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Cumulative Effects Assessment of Four Barren-ground Caribou Herds in the NWT

Barren-ground Caribou Range Land-use Scenarios 2022 – 2072



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Acronyms

ACCWM	Advisory Committee for Cooperation on Wildlife Management
CB	Cape Bathurst
BNE	Bluenose-East caribou
BNW	Bluenose-West caribou
CCP	Community Conservation Plan
DEWG	Dél'Iné ʔekwé Working Group
DGG	Dél'Iné Got'Iné Government
ENR	Environment and Natural Resources, GNWT
GNWT	Government of the Northwest Territories
GRRB	Gwichin Renewable Resources Board
GSA	Gwich'in Settlement Area
HG	Headwater Group
HTC	Hunters and Trappers Committee
IK	Indigenous Knowledge
ISR	Inuvialuit Settlement Region
ITH	Inuvik-Tuktoyaktuk Highway
NU	Nunavut
NWT	Northwest Territories
RRB	Renewable Resources Board
SARC	Species at Risk Committee
SRRB	Sahtú Renewable Resources Board; ʔehdzo Got'Iné Got'sé Nákedl
SSA	Sahtú Settlement Area
TAH	Total Allowable Harvest
TG	Tł'chq Government
TK	Traditional Knowledge
TP	Tuktoyaktuk Peninsula caribou
TRTI	Tł'chq Research and Training Institute
WMAC-NWT	Wildlife Management Advisory Council, NWT
WRRB	Wekèezhì Renewable Resources Board

1.0 Overview

1.1. Project Background

The Cumulative Effects Assessment of Four Barren-Ground Caribou Herds in the NWT project is assessing the cumulative effects of land-use, management, natural environmental and climate change scenarios on the Bluenose West (BNW), Bluenose East (BNE), Cape Bathurst (CB) and Tuk Peninsula (TP) barren-ground caribou herd habitat and population dynamics. More information can be found here: <https://accwm.com/cea>

Project Partners and Funders

Key project partners and guidance is coming from NWT Renewable Resource Boards (RRBs - GRRB, SRRB and the WRRB) and the Wildlife Management Advisory Council (WMAC-NWT) and GNWT ENR and ECCC.

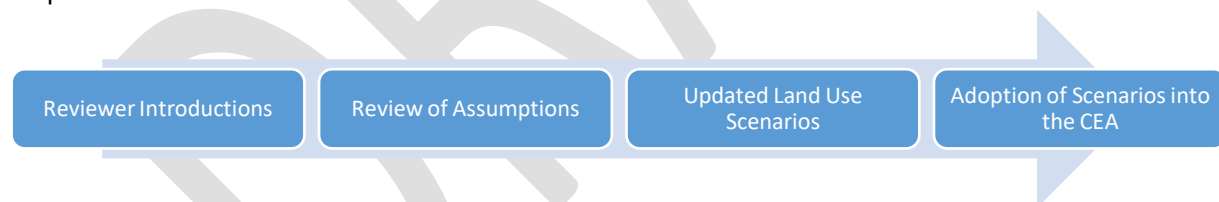
Project funders include the NWT Cumulative Impact Monitoring Program (CIMP), Environment and Climate Change Canada's Aboriginal Funding for Species at Risk program (ASFAR), the SRRB, Parks Canada and NWT ENR. In-kind contributions are provided by all project partners.

1.2. Purpose

Land use scenarios were constructed to inform the assessment of future cumulative effects on barren ground caribou over the next 50 years. The scenarios forecast future land use footprints across the barren-ground caribou ranges.

1.3. Land-use Scenario Development Process

The process for the development and review of the land-use scenarios was developed over four main steps:



1. **Reviewer Introductions**– introductions/phone conversations with reviewers were held to introduce and go over the land-use scenario process;

2. **Draft Land-use Scenario, Review of Assumptions** – A land-use scenario workbook was shared with reviewers to seek their review and comment on the following questions:

- Do the general assumptions for each scenario make sense?
- Are the specific assumptions and description of future land use scenarios appropriate?
- Are there key references that should be reviewed for the development of the land-use scenarios?

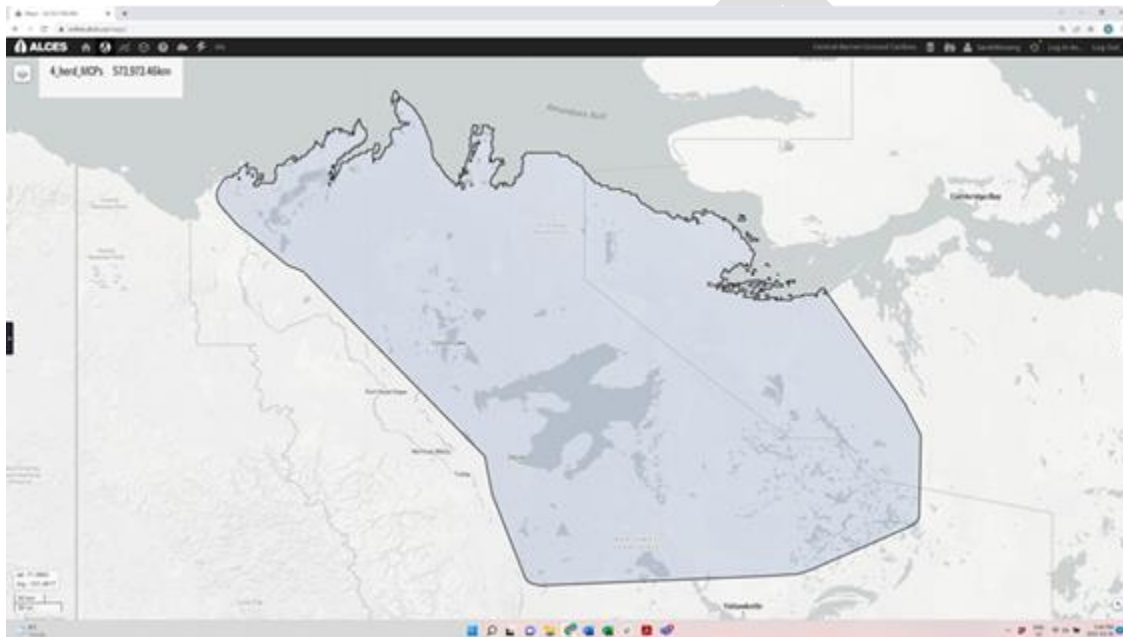
3. **Updated Land-use Scenarios** – an updated draft set of land-use scenarios will developed by the project team for review; and

4. **Adoption of the Land Use Scenarios into the CEA** – Land use scenario assumptions and forecasts were used to inform the CEA.

2. Study Area

The study area for the land-use scenario assessment covers the barren ground CEA study area including the ranges of the Bluenose-east, Bluenose-west, and Cape Bathurst and Tuk Peninsula herds. The area is outlined in Figure 1, below. Significant land uses adjacent to the study area and having the potential to influence study area land use (i.e. the Mackenzie Valley Highway) are included in the scenarios but not included in the related CEA assessment of caribou landscape and population dynamics as they is outside of the study area.

Figure 1: Barren Ground Caribou ranges



3. Future Development Scenarios

Three future development, land-use scenarios, were developed to provide insight into the amount of human-caused change that may occur in different parts of the barren ground ranges in the future.

The scenarios use information from the land-use scenario built for the Bathurst Caribou Range Plan, GNWT (2018c) and other sources (see References). Generally the scenarios were based on known or reasonably foreseeable future mineral development, petroleum resources, electricity and transportation projects that may occur in the next 50 years (2022 to 2072).

While the Mackenzie Valley Highway is not part of the study area, it is included within this report for context, along with petroleum development within the Sahtu shale oil district for development context. Only footprints within the study area are used in project modeling.

Scenarios

Scenario 1 Low/ Declining Development - represents a situation of declining development, where the existing operating diamond mines and Tibbit to Contwoyto Lake winter road cease operations by 2030, and no new mines are brought to production.

Mineral exploration declines or remains similar to current levels, with no other changes in transportation or electrical utility infrastructure.

Scenario 2 Medium/ Continuing Development - projects the current level of development into the future, where the existing diamond mines are replaced by new mineral development projects in the coming decades, using existing major road corridors with new winter or access road connections.

The continuing development scenario assumes that only a few of the existing advanced mineral exploration projects will become producing mines in the coming 50 years, mineral exploration will remain similar to current, and there will be limited change in current transportation and electrical utility infrastructure.

Incremental road projects are built connecting existing corridors to projects.

Scenario 3 High/ Increasing Development - represents an increasing level of mineral and oil and gas development with new all-season road infrastructure along the Mackenzie Valley (Hwy 1) and the Slave Province Corridor connecting to the Nunavut Grays Bay port and road (Hwy 4).

Mines and transportation/ electricity corridors are assumed to be developed in concert, both in Nunavut and Northwest Territories. The Sahtu/Canol shale oil area starts development, along with the Mackenzie Valley highway corridor connecting Norman Wells to Yellowknife. The Taltsan hydroelectricity expansion and transmission project will follow to provide electricity to Yellowknife and transmission of electricity into the Slave Province.

The increasing development scenario assumes that many of the existing advanced mineral exploration projects will become producing mines in the coming 50 years, the level of mineral exploration may increase, and the amount of transportation infrastructure will increase, along with electrical generation and transmission.

The Slave Province Corridor, Highway 4 is built and connecting to the Grays Bay Port and Road project into Nunavut, opening the region to base metal and gold projects.

The Mackenzie Highway is built facilitating petroleum development in the Sahtu.

Table 1 summarizes the major assumptions for each scenario. A detailed timeline of construction, operations and reclamation is created for each project considered in the scenario.

3.1. Scenario Summaries

Table 1: Future Development Scenario Assumptions Summary

Scenario Assumptions*	Scenario 1: Low/ Declining Development	Scenario 2: Medium/ Continuing Development	Scenario 3: High/ Increasing Development
General Assumptions	<p>Scenario 1 assumes the existing producing mines are closed at the end of their projected life-span and no new mines are built, leading to the discontinuation of the Tibbit to Contwoyto Lake winter road.</p> <p>Mineral exploration declines or remains similar to current, with no other changes in transportation or electrical utility infrastructure.</p>	<p>Scenario 2 assumes that only a few of the existing advanced mineral exploration projects will become producing mines in the coming 50 years, mineral exploration will remain similar to current, and there will be limited change in current transportation and electrical utility infrastructure.</p>	<p>Scenario 3 assumes that many of the existing advanced mineral exploration projects will become producing mines in the coming 50 years, the level of mineral exploration may increase, and the amount of transportation infrastructure will increase. Taltsan hydroelectric expansion and transmission is forecast. Mackenzie Valley highway connects Norman Wells to Yellowknife.</p>
Advanced Mineral Exploration	<p>Current mineral exploration projects.</p>	<p>Current mineral exploration projects are maintained except those that advance to producing mines.</p> <p>3 new Advanced Exploration projects</p>	<p>Current mineral exploration projects are maintained except those that advance to producing mines.</p> <p>6 new Advanced Exploration projects (Continuing Development assumptions plus 6 new)</p>
Mineral Development	<p>3 active mines:</p> <ul style="list-style-type: none"> • 3 producing diamond mines (Ekati, Diavik and Gahcho Kué) • 1 diamond mine under care and maintenance (Snap Lake). <p>The 3 producing diamond mines reach closure in 10-20 years future.</p>	<p>6 active mines:</p> <ul style="list-style-type: none"> • Back River Project (Goose) • Snap Lake (re-opens) • Kennady North • Ulu - Bluestar Gold • NICO • Nechalacho <p>The 3 producing diamond mines reach closure in 10-20 years.</p>	<p>12 active mines (Continuing Development assumptions plus the following 6):</p> <ul style="list-style-type: none"> • Izok Lake • High Lake • Indin Lake • Courageous Lake • Yellowknife Gold • George (Back River Project)

Scenario Assumptions*	Scenario 1: Low/ Declining Development	Scenario 2: Medium/ Continuing Development	Scenario 3: High/ Increasing Development
Petroleum Exploration and Development	Norman Wells oilfield and Enbridge pipeline close.	Norman Wells oilfield and pipeline close. Inuvialuit Energy Security Project developing the M-18 well with truck transport to Inuvik	Sahtu/ Canol shale oil project and new Norman Wells pipeline developed.
Transportation	Current all-season and winter road transportation network. After the Ekati, Diavik and Gahcho Kué mine sites are closed, the Tibbit to Contwoyto Winter Road is no longer used.	Current road network maintained except construction of new all-season roads: <ul style="list-style-type: none"> • NICO mine connection to TAsR close to Whati (Tlicho all season road) • M-18 Well access to Inuvik-Tuk Highway • MVH Prohibition Creek access • MVH Prohibition Creek extension • MVH Great Bear River Bridge • MVH Mount Gaudet extension 	Future low scenario plus new Nunavut mine site access roads: <ul style="list-style-type: none"> • Mackenzie Valley highway connects Norman Wells to Yellowknife • Slave Province Corridor, highway 4, develops in three phases to Izok Lake project at NWT border. • Grays Bay port and road links to Izok Lake project • Courageous Lake access to Highway 4 • Hacket River project access to Bathurst Inlet winter road • George deposit project access to Bathurst Inlet winter road
Electrical Generation and Transmission	Current facilities and transmission: <ul style="list-style-type: none"> • Snare; • Bluefish; and • Taltson 	<ul style="list-style-type: none"> • Snare hydro connection to NICO mine 	Taltson expansion project and transmission corridor expansion to the diamond mines.
Settlements	Current situation	No change; current situation is maintained.	No change; current situation is maintained.

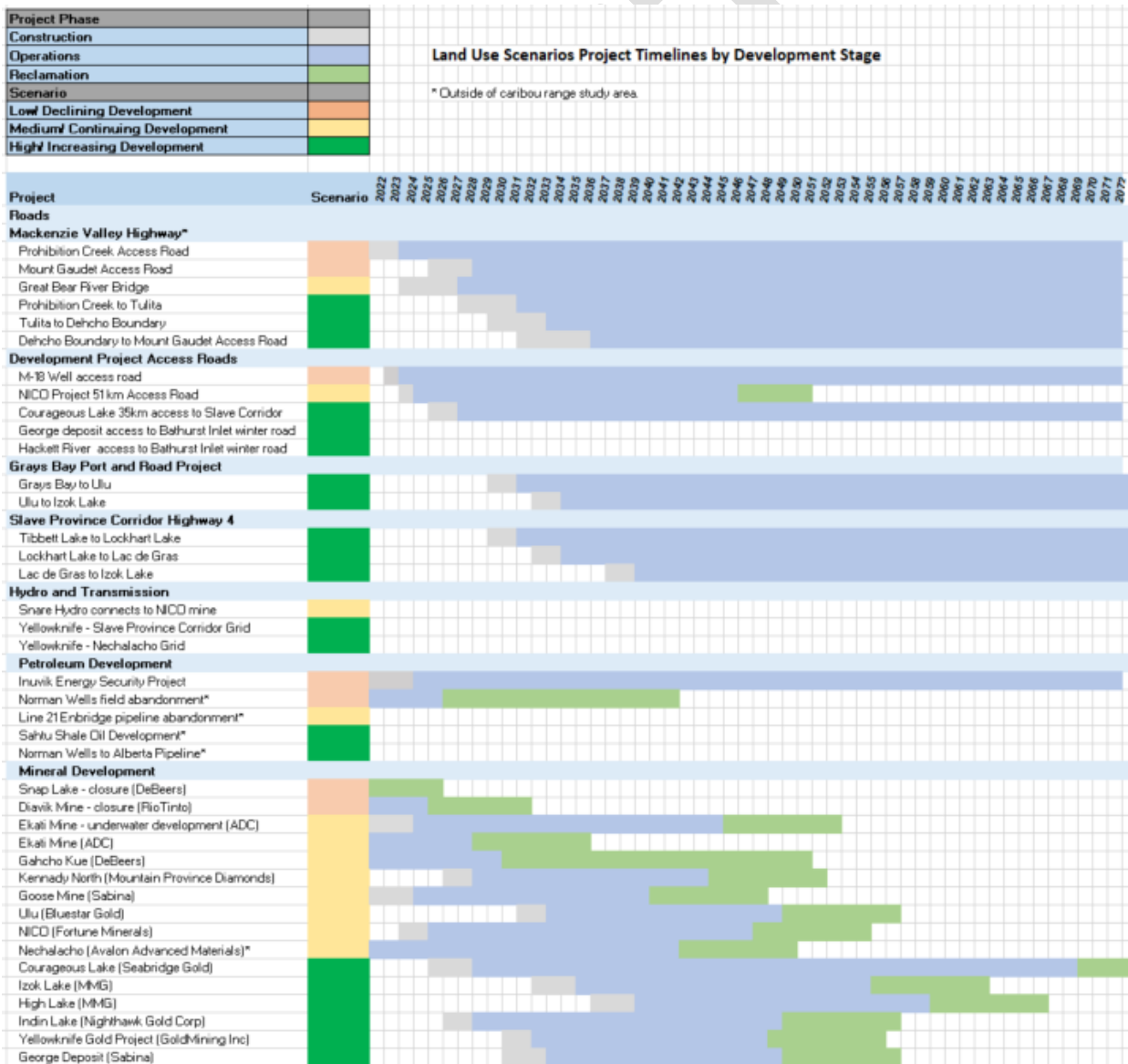
- Early- stage mineral exploration (staking and grass-roots exploration) is not currently addressed in the development Scenarios.

4. Scenario Assumptions

4.1. Timing and Footprint

Land use development timing and footprint estimates were made to project the:

- annual rate of growth (i.e., ha/yr) for each project and spatial layers indicating where each mine's growth should occur,
- rate of growth of petroleum footprints (wells, pipelines, cutlines) and spatial layers indicating where the footprint should occur,
- routing (and spatial layer) of the future roads, and what decade the roads should be built, and
- routing (and spatial layer) of the power grid expansion, and what decade the expansion should occur.



Mineral Development Assumptions:

4.2. Advanced Mineral Exploration

Early-stage mineral exploration (staking and grass-roots exploration) is not addressed in the development scenarios.

4.3. Mineral Development

Initial draft assumptions and projections for mineral development are taken from the projections done for the Bathurst Caribou Range Plan, GNWT (2018c). In the Bathurst Range Plan planning process they estimated the potential for project development from a list of advanced mineral projects.

Assumptions were updated based on available project information (see references) and interviews.

Declining development

The 3 producing diamond mines become past mines as they reach closure in 10-20 years future:

- 3 producing diamond mines (Ekati, Diavik and Gahcho Kué)
 - Diavik closes traditional mining in 2025.
 - Ekati closes in 2028. (Arctic Canadian Diamond Mine Company, 2022).
 - Gahcho Kué closes in 2030. (DeBeers, 2020).
- 1 diamond mine under care and maintenance (Snap Lake).
 - Snap Lake began an eight year closure period in 2020 (CBC 2019).

Continuing development

1 diamond mine renews development underwater

- Ekati commences underwater mining in 2025 for a twenty year period to 2045. Project currently in the concept stage.

6 active mines developed:

- Goose Mine, Back River Project (Sabina 2022), (CBC 2022).
 - Have made production decision (CBC 2022). All major regulatory permits secured.
 - Access is by 172km winter ice road to Bathurst Inlet as a part of a smaller version of the Bathurst Inlet Port and Road project (Nunatsiaq News 2018).
- Kennady North (Mountain Province Diamonds)
 - Currently in advanced exploration diamond project, no feasibility studies conducted.
 - Project leases in a ten kilometer radius around existing Gahcho Kue mine. Uses current winter exploration road.
 - Summer road construction permitted. Currently using winter/ice roads to connect to Gahcho Kue. (Mountain Province Diamonds 2019).
 - Adopted parallel timelines to Gachoe Kue for construction, operations and remediation timelines. Assumed start of construction in five years.
- Ulu (Bluestar Gold).
 - Currently in advanced exploration gold project, no feasibility studies conducted.
 - 135km long advanced exploration area on multiple sites (Bluestar Gold 2022).

- Access planned to be along proposed Grays Bay road corridor.
- Assumed two years construction, 15 years operation based on 1 million oz of gold targeted for mining.
- NICO (Fortune Minerals).
 - Environmental approvals, awaiting financing. (NICO 2022).
 - Starts construction in 2024.
 - 51km access road to connect to Whati.
 - One year road access construction. Two years overall construction.
 - Twenty year mine life.
 - Four year reclamation (including permitting).
- Nechalacho (Avalon Advanced Materials).
 - Environmental approvals competed. Slowly adding mine production capacity. 20 year mine life. Potential hydro intertie to Yellowknife.
 - Access via barging and winter road on Great Slave Lake. (Avalon Advanced Minerals 2022).

Advanced development

Includes projects dependent on an all-weather road:

- the Slave Province Corridor connecting to Yellowknife,
- the Grays Bay Port and Road project connecting to the Arctic Ocean.

12 active mines (Continuing Development assumptions plus the following 6):

- Courageous Lake (Seabridge Gold).
 - Gold project with a 15 year life.
 - Winter road access 35km off of existing Tibbitt to Conowoto winter road (Seabridge Gold 2022).
 - (TetraTech 2012).
- George Project, Back River Project (Sabina 2022).
 - Advanced exploration gold project adjacent to Sabina's Goose mine which is currently under development.
 - Winter road access is 10 kms off of the Bathurst Inlet port and winter road corridor built to access Sabina Gold's Goose mine.
 - Timing not forecast by company.
 - (Sabina 2022).
- Indin Lake (Nighthawk Gold Corp)
 - Advanced exploration gold project area within a 10-25km radius of the existing Colomac hub.
 - 200km north of Yellowknife adjacent to the old Colomac mine area.
 - Access along historic winter road to Colomac.
 - Working to confirm feasibility in three years and start construction in four.
 - (Nighthawk Gold, 2022).
 - (InnovExplo Inc. 2022).

- Izok Corridor Project: Izok Lake and High Lake (MMG).
 - The Izok Corridor copper/zinc metals project contains the Izok Lake and High Lake deposits in Nunavut.
 - Project development requires a 325km all-weather road and deep water port on the Arctic Ocean. Funding for road and port design and permitting was provided in 2019 for the Grays Bay Road and Port project.
 - Timing to coincide with permitting of the Grays Bay road and port.
 - (MMG 2022).

- Yellowknife Gold Project (GoldMining Inc.)
 - Advanced exploration gold project adjacent to the old Discovery mine and other properties in the Yellowknife gold belt, 90 km north of Yellowknife.
 - Access via historic winter road and airstrip.
 - No recent exploration activity or published development plans.
 - Assumed two years construction, 15 years operation based on 1 million oz of gold targeted for mining.
 - (SRK Consulting 2021).

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4.4. Petroleum Exploration and Development

The GNWT Petroleum Resources Strategy, GNWT (2018d), summarizes the state of the GNWT petroleum sector, with significant resources and infrastructure including the Mackenzie Delta and Beaufort Sea oil and gas resources, Sahtu/ Canol shale oil region, the legacy Norman Wells oilfield and pipeline connected into the Alberta system. The strategy outlines the potential for these areas with no projections. It also addresses the potential for regional (local market) gas development and distribution in areas with communities proximate to gas fields (i.e. Inuvik and Norman Wells).

CAPP (2022) offers no current projections for new developments in the NWT.

Inuvialuit Petroleum Corporation (2020) has announced that it plans on developing a regional gas distribution system for Inuvik, and redeveloping the M-18 well as a part of the Inuvialuit Gas Security Project.

Petroleum Development Assumptions:

Declining development

- The Norman Wells field and pipeline are abandoned beginning in 2026 (Offshore Technology 2022), (CBC, 2022).

Continuing development

- Inuvik Energy Security Project connects the existing M-18 to supply gas to Inuvik for electricity and heating starting construction in 2022 and production in 2024.
- Gas is trucked along a new four kilometer access road to the Inuvik-Tuk highway (Inuvialuit Regional Corporation, 2022). All season access road is assumed to be built following the already constructed (2021) winter road alignment.

Advanced development

- The Sahtu shale oil play is developed, with the refurbishment and realignment of the Norman Wells pipeline
- Scenarios for Sahtu shale oil play adopted from Carlson, M., Stubbs, T. (2018).

4.5. Transportation

The NWT Transportation Strategy 2015 – 2040 (GNWT 2013, p53) identifies three priority transportation corridors to support ‘a lower cost of living, improved quality of life, sustainable resource development, tourism and other economic activities’:

- Mackenzie Valley Highway from Wrigley to Tuktoyaktuk;
- All-weather road from Highway 3 to Whatì (now complete); and
- Improved access into the Slave Geologic Province from Yellowknife to Nunavut.

Transportation Assumptions:

Declining development

- Existing transportation system is maintained.
- Discontinuation of the Tibbit to Contwoyto Lake Winter Road at the end of the life of the existing diamond mines (2032).

Continuing development

- NICO mine 51 km road connection to Tlicho all season road (TASR). (Fortune Minerals 2019).
- Prohibition Creek Access Road
 - 13km gravel road connecting Canyon Creek Bridge south of Norman Wells heading south towards Tulita to the Prohibition Creek Bridge.
 - GNWT (2022) Prohibition Creek Access Road. Webpage accessed August 12, 2022. <https://www.inf.gov.nt.ca/en/PCAR>
- Mount Gaudet Access Road
 - 21km road connecting Hwy1 north to the Mount Gaudet quarry along current winter road alignment, with a possible deviation at Hodgson’s creek.
- Great Bear River Bridge
 - Bridge crosses at Tulita across Great Bear River connecting to winter road alignment on the south side.

Advanced development

- Improved access to the Slave Geologic province connecting Yellowknife to Nunavut.
- Mackenzie Valley Highway
 - Tulita to Dehcho boundary.
 - Dehcho boundary to Mount Gaudet Access Road.
- Slave Corridor Highway 4 (GNWT 2022a)
 - The Slave Corridor project is currently under study and has received federal National Trade Corridors funding to support regulatory review.
 - Three phases are anticipated – Tibbitt Lake to Lockhart Lake (construction starts 2030, 179 kms), Lockhart Lake to Lac de Gras (constructions starts 2033, 152 kms) and Lac de Gras to Izok Lake (construction starts 2038). The final phase has been modified to connect to the Izok Lake mine site just inside the NWT border instead of forecasting an NWT border stop to the project.
 - No specific timing has been committed. Estimates are based on forecasts of potential start dates for relevant mine projects.

- Grays Bay Port and Road project (MMG 2022).
 - The Grays Bay Port and Road Project has received federal National Trade Corridors funding to support regulatory review.
 - Two phases are forecast linking Grays Bay to three forecasted projects. The first phase connects Ulu (Bluestar) and High Lake (MMG) starting construction in 2030, and the second phase starts construction in 2033 linking to Izok Lake (MMG).
 - No specific timing has been committed by proponents. Estimates are based on forecasts of potential start dates for relevant mine projects.

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4.6. Electrical Generation and Transmission

The GNWT 2030 Energy Strategy (GNWT 2018e) envisages the Taltsan hydroelectricity expansion, in the South Slave region, with grid connections to the NICO project and to the Ekati, Diavik, Snap Lake and Gahcho Kue mines in the North Slave.

There are no major generation or distribution projects identified in the caribou range areas in Nunavut by the Quilliq Energy Corporation (2020).

Electrical Development Assumptions:

Declining development

- Existing electrical generation and transmission system is maintained.

Continuing development

- Expansion of the existing NWT grid to Whatì is forecast.

Advanced development

- Extension of a transmission line from the Snare Rapids generation facility to the NICO/Fortune minerals project in 2030.
- The development of the Taltsan hydroelectricity expansion and transmission systems (GNWT 2019b):
 - Phase 1 – a 60mw generation expansion at the Talstan Twin Gorges site along with a grid connection to Yellowknife,
 - Phase 2 – a transmission grid connecting to the Slave Geologic Province following the Slave Corridor highway alignment with an additional 60m right of way for the transmission line, and
 - Phase 3 – a transmission grid connecting to Alberta.
- Inter-tie connections to forecast Slave Province mine access roads and the Slave Province corridor transmission line.

4.7. Settlements

No new settlements or significant expenses to settlements are forecast.

5. Disturbance Resulting from Future Development Scenarios

Disturbance, shown as project footprint, is mapped from projects identified in the three scenarios. References supporting how project footprints are estimated are outlined in the overall project methods paper.

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6. Reviewers

Information and responses have been received from:

Inuvik Energy Security Project

Alan MacDonald

NWT and Nunavut Chamber of Mines

Tom Hofer
Executive Director

NWT Industry Trade and Investment

Anne-Marie Jennings
Mineral Resources Analyst
Dinah Elliott, P.Geo. ITI
Senior Policy and Resource Analyst
Strategic Policy & Natural Resources
Johnny Lennie,
Manager Oil and Gas Rights

NWT Infrastructure

Andrew Stewart, Director, Energy
Seth Bohnet, Director Strategic Initiatives
Patricia Coyne, Manager Mackenzie Valley
Highway Environmental Affairs
David Scott – McQuinn, Manager Slave Province
Geological Corridor

Nunavut Economic Development & Transportation

Paul Budkewisch
Manager, Minerals and Petroleum Resources

Nunavut Impact Review Board

Tara Arko
Director, Technical Services

Requests for the review the land use scenario were also sent out to:

Nunavut Geological Survey
GNWT Department of Infrastructure, GNWT
GNWT Mineral and Petroleum Resources
GNWT Geological Survey
Lands and Resources. Nunavut Tunngavik Inc. (NTI)

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