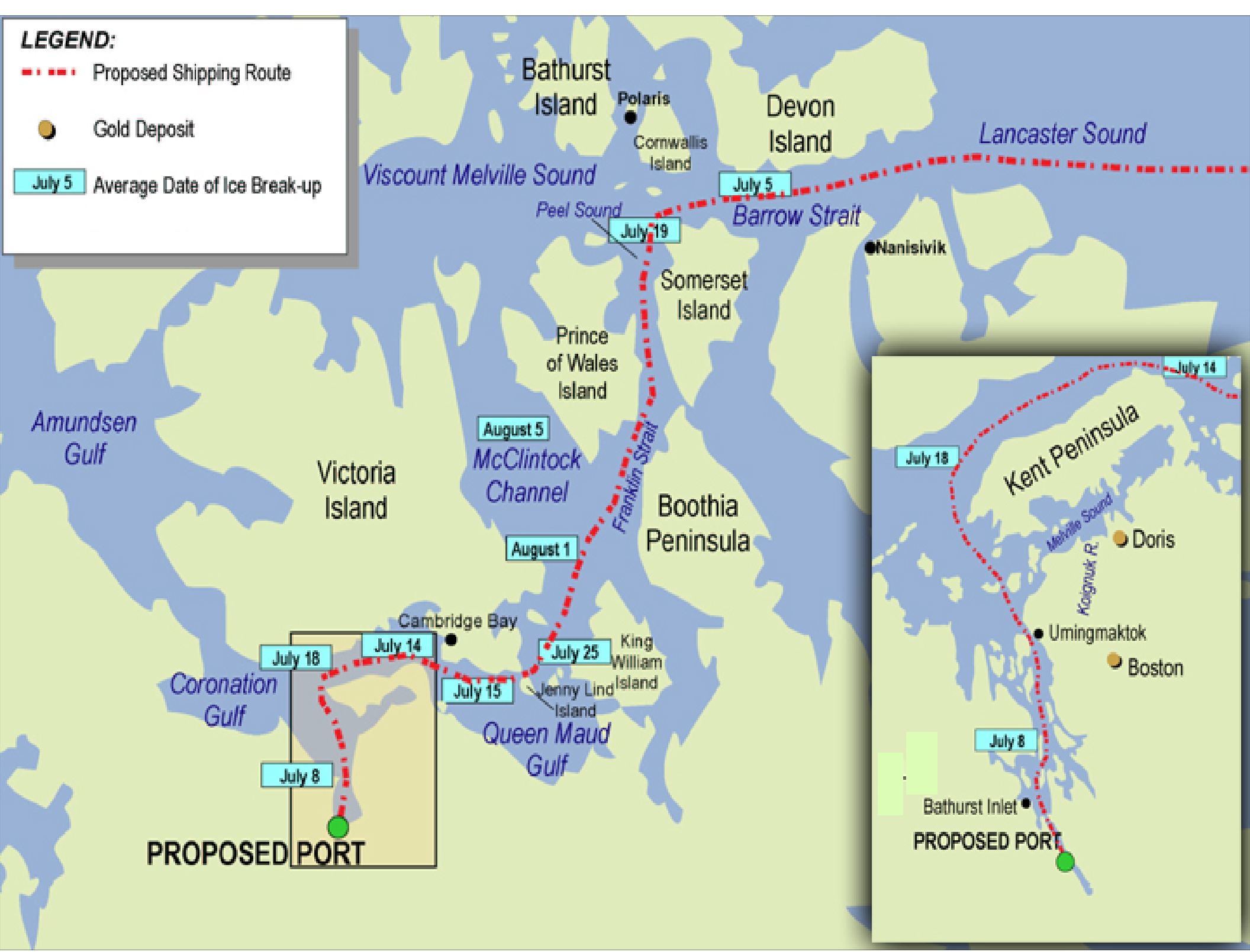
- Inuit Owned Land (IOL) 143 ha
  - Contwoyto camp 2 ha
  - 82.3km of road (& quarries) 141 ha
- Crown Land 370 ha
  - Port site camp and airstrip 159 ha
  - 128.9 km of road (&quarries) 211 ha

Project Operations

- Summer shipping season
- Fuel and supplies delivered to Kitikmeot communities by barge during summer.
- The “all weather” road would operate in winter only, between January and April, to deliver fuel and supplies by truck to mines in Nunavut and NWT. Trucks would be both captive to the project and also come from the South as necessary.
- Water use is for domestic purposes only. No industrial wastes, sewage would be treated for disposal.

Shipping

- Independent studies have shown that the route to the proposed port site is suitable for vessels up to 50,000 tonnes
- Vessels are allowed to enter Canadian Arctic waters as long as they comply with the Arctic Waters Pollution Prevention Act.
- Vessels must meet Canadian standards.
- Fuel and supplies would be shipped from eastern Canada or offshore into Bathurst Inlet during the open ice period, mid-July to mid October, (approx 90 days, similar to the shipping at Polaris and Nanisivik Mines).
- Icebreaking will not be required to extend the season


LEGEND:
Proposed Shipping Route
Gold Deposit
July 5
Average Date of Ice Break-up
Bathurst Island
Polaris
Cornwallis Island
Devon Island
Lancaster Sound
Viscount Melville Sound
Peel Sound
July 19
July 5
Barrow Strait
Nanisivik
Somerset Island
Prince of Wales Island
Amundsen Gulf
August 5
McClintock Channel
Franklin Strait
Victoria Island
Boothia Peninsula
August 1
Cambridge Bay
July 18
July 14
July 25
King William Island
July 15
Jenny Lind Island
Coronation Gulf
Queen Maud Gulf
July 8
PROPOSED PORT
July 14
July 18
Kent Peninsula
Melville Sound
Doris
Kugmuk R.
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Boston
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PROPOSED PORT

Project Benefits

- Reduced cost of fuel and supplies for the Kitikmeot communities and earlier delivery to Cambridge Bay
- Reduced capital and operating costs for mineral exploration and mine development
- Significant increase in Inuit businesses and local employment
- Increased training and skills development in the Kitikmeot
- Increased economic activity in Nunavut and NWT (especially Yellowknife)

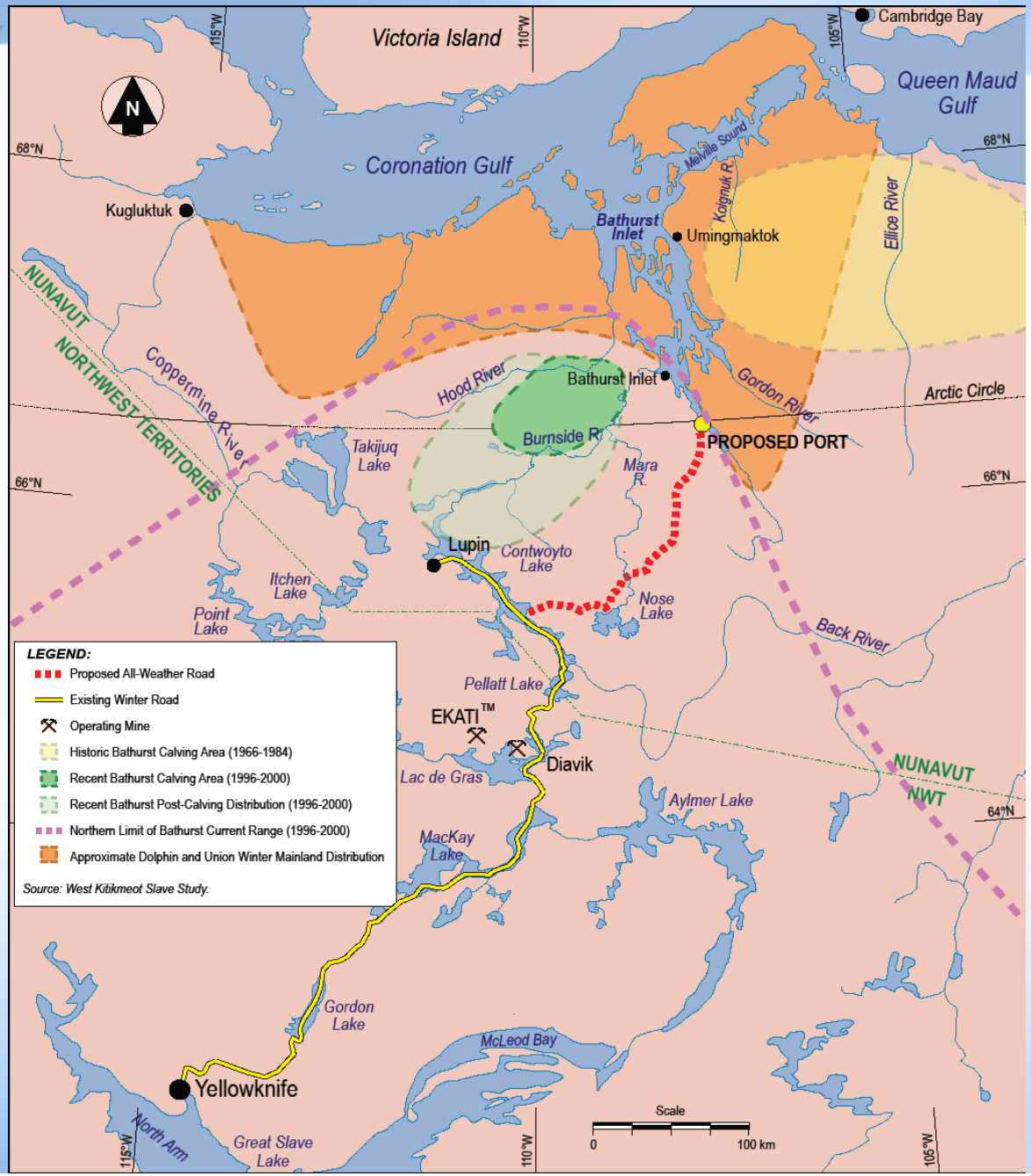
the BATHURST INLET PORT AND ROAD PROJECT

Environmental, Archaeology and Socio-economic Studies

Study Components

- Freshwater Environment
- Marine Environment
- Wildlife
- Meteorology
- Bedrock Geology and ARD
- Surficial Geology, Soils and Ecosystem Mapping
- Traditional Knowledge
- Archaeology/cultural sites

Mainland Caribou Ranges



the BATHURST INLET PORT AND ROAD PROJECT

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Methodology

- detailed literature search
- questionnaire to survey residents
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Community of Bathurst Inlet

the Bathurst Inlet Port and Road Project

Community Consultations to Date

Community consultations began in 2001 and have included the following activities:

- Meetings with Mayor & Council
- Public meetings
- Public Open Houses
- Presentations to stakeholder groups
- Site tours with Elders
- Scoping meetings
- Discussion groups

the Bathurst Inlet Port and Road Project

Socio-Economic Studies to date

To gather socio-economic data and to understand community values & viewpoints we have conducted :

- Research and review of existing literature & demographic data
- Community visits
- Questionnaires
- In-depth interviews
- Discussion groups & meetings

Socio-Economic Studies to date

Some of the topics raised during these activities included:

- Employment & training opportunities
- Business Opportunities
- Family, community health & wellness
- Inuit culture & traditional way of life
- Impacts on environment & wildlife

the BATHURST INLET PORT AND ROAD PROJECT

Heritage Resources

Heritage Study Scope

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2007 Program

- Field work
  - Marine mammal surveys in Bathurst Inlet
  - Bird surveys in the project area
  - Acid rock/metal leaching tests on construction rock
  - Update freshwater/marine fisheries work
- Socio-economic studies and Traditional Knowledge studies
- Preparation of the draft Environmental Impact Statement

Community Consultation

2007 Objectives

- Increase awareness of the BIPR project
- Gather community opinion, input and expectations of the project
- Develop understanding of Traditional lifestyle and how project may affect this
- Collect current and accurate information to build a comprehensive base line
- Assess socio-economic effects of project on area of influence

Next Steps

- The information from community consultation will be included in the Draft EIS
- Submit Draft EIS to NIRB
- NIRB public environmental review process

Koana

www.bipr.ca

the Bathurst Inlet Port and Road Project

COMMUNITY MEETINGS, ELDER'S LUNCH, MAY 2007

the BATHURST INLET PORT AND ROAD PROJECT

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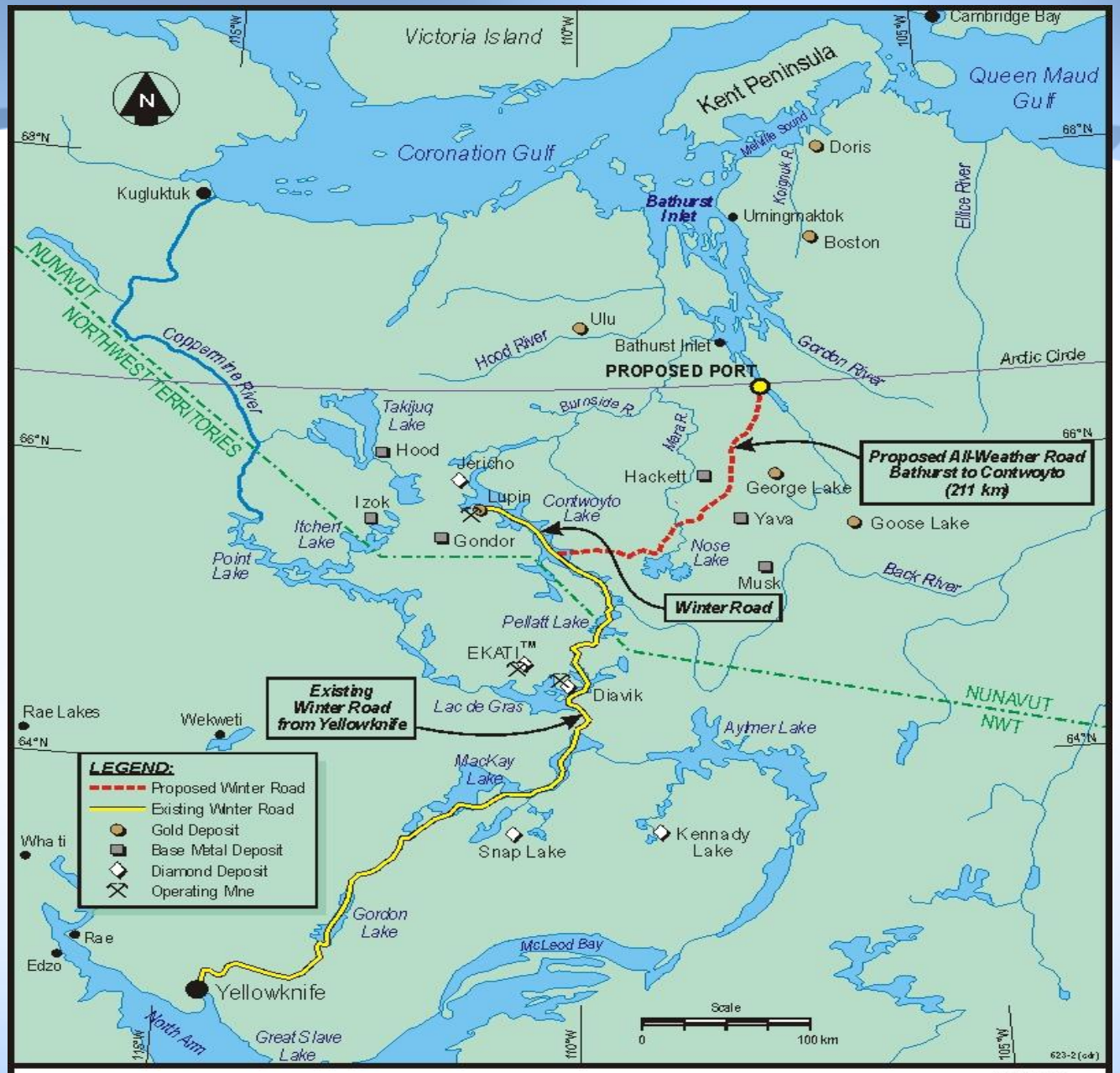

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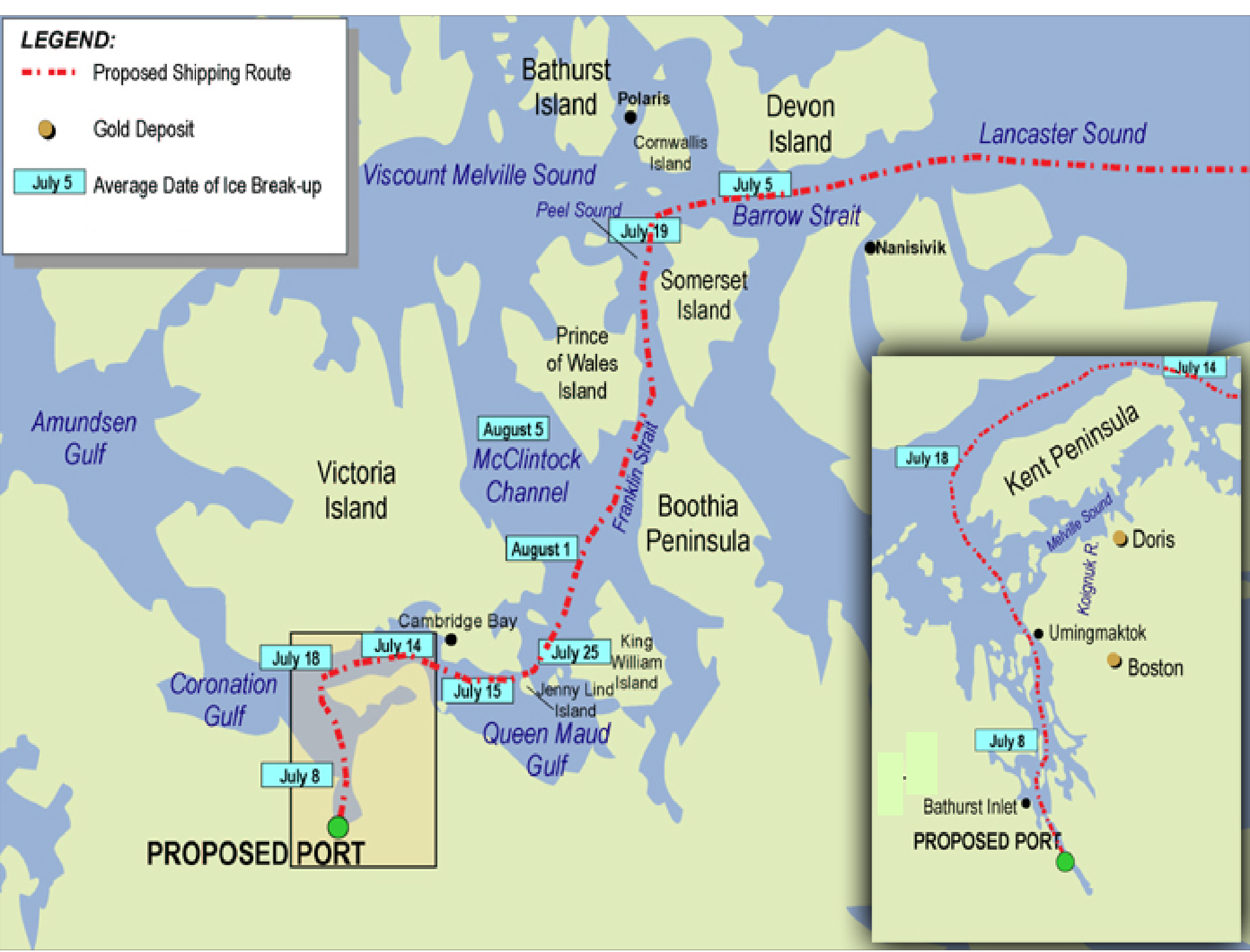
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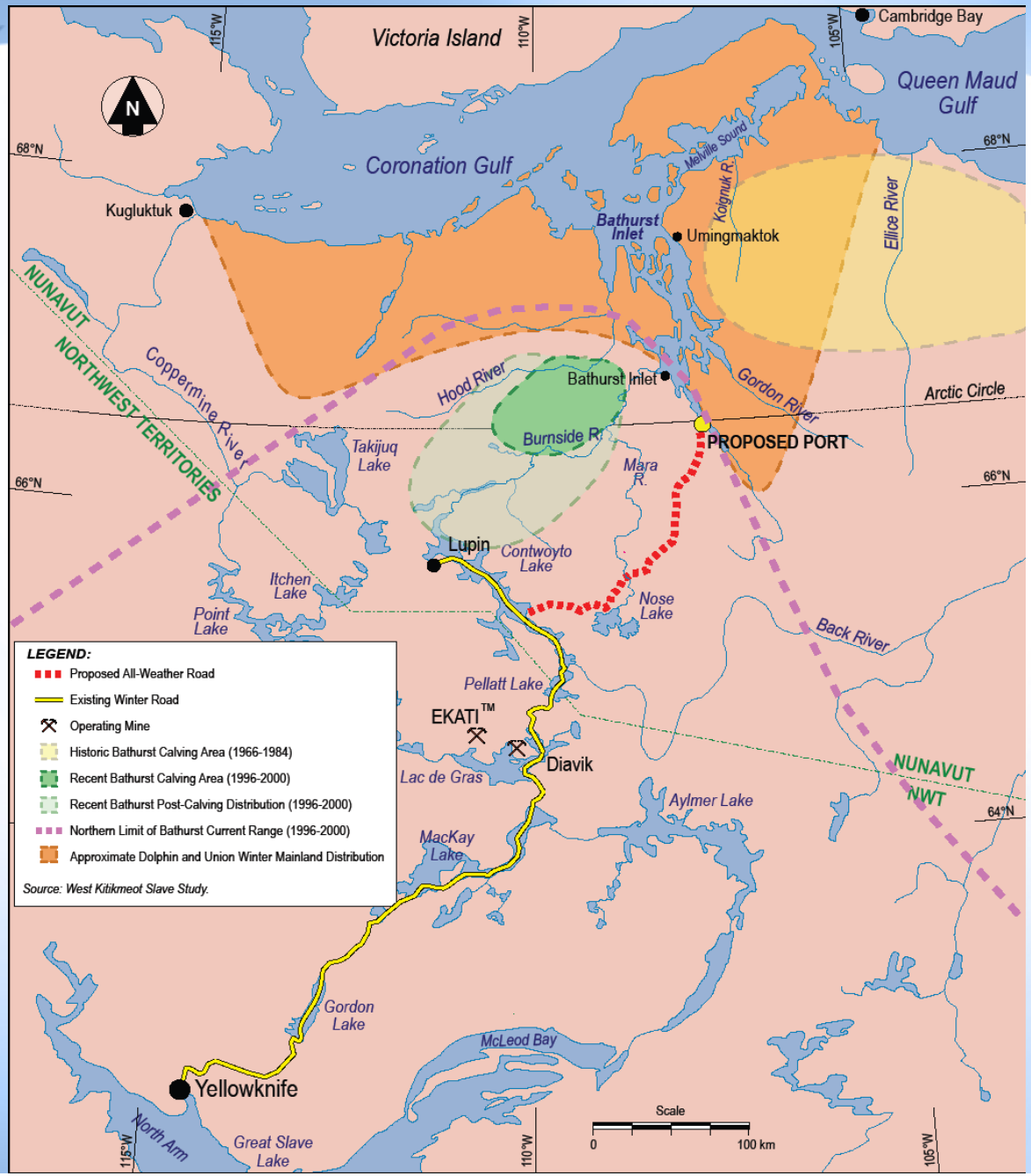

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- Profile baseline conditions in the West Kitikmeot communities (*e.g.,* demographics, employment and income, education, training and employment skills, e*tc.*)

Methodology

- detailed literature search
- questionnaire to survey residents
- visits to communities
- interviews

Community of Bathurst Inlet

the Bathurst Inlet Port and Road Project

Community Consultations to Date

Community consultations began in 2001 and have included the following activities:

- Meetings with Mayor & Council
- Public meetings
- Public Open Houses
- Presentations to stakeholder groups
- Site tours with Elders
- Scoping meetings
- Discussion groups

the Bathurst Inlet Port and Road Project

Socio-Economic Studies to date

Some of the topics raised during these activities included:

- Employment & training opportunities
- Business Opportunities
- Family, community health & wellness
- Inuit culture & traditional way of life
- Impacts on environment & wildlife

Heritage Study Scope

- 2 year program – 2001 and 2002
- Program outline
  - Site file search to identify previously recorded sites
  - Literature search to provide information on site types and locations; provide regional archaeological and historical context
  - Evaluation of terrain features for archaeological site potential
  - Field survey to inventory sites
  - Evaluation of potential site values

2007 Program

- Field work
  - Marine mammal surveys in Bathurst Inlet
  - Bird surveys in the project area
  - Acid rock/metal leaching tests on construction rock
  - Update freshwater/marine fisheries work
- Socio-economic studies and Traditional Knowledge studies
- Preparation of the draft Environmental Impact Statement

Community Consultation

2007 Objectives

- Increase awareness of the BIPR project
- Gather community opinion, input and expectations of the project
- Develop understanding of Traditional lifestyle and how project may affect this
- Collect current and accurate information to build a comprehensive base line
- Assess socio-economic effects of project on area of influence

Next Steps

- The information from community consultation will be included in the Draft EIS
- Submit Draft EIS to NIRB
- NIRB public environmental review process

Koana

www.bipr.ca

the Bathurst Inlet Port and Road Project

COMMUNITY MEETINGS, JUNE 2007

the BATHURST INLET PORT AND ROAD PROJECT

Bathurst Inlet Port and Road Project

(An Economic Development Project for the Kitikmeot Region of Nunavut)

Community Meetings
June 2007

Project Status

- Project Proponent/owner is the Bathurst Inlet Port and Road Joint Venture Ltd.

  (An Inuit company, a 50/50 JV between Kitikmeot Corporation and Nuna Logistics)

- In December 2004 NIRB issued guidelines for the Draft Environmental Impact Statement (DEIS)

- The project now has funding to proceed with the DEIS

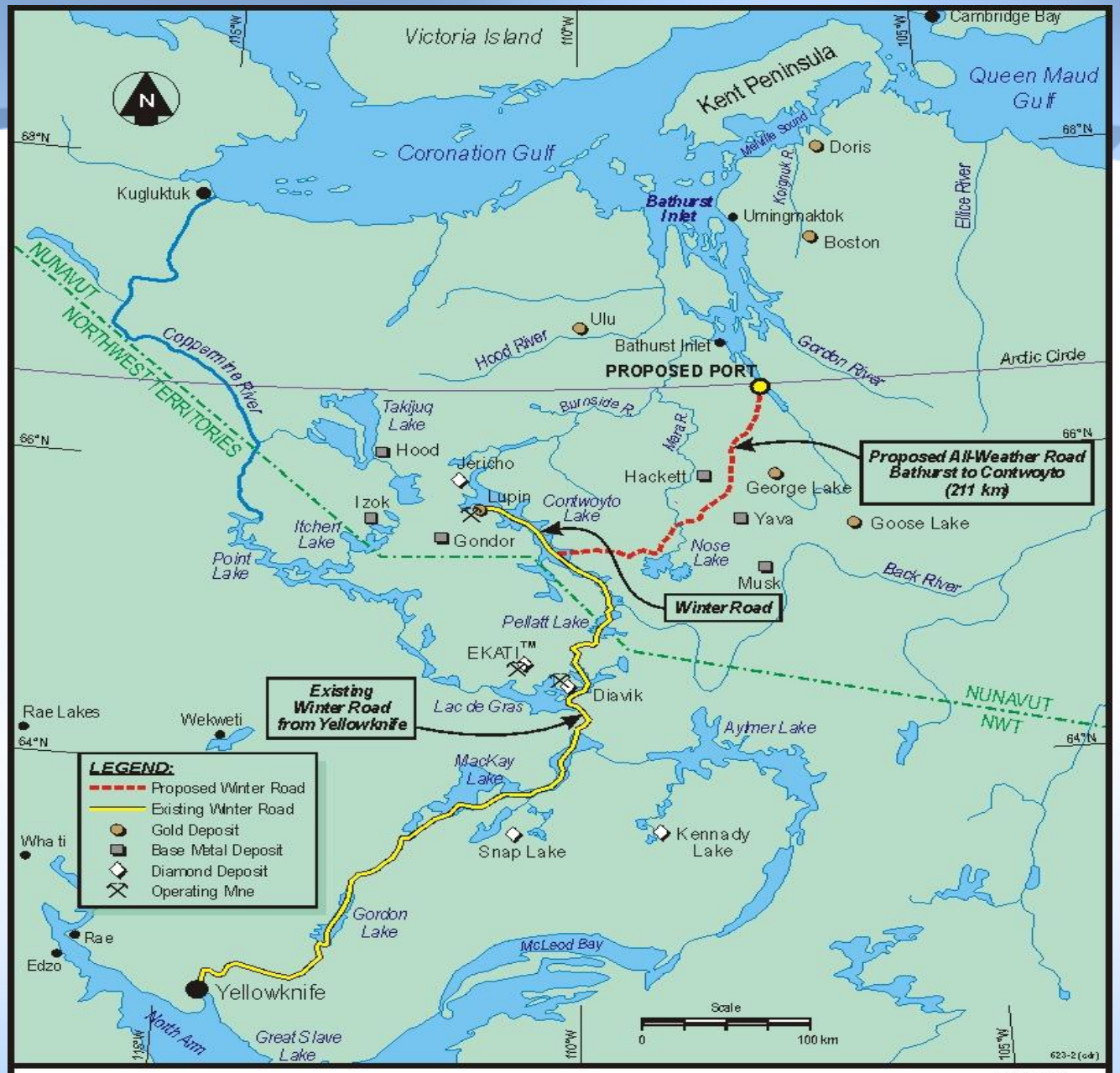


FIGURE 1

Bathurst Inlet Port and Road Project - Location Map

The Project

- Port site on Bathurst Inlet
  - Dock to serve large ice class vessels delivering fuel and bulk cargo to the port
  - Dock to handle barges serving the Kitikmeot Communities
  - 150 person camp and services
  - 180 million litre fuel tank farm
  - Truck and trailer repair shop
  - 1,200 metre airstrip (small planes)
- Road 211 km to Contwoyto Lake
  - Maintenance camp at Contwoyto Lake

Project Schedule

- Draft EIS to NIRB fall of 2007
- If permitting is complete by mid 2009, then mobilization can begin summer/fall 2009
- Construction can begin fall 2009 and be complete by winter 2011. The port site could be operational by summer 2011
- Road operations could then begin February 2012

Land Ownership

The project will occupy:

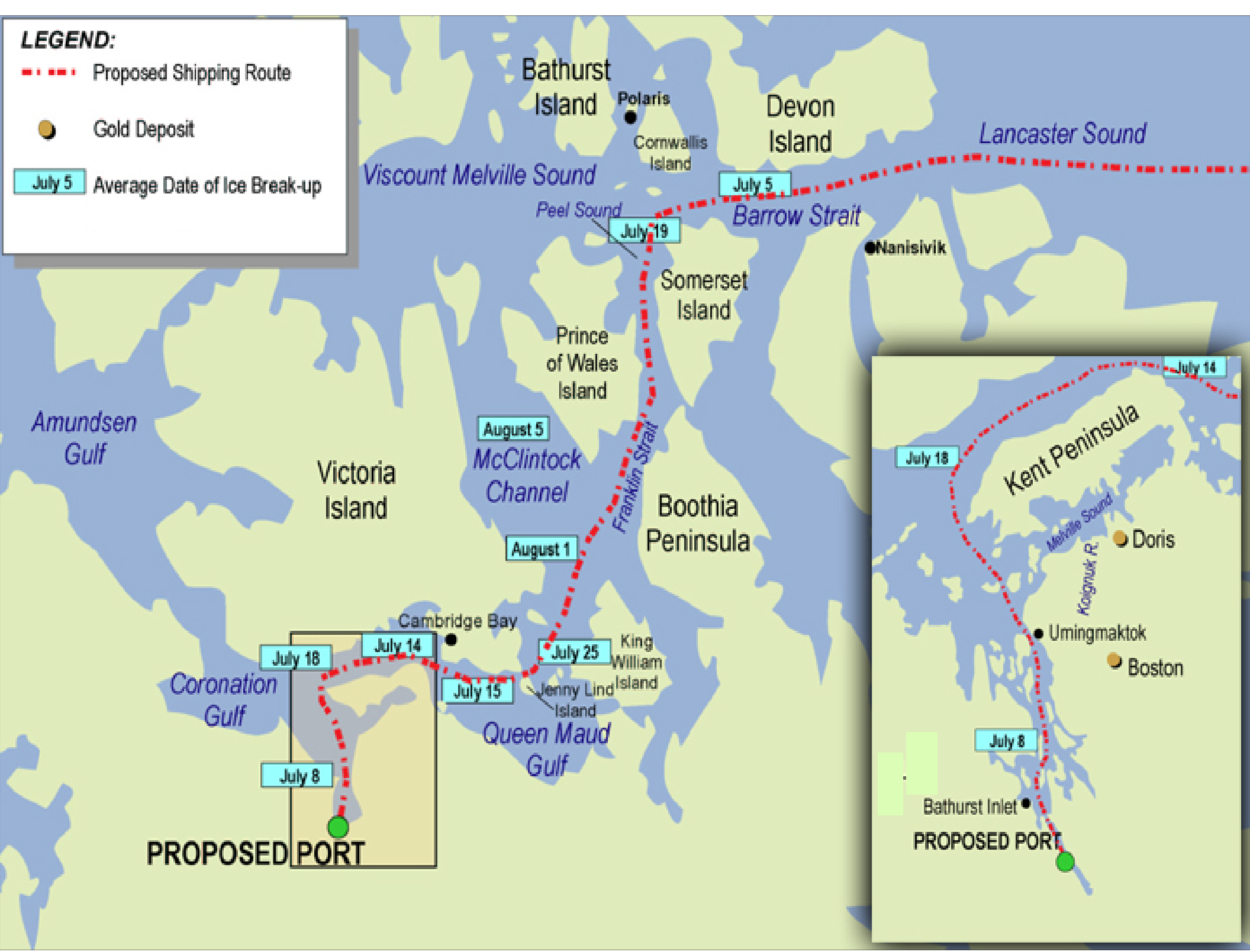
- Inuit Owned Land (IOL) 143 ha
  - Contwoyto camp 2 ha
  - 82.3km of road (& quarries) 141 ha
- Crown Land 370 ha
  - Port site camp and airstrip 159 ha
  - 128.9 km of road (&quarries) 211 ha

Project Operations

- Summer shipping season
- Fuel and supplies delivered to Kitikmeot communities by barge during summer.
- The “all weather” road would operate in winter only, between January and April, to deliver fuel and supplies by truck to mines in Nunavut and NWT. Trucks would be both captive to the project and also come from the South as necessary.
- Water use is for domestic purposes only. No industrial wastes, sewage would be treated for disposal.

Shipping

- Independent studies have shown that the route to the proposed port site is suitable for vessels up to 50,000 tonnes
- Vessels are allowed to enter Canadian Arctic waters as long as they comply with the Arctic Waters Pollution Prevention Act.
- Vessels must meet Canadian standards.
- Fuel and supplies would be shipped from eastern Canada or offshore into Bathurst Inlet during the open ice period, mid-July to mid October, (approx 90 days, similar to the shipping at Polaris and Nanisivik Mines).
- Icebreaking will not be required to extend the season


LEGEND:
Proposed Shipping Route
Gold Deposit
July 5
Average Date of Ice Break-up
Bathurst Island
Polaris
Cornwallis Island
Devon Island
Lancaster Sound
Viscount Melville Sound
Peel Sound
July 19
July 5
Barrow Strait
Nanisivik
Somerset Island
Prince of Wales Island
Amundsen Gulf
August 5
McClintock Channel
Franklin Strait
Victoria Island
Boothia Peninsula
August 1
Cambridge Bay
July 18
July 14
July 25
King William Island
July 15
Jenny Lind Island
Coronation Gulf
Queen Maud Gulf
July 8
PROPOSED PORT
July 14
July 18
Kent Peninsula
Melville Sound
Doris
Kugmuk R.
Umingmaktok
Boston
July 8
Bathurst Inlet
PROPOSED PORT

Project Benefits

- Reduced cost of fuel and supplies for the Kitikmeot communities and earlier delivery to Cambridge Bay
- Reduced capital and operating costs for mineral exploration and mine development
- Significant increase in Inuit businesses and local employment
- Increased training and skills development in the Kitikmeot
- Increased economic activity in Nunavut and NWT (especially Yellowknife)

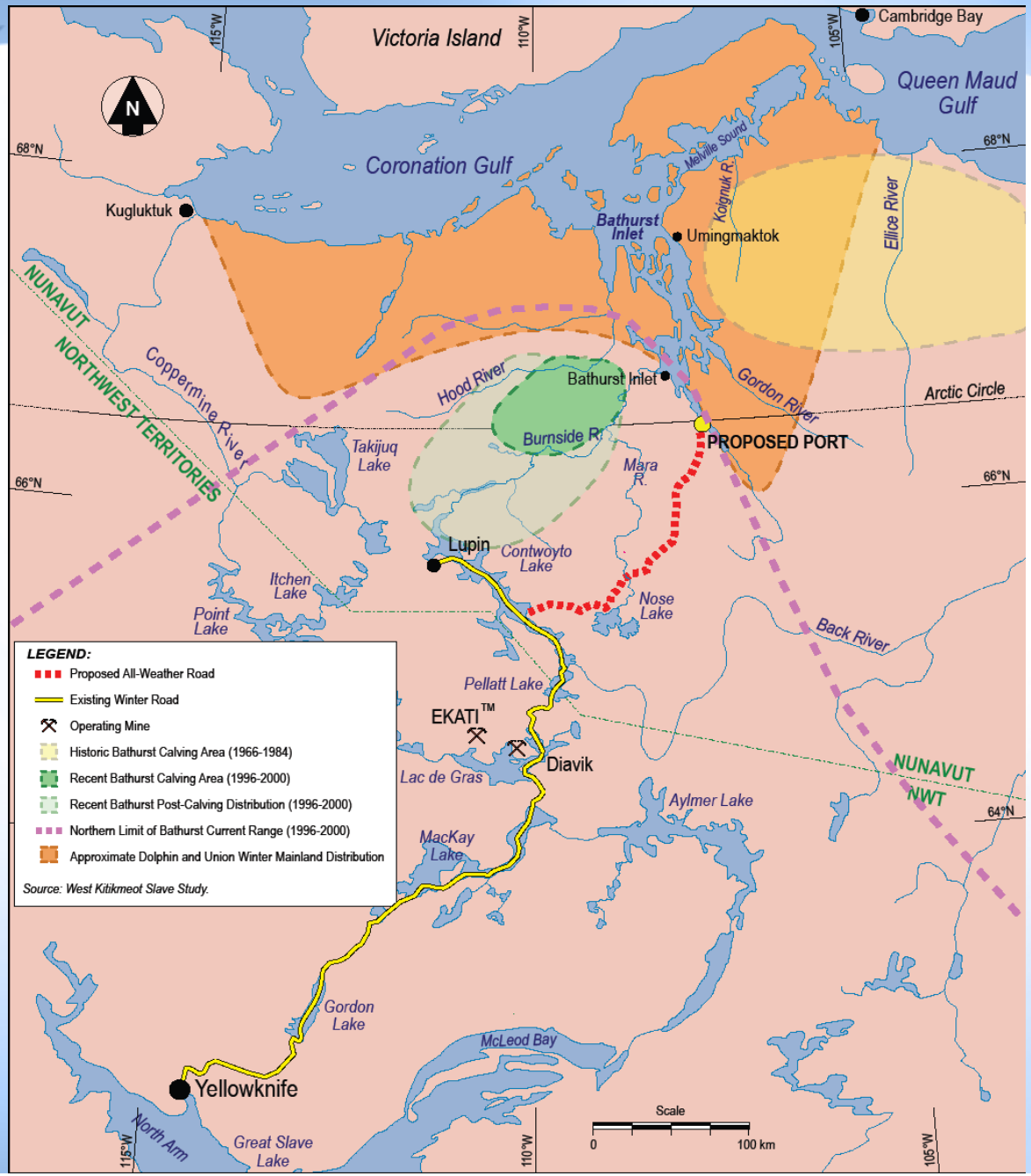
the BATHURST INLET PORT AND ROAD PROJECT

Environmental, Archaeology and Socio-economic Studies

Study Components

- Freshwater Environment
- Marine Environment
- Wildlife
- Meteorology
- Bedrock Geology and ARD
- Surficial Geology, Soils and Ecosystem Mapping
- Traditional Knowledge
- Archaeology/cultural sites

Mainland Caribou Ranges



the BATHURST INLET PORT AND ROAD PROJECT

Traditional Knowledge

Naonaiyaotit Traditional Knowledge Project (NTKP)

- Bathurst Port and Road Project within study area of the NTKP
- covers wide variety of topics, such as transportation routes, harvesting, cultural resources, wildlife, and fish
- raw data contained within a GIS database

Tuktu Nogak Project (TNP)

- Caribou and calves

Socio-Economic Studies

- Profile baseline conditions in the West Kitikmeot communities (*e.g.,* demographics, employment and income, education, training and employment skills, e*tc.*)

Methodology

- detailed literature search
- questionnaire to survey residents
- visits to communities
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Community of Bathurst Inlet

the Bathurst Inlet Port and Road Project

Community Consultations to Date

Community consultations began in 2001 and have included the following activities:

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- Site tours with Elders
- Scoping meetings
- Discussion groups

the Bathurst Inlet Port and Road Project

Socio-Economic Studies to date

To gather socio-economic data and to understand community values & viewpoints we have conducted :

- Research and review of existing literature & demographic data
- Community visits
- Questionnaires
- In-depth interviews
- Discussion groups & meetings

Socio-Economic Studies to date

Some of the topics raised during these activities included:

- Employment & training opportunities
- Business Opportunities
- Family, community health & wellness
- Inuit culture & traditional way of life
- Impacts on environment & wildlife

the BATHURST INLET PORT AND ROAD PROJECT

Heritage Resources

Heritage Study Scope

- 2 year program – 2001 and 2002
- Program outline
  - Site file search to identify previously recorded sites
  - Literature search to provide information on site types and locations; provide regional archaeological and historical context
  - Evaluation of terrain features for archaeological site potential
  - Field survey to inventory sites
  - Evaluation of potential site values

Heritage Consultation Results

- Kugluktuk Comments – routing:
  - Bathurst Inlet Port previously recorded archaeological sites
  - Nose Lake burials
- Cambridge Bay Comments:
  - Bathurst Inlet Port previously recorded sites and burials
  - Mara River and Burnside River burials
  - Inclusion of newly recorded sites into accessible database
  - Collection policies and protocols

2007 Program

- Field work
  - Marine mammal surveys in Bathurst Inlet
  - Bird surveys in the project area
  - Acid rock/metal leaching tests on construction rock
  - Update freshwater/marine fisheries work
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2007 Objectives

- Increase awareness of the BIPR project
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the Bathurst Inlet Port and Road Project

BATHURST INLET PORT AND ROAD PROJECT
POSTERS 2007

Bathurst Inlet Port and Road Project

Welcome to the Bathurst Inlet Port and Road Project

Project Proponent
Bathurst Inlet Port and Road Joint Venture Ltd.
(a 50/50 JV between Nuna Logistics Limited and the Kitikmeot Corporation)

Kitikmeot Corporation
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Kitikmeot Corporation

NUNA
Nuna Logistics Limited

Project Consultants

SNC·LAVALIN
SNC Lavalin
Vancouver, British Columbia

Rescan™
Rescan Environmental Services Ltd.
Yellowknife, Northwest Territories

FMA
FMA Heritage Consultants Inc.
Calgary, Alberta

HEMMERA
Hemmera Consultants
Vancouver, British Columbia

LGL LIMITED
environmental research associates
LGL Limited
King City, Ontario

An Economic Development Project for the Kitikmeot Region, Nunavut

Project Overview

Introduction

- The Slave Geological Province (SGP) is rich in mineral resources. About 40% of the SGP is in Nunavut (Kitikmeot).
- Full potential of the SGP has not been developed because of a lack of transportation infrastructure.
- The only road access is by winter road from Yellowknife to Lupin Mine (630 km).
- An arctic sea port and connecting roads would lead to significant growth in the area.

Infrastructure Solution

- Studies indicate the best option is a port on Bathurst Inlet and an all-weather road connecting with the existing winter road on Contwoyto Lake.
- Project built and operated by a public/private partnership of Inuit, industry and governments.
- The port and road would provide revenues from user fees and/or tolls.

Project Overview

The Project

- A dock on Bathurst Inlet, capable of handling 50,000 tonne ice class vessels.
- Camp for 150 persons, maintenance shop, 180 million litre capacity fuel tank farm and a 1,200 m airstrip.
- All-weather road to Contwoyto Lake (211 km) to connect to the existing winter ice road.
- Maintenance camp at Contwoyto Lake.

Bathurst Inlet Port Site

Operating Season

Operating Season Schedule

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Shipping												
Road Operation												

Note: Based on Contwoyto Lake ice road and barge shipping seasons.

Bathurst Inlet Port Site

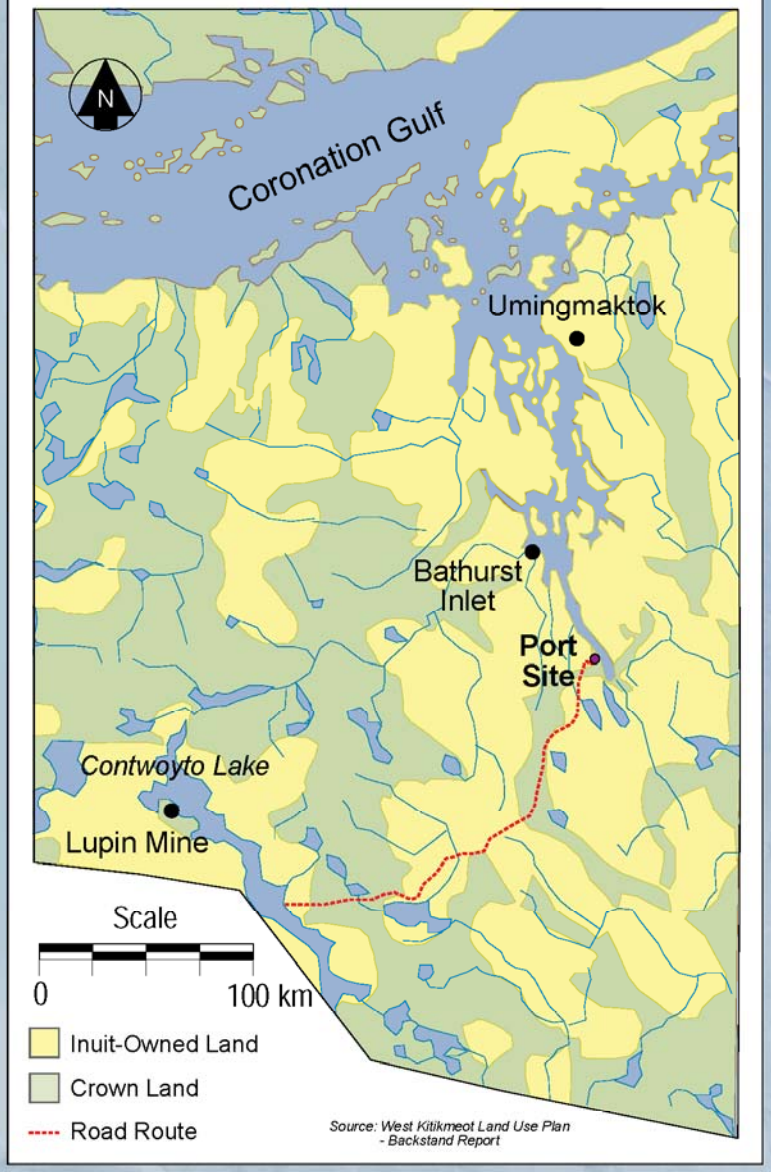
Land Ownership

Inuit Owned Lands (142 ha)

- 82.3 km of road plus associated quarry sites

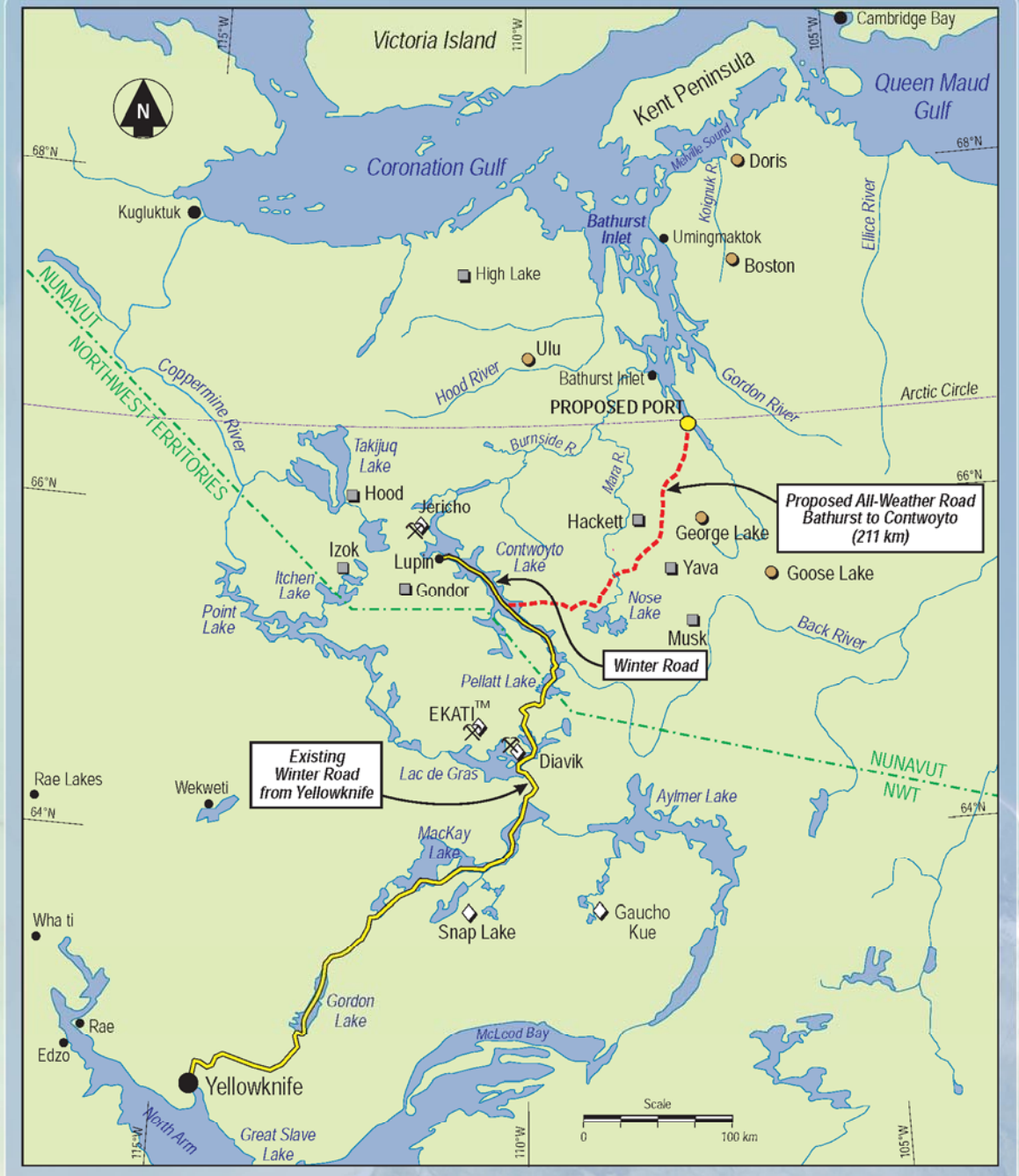
Crown Land (370 ha)

- Bathurst Inlet Port site
- 128.9 km of road and associated quarry sites



West Kitikmeot Planning Region

Map of Road Route



LEGEND:

- Proposed All-Weather Road
- Existing Winter Road
- Operating Mine
- Gold Deposit
- Base Metal Deposit
- Diamond Deposit

Proposed Shipping Route and Ice Data

Proposed Shipping Route

Detail of Proposed Shipping Route in Bathurst Inlet

LEGEND:

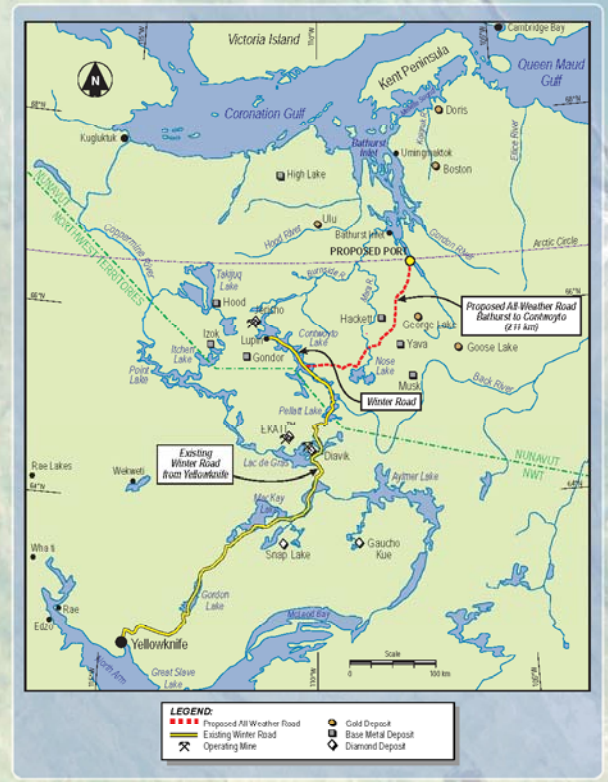
- Proposed Shipping Route
- Gold Deposit
- July 5 — Average Date of Ice Break up (1975-2002)

Project Benefits

- Improved transportation infrastructure in the region
- Reduced cost of fuel and supplies for the Kitikmeot communities.
- Reduced capital and operating costs for mining exploration and development.
- Significant increase in local employment, training opportunities.
- Significant increase in Inuit businesses and capacity building in the Kitikmeot and Nunavut in general.
- Increased economic activity and taxation revenues to Nunavut and Canada
- Improved security of supply routes for the NWT mines dependant solely upon the existing winter road.

Impacts of the Project on the Existing Winter Road and Yellowknife

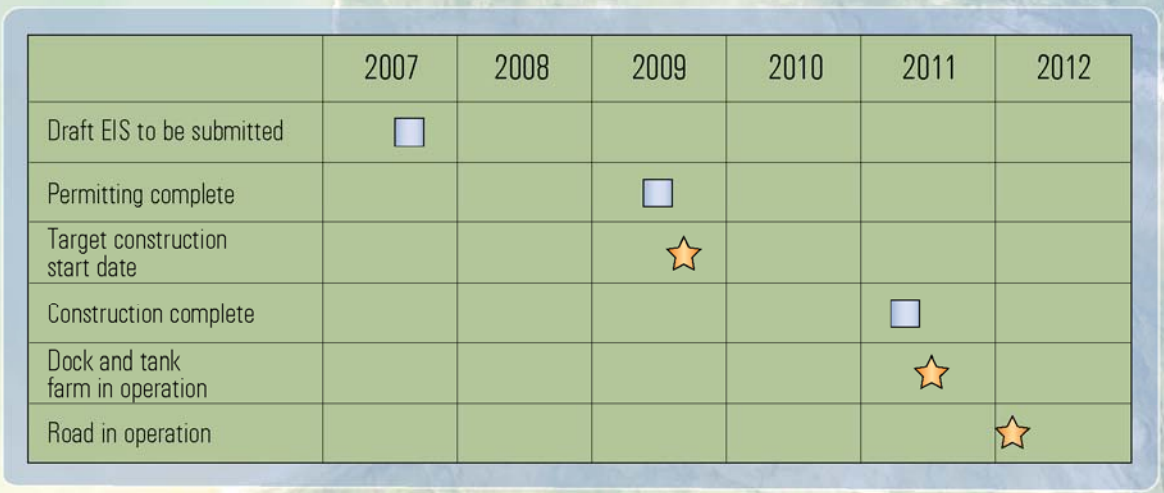
- The Project will have a positive effect on the whole region. The existing Winter Road will continue to be an essential component of the regional transportation infrastructure, linked to the BIPR Project. The economic impact on Yellowknife will be positive.
- With the BIPR Project in place, the annual trucking volumes in the region will double if the Izok and/or Hackett River mines come into production.
- It will be possible to move freight, such as construction materials for the Kitikmeot communities, from Yellowknife to Bathurst Inlet during the winter season.
- A 1999 GNWT study stated "...The construction of an all-weather road in the north and a port on Bathurst Inlet will be to the Western NWT's eventual benefit. It will lower costs and spur development both east and west of the border."
- A recent study by EBA for the diamond mines stated that "There is a high risk the TCWR (existing winter road) won't meet current or future demand forcasts. Therefore the need to initiate a supplementary transportation plan is urgent."
- The EBA study shows an increase in truck loads on the winter road of 20 to 40% over the 2007 level, between 2011 and 2017



Project Schedule

Project Schedule

- Draft Environmental Impact Statement to be submitted to NIRB, fall 2007.
- Permitting Complete mid 2009.
- Target Construction start fall 2009.
- Construction complete 2011.
- Dock and tank farm in operation 2011.
- Road in operation 2012.



Capital Cost/Employment Opportunities

Capital Cost	$ (million)
Bathurst Inlet Port	$63
Bathurst/Contwoyto Lake Road (211 km)	110
Bathurst Inlet Fuel Storage	64
Total	$237

Employment Opportunities

Construction (peak)

Administration and Supervision
Labour and Equipment Operators
} 170 people

Operation (average)

Administrative
Operation and Maintenance
Trucking (contract to mining companies)
} 164 people

Bathurst and Dolphin and Union Caribou Herds

- The road route lies within the spring and summer range of the Bathurst caribou herd, which is shared by NWT and Nunavut.
- Aerial surveys and ground observations of caribou distribution within a 10 km corridor along the proposed road route were carried out between July 2001 and July 2002.
- Road operations are scheduled to be suspended during spring break-up, between April 30 and July 15, which coincides with spring migration, calving and post-calving movements in the Project area.

Other Wildlife

- Aerial surveys were conducted in four seasons for large mammals within a 10 km corridor along the proposed road route (*e.g.* grizzly bears, muskox, wolves, *etc.*)

- Grizzly bear habitat along the route has been assessed.

- Incidental wildlife sightings were collected during field work in July-August 2001 and April, 2002, including mammals, waterfowl, and song birds.

- Esker complexes have been ground-surveyed for wildlife use.

- Denning sights were located by helicopter or esker ground surveys. Wolf, fox, grizzly bear, and wolverine dens were recorded and assessed.

- Small mammal populations were assessed by trapping (*e.g.* voles, lemmings).

- Raptor territory and nest surveys were completed in July, 2002 (*e.g.* rough-legged hawks, peregrine falcons, gyrfalcons).

Freshwater Environment

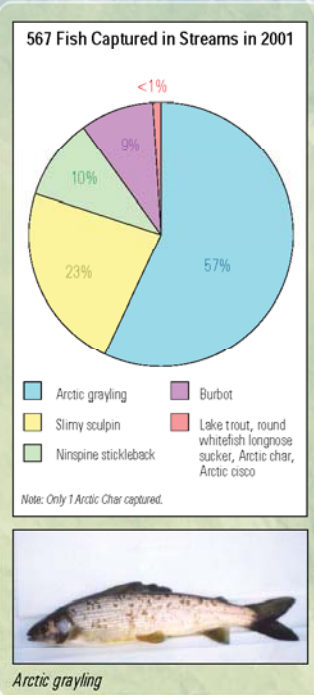
Contwoyto Lake

- **Fish Community**
  - gillnetting, seining, minnow traps (lake trout is the dominant species)
- **Fish Habitat**
  - aerial and ground survey
- **Aquatic Biology and Chemistry**
  - Physical parameters (temperature, DO, light penetration)
  - Water quality (physical parameters, nutrients, metals, petroleum hydrocarbons)
  - Sediment quality (description, nutrients, metals, petroleum hydrocarbons, and particle size)
- **Phytoplankton**
- **Zooplankton**
- **Benthic Invertebrates**

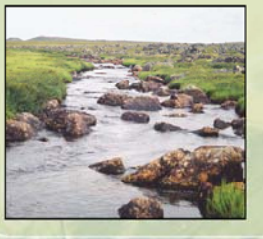
Lake trout

Streams Along the Road Route

- **Fish Community and Fish Habitat**
  - Aerial assessment of 156 streams in July 2001
  - Detailed surveys of 75 streams in August 2001
  - Additional work conducted in 2002
- **Aquatic Biology and Chemistry**
  - Water quality (physical parameters, nutrients, metals)
  - Sediment quality (description, nutrients, metals, particle size)
  - Periphyton
  - Benthic invertebrates



Arctic grayling



Prepared by Rescan™ Environmental Services Ltd.

Marine Environment

Fish and Fish Habitat Studies

Fish Community

- Various equipment used to sample (gillnets, beach seines, long lines and minnow traps)
- 11 fish species captured (Arctic cisco, starry flounder, Arctic cod, Arctic flounder, Pacific herring, broad whitefish, rainbow smelt, Arctic char, ogac, and lake trout

Saffron cod

Broad whitefish

Starry flounder

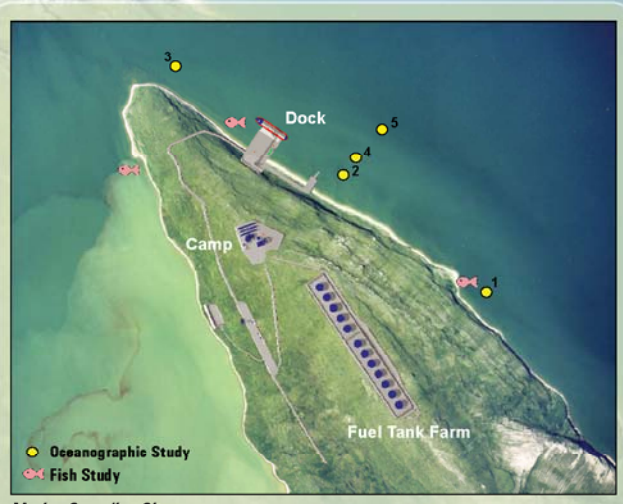
Beach Seining at Port Site in Bathurst Inlet

Fish Habitat

- Aerial Survey
- Ground Survey

Marine Mammals

- Aerial Survey of Shipping Route - September 2004
- Aerial Survey of Bathurst Inlet - June 2007



Marine Sampling Sites

Physical/Biological Oceanography

- 5 stations near port site
- Physical parameters collected:
  - temperature
  - dissolved oxygen
  - conductivity
  - water quality
  - sediment quality
- Biological parameters collected:
  - phytoplankton
  - chlorophyll *a*
  - zooplankton
  - benthic invertebrates

Sampling Water at Port Site

Surficial and Bedrock Geology/Terrestrial Ecosystem Mapping/Atmospheric Environment

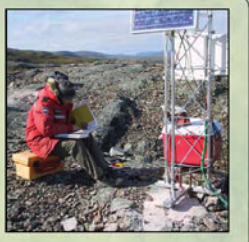
Surficial Geology and Terrestrial Ecosystem Mapping

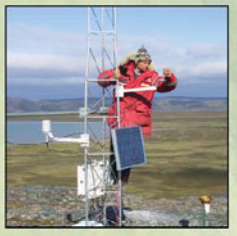
- Mapping was conducted at 1:15,000 scale using aerial photographs.
- Nearly 4,500 terrain units were delineated along the road route for the surficial geology and soils mapping.
- More than 700 vegetation plots were established along the road route.

Bedrock Geology Characterization

- Completed bedrock geology mapping at 1:60 000 scale across a 1 km wide corridor along the entire proposed route.
- Collected 38 representative bedrock samples that underwent acid base accounting analysis to determine the potential for acid rock drainage.
- Prospected for soapstone occurrences along the route. The Inuit continue to use soapstone for traditional carvings throughout many areas in Nunavut and the Northwest Territories.

Atmospheric Environment





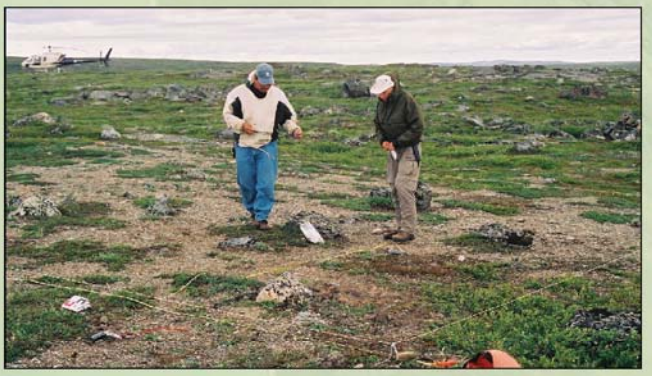
- Meteorological station set-up near the Bathurst Inlet Port location.
- Data collected from August 2001 to August 2002.
- Data collected include:
  - Air temperature
  - Relative humidity
  - Rain
  - Wind Speed
  - Wind direction
  - Solar radiation
  - Snow depth

Prepared by Rescan™ Environmental Services Ltd.

Heritage Resource Studies

Heritage resources survey for the proposed route of the Bathurst Inlet Port and Road project was conducted under permit of the Nunavut Government and the Department of Culture, Language, Elders and Youth

- In 2001, 100 heritage resources sites were identified by an archaeological team.
- In 2002, a team conducted mitigation of the sites considered to be in danger of impact due to road construction. During that project an additional 34 heritage resources sites were identified.
- During both surveys, community assistants participated as team members in the identification of heritage resources. Elders from local communities were given the opportunity to visit sites and comment on the impacts of the proposed project on heritage sites and how the impacts could be resolved.



Tony Akoluk and Alan Youell working on artifact collection at LjPb-33 overlooking Itchen Lake narrows. Mitigating this site will preserve the data for use in the regional database of heritage sites.

Tent Ring at Bathurst Peninsula. A number of tent rings are located along the shoreline of the Bathurst Inlet port site that indicate previous seasonal occupations of the area.

Artifacts such as this projectile point are used to identify previous occupants of the study area and to try and tie them into a time period.

Prepared by Rescan™ Environmental Services Ltd.

Bathurst Inlet Port and Road Project

Socio-Economic Study

- This study is part of the Environmental Impact Assessment of the Proposed Bathurst Inlet Port and Road (BIPR) in accordance with NIRB Project guidelines.

- The purpose of this study is to thoroughly assess the potential socio-economic impacts and benefits that the BIPR could have on the area of influence

- A socio-economic study is being produced for the Region to aid in the impact and benefit analysis.

- Demographics will be obtained through various community consultation processes.

Socio-Economic Studies to Date

To gather socio-economic data and to understand community values & viewpoints we have conducted:

- Research and review of existing literature & demographic data
- Community visits
- Questionnaires
- In-depth interviews
- Discussion groups & meetings

Some of the topics raised during these activities included:

- Employment & training opportunities
- Business Opportunities
- Family, community health & wellness
- Inuit culture & traditional way of life
- Impacts on environment & wildlife

Community Consultations

We need your input to:

- Gain insight from the people who still rely on the land for their livelihood
- Provide feedback on the potential impacts and benefits of the project
- Provide current and accurate information on the socio-economic conditions in your communities

Our goals for the consultations are to:

- Increase awareness of the BIPR project
- Gather community opinion, input and expectations of the project

- Develop understanding of Traditional lifestyle and how the project may affect this
- Collect current and accurate information to build a comprehensive base line
- Assess socio-economic effects of the project on area of influence

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Community consultations began in 2001 and have included the following activities:

- Meetings with Mayor & Council
- Public meetings
- Public Open Houses
- Presentations to stakeholder groups
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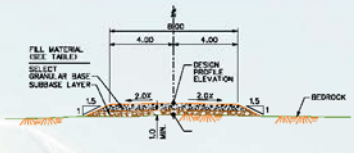
- Scoping meetings
- Discussion groups

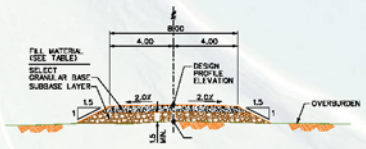
Typical Road Design

Typical Cross Section of All Weather Road and Ice Road

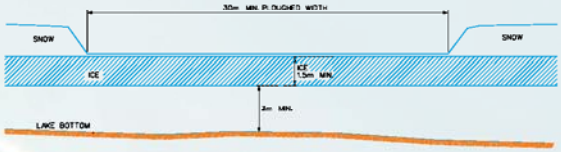


TYPICAL ALL WEATHER ROAD SECTION
ON BEDROCK OR WELL-DRAINED GRANULAR SOILS
NTS

TYPICAL ALL WEATHER ROAD WITH TURN-OUT
NTS

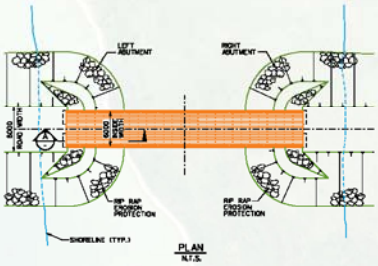


TYPICAL ALL WEATHER ROAD SECTION
ON ICE-RICH SOILS
NTS



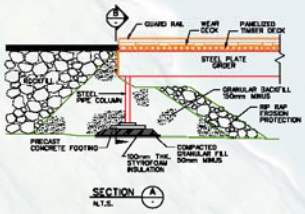
ICE ROAD SECTION
NTS

All Weather Road Typical Bridge Details

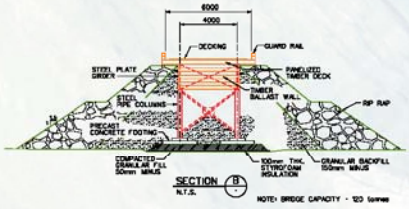


PLAN
N.T.S.

ELEVATION
N.T.S.



SECTION A
N.T.S.



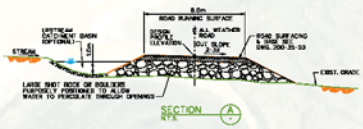
SECTION B
N.T.S.

NOTE: BRIDGE CAPACITY - 120 tonnes

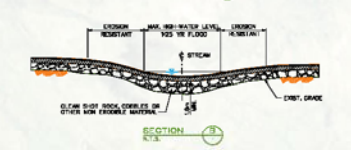
All Weather Road Typical Stream Crossing Details

TYPICAL MINOR STREAM FORD CROSSING
N.T.S.
CATCHMENT AREA > 5 km²

TYPICAL INTERMITTENT STREAM CROSSING
N.T.S.
CATCHMENT AREA < 5 km²



SECTION A
N.T.S.



SECTION C
N.T.S.

SECTION D
N.T.S.