

MACKENZIE VALLEY HIGHWAY PROJECT

DEVELOPER'S ASSESSMENT REPORT

Mandate commitment of the 19th Legislative Assembly

October 2023

VOLUME 1

Introduction and Project Description

Government of
Northwest Territories

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1.0 INTRODUCTION TO THE ASSESSMENT

The Government of the Northwest Territories (GNWT) is proposing the construction of the Mackenzie Valley Highway Project (the Project). The Project is led by the Department of Infrastructure (GNWT-INF) and involves the extension of the all-season Mackenzie Highway (Northwest Territories Highway #1) between Wrigley (Pehdzéh Kì N'deh), hereafter referred to as Wrigley, to Tulita (Tulít'a), hereafter referred to as Tulita, and Norman Wells (Tłegóhłı), hereafter referred to as Norman Wells, to replace the seasonal Mackenzie Valley Winter Road (MVWR) along this portion.

The Project is undergoing environmental assessment by the Mackenzie Valley Environmental Impact Review Board (MVEIRB). This Developer's Assessment Report (DAR) is being submitted to the MVEIRB in fulfillment of the requirements of the Terms of Reference (ToR; MVEIRB, 2015; Public Registry¹ [PR]#66) for the environmental assessment (EA1213-02) of the Project.

1.1 Background

The vision of an all-season highway through the Mackenzie Valley to the Arctic Coast has been a strategic priority for Canada since 1958, under the "Roads to Resources" program. This vision is restated in several GNWT strategic investment documents, including *Investing in Roads for People and the Economy: A Highway Strategy for the Northwest Territories* (GNWT, 2000); in the successful funding proposals *Corridors for Canada* (GNWT, 2002) and *Corridors for Canada II* (GNWT, 2005); and, in *Connecting Us - NWT Transportation Strategy 2015-2040* (DOT, 2015).

In 1972, the federal government announced that the Mackenzie Highway would be extended from Fort Simpson to the Dempster Highway, south of Inuvik. Construction of the highway began in Fort Simpson but was halted in 1977, approximately 18 kilometres (km) south of Wrigley, due to findings of the Berger Inquiry and a 10-year moratorium on oil and gas development in the north (GNWT, 2014).

The GNWT developed its Highway Strategy in 1989 after authority for the territorial highway system was devolved from the federal government. By 1994, the remaining 18 km of the Mackenzie Highway to Wrigley was completed. Preliminary engineering, environmental and financial studies to support planning for construction of the remainder of the highway to Inuvik were completed in 1999. In 2009, the 16th Legislative Assembly of the Northwest Territories (NT) passed a motion unanimously supporting the construction of the Mackenzie Valley Highway.

¹ Mackenzie Valley Environmental Impact Review Board Public Registry for EA1213-02 available at <https://reviewboard.ca/node/433/documents>

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In 2010, the GNWT Department of Transportation (DOT, now GNWT-INF) signed Memoranda of Understanding with the following Indigenous Organizations to complete four Project Description Reports for the Dehcho Region, Tulita District of the Sahtu Region, K'asho Got'ine District of the Sahtu Region and Gwich'in Settlement Area to support further planning and permitting of the highway:

- Gwich'in Tribal Council
- 5658 NWT Ltd representing the Tulita Land Corporation
- Norman Wells Land Corporation
- Fort Norman Metis Land Corporation
- Tulita Dene Band
- K'asho Got'ine Development Foundation
- Pehdzéh Kì First Nation

The Project Description Reports were completed in 2011 and 2012 providing preliminary design and environmental planning information for each segment of highway from Wrigley to the Dempster Highway:

- Mackenzie Valley Highway Extension Pehdzeh Ki Ndeh – Dehcho Region - Project Description Report (Dessau, 2012; PR#13)
- Project Description Report for Construction of the Mackenzie Valley Highway Tulita District, Sahtu Settlement Area (5658 NWT Ltd. and GNWT; PR#16)
- Project Description Report for Construction of the Mackenzie Valley Highway Extension in the K'asho Got'ine District Northwest Territories (K'asho Development Foundation, 2012; PR#15)
- Project Description Report for the Construction of the Mackenzie Valley Highway Gwich'in Settlement Area, NT (Nehtruh-EBA and Mackenzie Aboriginal Corporation, 2011; PR#14)

In August 2014, DOT (now GNWT-INF) re-scoped the project in accordance with the revised priorities of the GNWT and shortened the proposed highway to include only the portion from Wrigley to Norman Wells rather than the entire 818 km to the Dempster Highway. This is the basis of the Project being proposed. The information presented in the Project Description Reports for the Dehcho Region (Dessau, 2012) and Tulita District (5658 NWT Ltd. and GNWT) have contributed to the Project as proposed in this DAR.

Today, access to the north's opportunities remains of importance for the GNWT and in 2019, the 19th Legislative Assembly prioritized the Mackenzie Valley Highway Project as one of three strategic infrastructure investment projects for advancement (GNWT, 2019). The GNWT continues

to collaborate with Indigenous Governments², Indigenous Organizations³, the Government of Canada, various community governments and land claim organizations as well as other affected parties⁴, to help advance the Project.

1.2 Purpose of the Project

The purpose of the Project is to provide the needed infrastructure to support an improved quality of life and lower cost of living for territorial residents in the Mackenzie Valley and support the expansion and diversification of the territorial economy.

The Project will connect communities via an all-season road that connects the existing highway at Wrigley, to Tulita and Norman Wells providing reliable access and connect isolated communities to the national highway system.

Improved access will incentivize resource exploration and development opportunities in the region, while creating social and economic benefits for territorial and Canadian residents.

The Project is intended to provide the following specific benefits:

- Provide a transportation link connecting the central Mackenzie Valley with the southern Northwest Territories and southern Canada for the majority of the year (due to the presence of ferry crossings and/or winter road crossings along the route which are inoperable for a total of 2 to 3 months per year during break-up and freezing)
- Support resource exploration, development, and production to stimulate the territorial economy
- Improve access and variety in non-traditional food goods for residents
- Improve access to educational resources and provide employment opportunities
- Increase the resiliency of the NT transportation system to the impacts of climate change
- Improve the ability for individuals, families and communities to interact with others in different parts of the territory, thereby increasing social and cultural connectivity
- Improve opportunities for families and communities to participate in recreational and competitive sporting activities, thereby increasing physical and emotional wellbeing
- Create tourism and hospitality opportunities

² Governments that have negotiated, or are in the process of negotiating, Lands and Resources and/or Self-Government Agreements (Land Claims) with the GNWT and the Government of Canada.

³ Organizations that do not meet the definition of an Indigenous Government that have been elected as the sole representative of the collective Aboriginal and/or Treaty rights of its Indigenous membership.

⁴ All entities who may be affected by the Project, including, but not limited to, community governments or designated authorities, land corporations, renewable resource boards and councils, co-management boards, regulatory authorities of the Project, Federal and GNWT departments with associated mandates, educational institutions, public services, health and cultural organizations, Indigenous Governments and Indigenous Organizations, landowners, private organizations (such as Enbridge), emergency services, local businesses, local residents, and the public.

- Reduce the cost of delivering government services
- Help fulfill the government's commitment to increasing regional and territorial economic development opportunities
- Demonstrate the GNWT's commitment to Arctic sovereignty

1.2.1 The Business Case

In 2015, the GNWT prepared a project-specific Business Case to outline the purpose, benefits, and cost of the Project (GNWT, 2015b; Appendix 1A). Each of the project purposes described in the Business Case were outlined in Section 1.2. Regarding benefits, over the length of the Project, the Business Case estimated that a total of 14,000 direct and indirect jobs will be created during the construction phase, with 160 jobs created once the highway is operational (GNWT, 2015b; Appendix 1A).

At the time the Business Case was developed, the Project was projected to cost over \$700 million to construct (GNWT, 2015b; Appendix 1A). Similar to infrastructure projects across Canada, it is anticipated that project costs will have escalated significantly since it was originally estimated. Upon completion of the detailed design for the Project, the Business Case and associated cost estimates will be updated.

1.2.2 Economic Studies

In 2017, the GNWT completed an economic study on the project as part of its funding application to the federal government (Nicols, 2017). The study concluded that the operations and maintenance costs of the Project would be approximately \$1.7 million per year (2014 dollars). The Project would displace \$335,000 (2014 dollars) in annual spending related to the construction of the MVWR and \$0.6 million (2014 dollars) in annual expenditures related to maintenance of the MVWR.

In the 2017 economic study, the timelines for construction were condensed to 10 year construction timeframe (Nicols, 2017). In this scenario, the Project would contribute \$681 million to the gross domestic product (GDP) of the NWT (representative of approximately 1.5% of the NWT GDP in 2013). The Project would also contribute approximately \$533 million in GDP to Canada (representative of 0.1 % of Canada's GDP in 2013).

Upon completion of the detailed design for the Project, economic studies will be revisited to support the updating of the Business Case and overall project cost estimate.

1.3 The Environmental Assessment Presented in the Developer's Assessment Report

1.3.1 Preliminary Screening and Referral to Environmental Assessment

In February 2013, the proponent (DOT now the GNWT-INF) submitted a land use permit application to the Mackenzie Valley Land and Water Board (MVLWB) for clearing of a section of the Mackenzie Valley Highway in the Gwich'in Settlement Area. The four Project Description Reports described in Section 1.1 were submitted as part of the application. In its application, the DOT (now the GNWT-INF) indicated its proposal was to construct the highway from Wrigley to the Dempster Highway. The MVLWB prepared to initiate a preliminary screening of the highway according to s. 124 of the *Mackenzie Valley Resource Management Act* (MVRMA).

Under authority of s. 126(2)(a) of the MVRMA, in February 2013 the DOT (now the GNWT-INF) referred its own application, including the entire 818 km Mackenzie Valley Highway, to the MVEIRB for environmental assessment. The reason DOT (now the GNWT-INF) referred its own application was that it believed it to be in the best interest of all parties to proceed directly to environmental assessment (EA) and initiate an efficient scoping and assessment process. The MVEIRB commenced the EA on February 11, 2013 under file EA1213-02. The project proposed at the time has since been re-scoped to focus on the portion of the Mackenzie Valley Highway from Wrigley to Norman Wells, as reflected in the current ToR (MVEIRB, 2015 [PR#66]).

1.3.2 Purpose of the Developer's Assessment Report

This Developer's Assessment Report (DAR) is intended to provide information to the MVEIRB to satisfy the EA requirements of Part 5 of the MVRMA and the project-specific requirements contained in the ToR issued by the MVEIRB (2015; PR#66).

1.3.3 Statutory Requirements of Assessment

The MVRMA establishes an integrated system of land and water management in the Mackenzie Valley and creates certain boards and processes for land use planning (Part 2), land and water regulation (Part 3 and Part 4) environmental assessment (Part 5) and monitoring (Part 6) to fulfill that purpose. Section 114 of the MVRMA describes the purpose of Part 5 specifically, which is:

(b) to ensure that the impact on the environment of proposed developments receives careful consideration before actions are taken in connection with them; and

(c) to ensure that the concerns of aboriginal people and the general public are taken into account in that process.

Section 115 provides the guiding principles for the EA process of Part 5, undertaken by the MVEIRB, which include having regard to:

(a) the protection of the environment from the significant adverse impacts of proposed developments;

(b) the protection of the social, cultural and economic well-being of residents and communities in the Mackenzie Valley; and

(c) the importance of conservation to the well-being and way of life of the aboriginal peoples of Canada to whom section 35 of the Constitution Act, 1982 applies and who use an area of the Mackenzie Valley.

Section 117 lists the factors to be considered, and Section 126 stipulates the outcome of the EA specifically, which is for the MVEIRB to determine if the Project is “likely to have significant adverse impacts on the environment or to be a cause of significant public concern”. Section 3 of the MVEIRB’s Environmental Impact Assessment Guidelines (MVEIRB, 2004) describes the EA process in detail.

1.3.4 Key Issues

Along with considering information provided by DOT (now the GNWT-INF), the MVEIRB completed scoping meetings in Mackenzie Valley communities to identify issues to be addressed in the DAR. Two key lines of inquiry (KLOIs) were identified as requiring the most attention in the DAR, as they reflect the topics of greatest concern and require the most attention and analyses in the DAR. These are specified in the ToR (MVEIRB, 2015 [PR#66]):

- **Local social and economic considerations** include employment opportunities, income opportunities, maximizing local and Indigenous employment and participation, cost of living, education and training programs, the Project’s contribution to Gross Domestic Product, and effects on the traditional economy.
- **Caribou, moose, and harvesting** includes effects on sensitive or important habitat, effects on wildlife, population cycles, predator-prey relationships, increased human-wildlife interactions, contaminant levels in harvested species and effects on harvesting, and measures to control these effects.

Other aspects of the environment, identified by the MVEIRB as valued components, are to be addressed as subjects of note (SONs), which are of lower priority than the KLOIs (MVEIRB, 2015).

1.3.5 Structure of the Developer’s Assessment Report

The DAR is presented in five volumes:

- The Front Matter includes:
 - Non-technical summary of the DAR
 - Full table of contents for the DAR

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- Full list of abbreviations used in the DAR and glossary of terms
- Concordance table indicating where the items of the ToR are addressed in the DAR
- Volume 1 is the Introduction and Project Description:
 - Chapter 1 provides an introduction to the Project and the GNWT as a proponent.
 - Chapter 2 describes the GNWT's approach to engagement and summary of engagement activities and outcomes.
 - Chapter 3 describes the GNWT's approach to obtaining and integrating Traditional Knowledge in the EA.
 - Chapter 4 presents the EA approach and methods.
 - Chapter 5 provides a detailed Project description, schedule, and includes a mapbook.
 - Chapter 6 details authorizations, approvals and agreements needed for the Project, and outlines how the Project conforms with the Sahtu Land Use Plan.
 - Chapter 7 describes and evaluates alternative routes and alternative methods for the Project.
- Volume 2 presents the KLOIs:
 - Chapter 8 provides summaries of the local social and economic considerations KLOI and the caribou, moose and harvesting KLOI.
 - Chapter 9 details the assessment of the effects of the Project on human health and community wellness, education training and skills, employment and economy, infrastructure, services and institutional capacity and non-traditional land and resource use.
 - Chapter 10 details the assessment of potential effects of the Project on caribou and moose.
 - Chapter 11 details the assessment of potential effects of the Project on culture and traditional and use, including harvesting.
- Volume 3 addresses the following SONs:
 - Chapter 12 details the assessment of potential effects on air quality.
 - Chapter 13 details the assessment of potential effects on noise.
 - Chapter 14 details the assessment of potential effects on terrain, soils and permafrost.
 - Chapter 15 details the assessment of potential effects on water quantity.
 - Chapter 16 details the assessment of potential effects on water and sediment quality.
 - Chapter 17 details the assessment of potential effects on fish and fish habitat.
 - Chapter 18 details the assessment of potential effects on vegetation and wetlands.
 - Chapter 19 details the assessment of potential effects on wildlife and wildlife habitat.
 - Chapter 20 details the assessment of potential effects on birds and bird habitat.
 - Chapter 21 details the assessment of potential effects on biodiversity.
 - Chapter 22 details the assessment of potential effects on heritage resources.

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- Volume 4 addresses other topics of the ToR:
 - Chapter 23 describes compliance and effects monitoring.
 - Chapter 24 provides an assessment of the potential effects of the environment on the Project.
 - Chapter 25 details an assessment of potential accidents or malfunctions.
 - Chapter 26 provides a summary of the assessment of cumulative effects presented in other chapters.
 - Chapter 27 compiles the GNWT's commitments made in the DAR.
- Volume 5 provides draft management plans referenced in other chapters of the DAR.

1.4 The Mackenzie Valley Highway Project

1.4.1 Project Overview

The Project will include construction of approximately 281 km of new all-season gravel highway between Hodgson Creek (located 1 km north of Wrigley) and Prohibition Creek (located 28 km southeast of Norman Wells). The Project will connect to watercourse crossing structures (bridges and culverts) along the MVWR, previously constructed highway between Prohibition Creek and Norman Wells, and the Great Bear River Bridge project in Tulita, which will be advanced as a separate project.

The Project will also include the construction and operation of temporary and permanent quarry and borrow sources along the proposed highway alignment, as well as the operations and maintenance of a contiguous total of approximately 321 km of highway between Wrigley, Tulita, and Norman Wells.

1.4.2 Proponent

The GNWT is the proponent, and the GNWT-INF is the project lead. During the EA, the GNWT-INF is coordinating the involvement of other GNWT Departments and their respective mandates (Section 1.5). Contact information for the GNWT proponent is provided below.

Seth Bohnet
Director of Strategic Infrastructure
Department of Infrastructure
The Government of the Northwest Territories
5009 49th Street, PO Box 1320
Yellowknife, Northwest Territories X1A 2L9
Ph: (867) 767-9082 ext. 31035

1.4.3 Project Activities

The Project includes the following physical works and activities, which are presented in more detail in Chapter 5:

- Widening of the existing cleared MVWR right-of-way (ROW) and clearing of intermittent sections of new ROW
- Construction of approximately 281 km of new all-season gravel highway embankment (102 km in Dehcho, 179 km in Sahtu) and intermittent pullouts
- Construction of approximately 85 culverts as watercourse crossing structures
- Construction and operation of approximately six temporary borrow sources and quarries and associated all-season access roads
- Construction and operation of approximately nine permanent borrow sources and quarries and associated all-season access roads
- Water withdrawal and water use for road construction and maintenance
- Construction and operation of temporary support infrastructure and workspaces, including camps, maintenance yards, laydown and staging areas, and fuel storage areas
- Staging, supply and resupply of equipment, materials, fuel, and personnel
- Construction and operation of permanent maintenance yards
- Closure and reclamation of temporary borrow sources, quarries, and workspaces
- Demobilization of equipment and materials
- Closure and reclamation of portions of the MVWR ROW not used for the Project
- Operations and maintenance activities including snow clearing, grading, dust control, and bridge and culvert maintenance
- Use of the highway by the public

The Project does not include:

- Construction of the Great Bear River Bridge project, which is being advanced as a separate project
- Operations and maintenance of the MVWR as required for public safety, including repair or upgrades of existing watercourse crossing structures, until such time that segments of the Mackenzie Valley Highway are opened to traffic and replace the MVWR
- Use of existing and authorized municipal, commercial, or public infrastructure or services, such as municipal solid waste and wastewater facilities, transportation services and the MVWR

1.4.4 Project Location

The Project is located within the Dehcho Region and Tulita District of the Sahtu Region, as shown in Figure 1.1. The Project will replace the MVWR in this section and incorporate existing and planned watercourse crossing structures (such as bridges) along the MVWR. The Project is located on public lands, and Sahtu Settlement Lands, as identified in the Sahtu Dene and Métis Comprehensive Land Claim Agreement (1993) within the Dehcho Region and Sahtu Region. See Figure 1.2.1 to Figure 1.2.3 for an overview of the Project route.

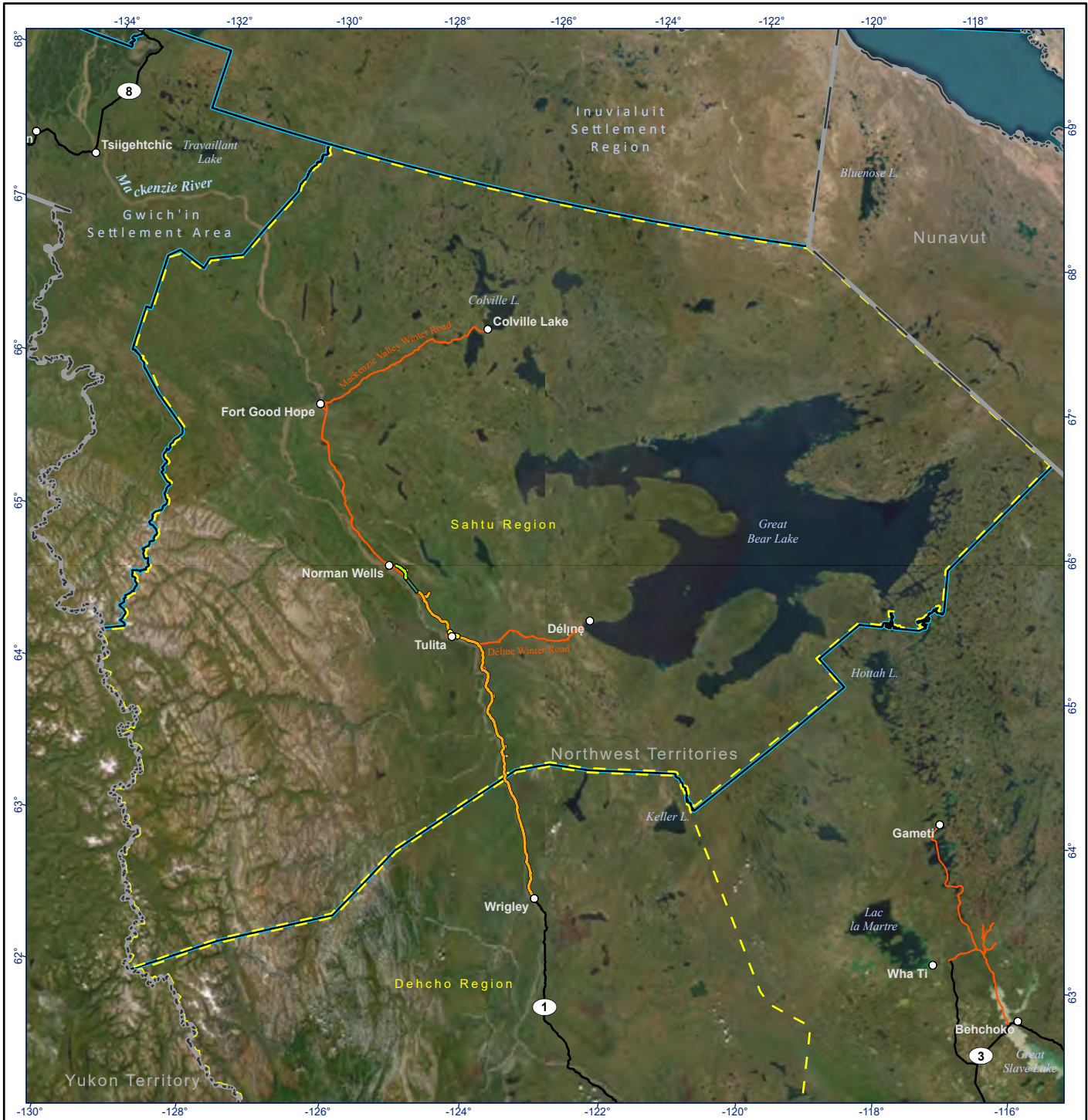
1.4.5 Existing Permits and Approvals

The GNWT does not have authorizations or approvals to construct the Project. Authorizations and approvals needed for the Project are discussed in Chapter 6.

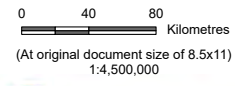
1.4.5.1 The GNWT is the Operator of the Mackenzie Valley Winter Road

The GNWT-INF is responsible for planning, design and construction and maintenance of safe transportation infrastructure, capable of meeting user needs in the NWT. The GNWT-INF has been operating and maintaining the MVWR in the Dehcho and Sahtu regions since the 1970's. The current MVWR extends from Wrigley north to the Sahtu region and connects the communities of Norman Wells, Tulita, Délı̄ne, Colville Lake and Fort Good Hope (see Section 5.3.1) to the territorial highway system on a seasonal basis. The annual operation and maintenance of the MVWR is conducted in accordance with existing authorizations.

The MVWR has been used to provide seasonal access for community re-supply and inter-community travel for community members, the public, government, and industry. The winter road is constructed and maintained along the existing winter road corridor from approximately November to March of each year. Increasingly variable climate conditions have led to difficulties in constructing and maintaining the winter road. This has resulted in short, unpredictable winter road seasons for residences and businesses to utilize the road and complete community re-supply.



- Proposed Mackenzie Valley Highway Project Route
- Canyon Creek All Season Access Road (Constructed)
- Prohibition Creek Access Road (In Construction)
- Great Bear River Bridge Project (Proposed)
- Community
- Northwest Territories Highway
- Winter Road
- Settlement Area Boundary
- Region Boundary
- Territorial Boundary



Project Location: Wrigley to Norman Wells, NWT
 Prepared by DS on 8/4/2023
 TR by EB on 8/4/2023

Client/Project: 144903025-0172 REV B

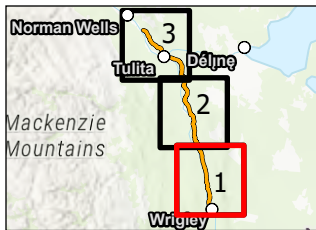
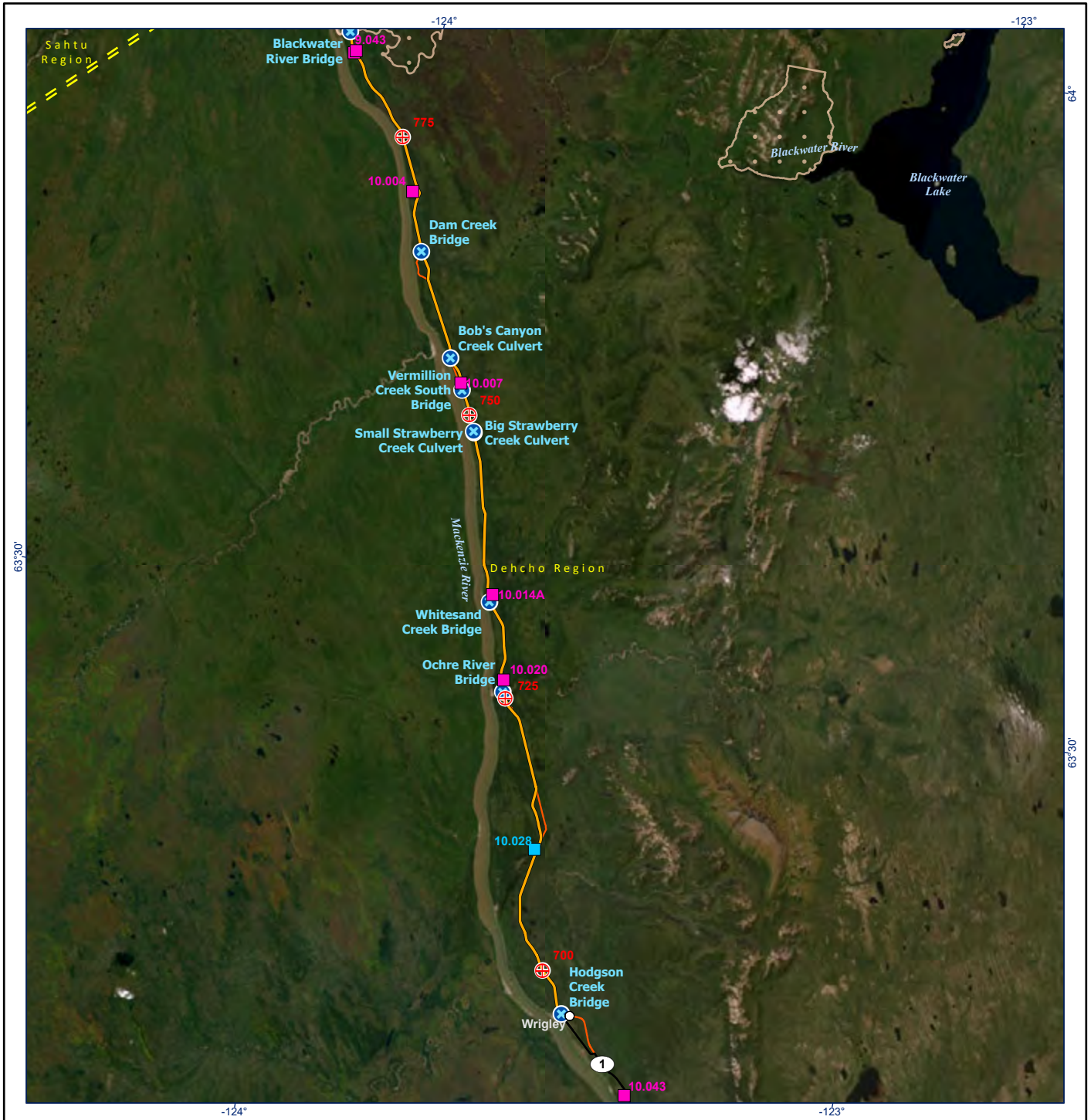
Government of the Northwest Territories
 Mackenzie Valley Highway Project

Figure No. **1.1**
 Title

Project Overview

Notes
 1. Coordinate System: NAD 1983 Northwest Territories Lambert
 2. Data Sources: Centre for Geomatics Government of NWT, Government of Canada, Stantec
 3. Background: World Topographic Map: Esri, FAO, NOAA, USGS, NRCan
 World Imagery: Earthstar Geographics
 World Hillshade: Esri, USGS
 Imagery dates: 2015 - 2020

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Notes

1. Coordinate System: NAD 1983 Northwest Territories Lambert
2. Data Sources: GNWT (Government of the Northwest Territories) Centre for Geomatics, n.d. Inventory of Landscape Change Map Viewer, GNWT, Centre for Geomatics, n.d. Open Data, MVLWB, n.d. Public Registry, Sahtu Land and Water Board, n.d. Public Registry, Environment and Natural Resources GNWT, Government of Canada, Kálo-Stantec 2022, Stantec, Wilson and Haas 2012, and Caslys Consulting Ltd.
3. Background: World Topographic Map: Northwest Territories, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NRCAN, Parks Canada
World Imagery: Earthstar Geographics
World Hillshade: Esri, USGS
Imagery dates: 2015 - 2021

- Proposed Mackenzie Valley Highway Kilometre Marker (Approximate)
- Existing or Planned Bridge Crossing (Not in Scope of Project)
- Proposed Mackenzie Valley Highway Project Route
- Proposed Bear Rock Alignment Option
- Canyon Creek All Season Access Road (Constructed)
- Prohibition Creek Access Road (In Construction)
- Proposed Great Bear River Bridge Project (Not in Scope of Project)
- Proposed Granular Borrow Source
- Proposed Rock Quarry Source
- Proposed Granular Borrow Access
- Proposed Rock Quarry Access
- Community
- Northwest Territories Highway
- Mackenzie Valley Winter Road (Not in Scope of Project)
- Region Boundary
- Sahtu Land

0 5 10 Kilometres
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Project Location Wrigley to Norman Wells, NWT
Client/Project Government of the Northwest Territories
Mackenzie Valley Highway Project

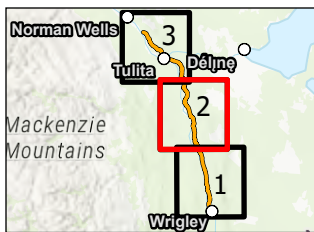
Prepared by DS on 8/4/2023
TR by EB on 8/4/2023

144903025-0179 REVA

Figure No.
1.2.1

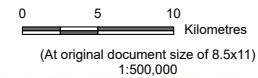
Title
Mackenzie Valley Highway Project - Overview

Page 1 of 3



Notes
 1. Coordinate System: NAD 1983 Northwest Territories Lambert
 2. Data Sources: GNWT (Government of the Northwest Territories) Centre for Geomatics, n.d. Inventory of Landscape Change Map Viewer, GNWT, Centre for Geomatics, n.d. Open Data, MVLWB, n.d. Public Registry, Sahtu Land and Water Board, n.d. Public Registry, Environment and Natural Resources GNWT, Government of Canada, Kalo-Stantec 2022, Stantec, Wilson and Haas 2012, and Caslys Consulting Ltd.
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- Proposed Granular Borrow Access
- Proposed Rock Quarry Access
- Community
- Northwest Territories Highway
- Mackenzie Valley Winter Road (Not in Scope of Project)
- Region Boundary
- Sahtu Land

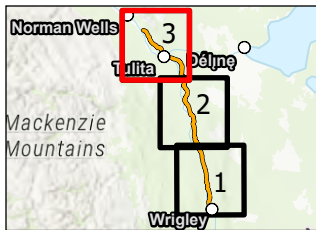
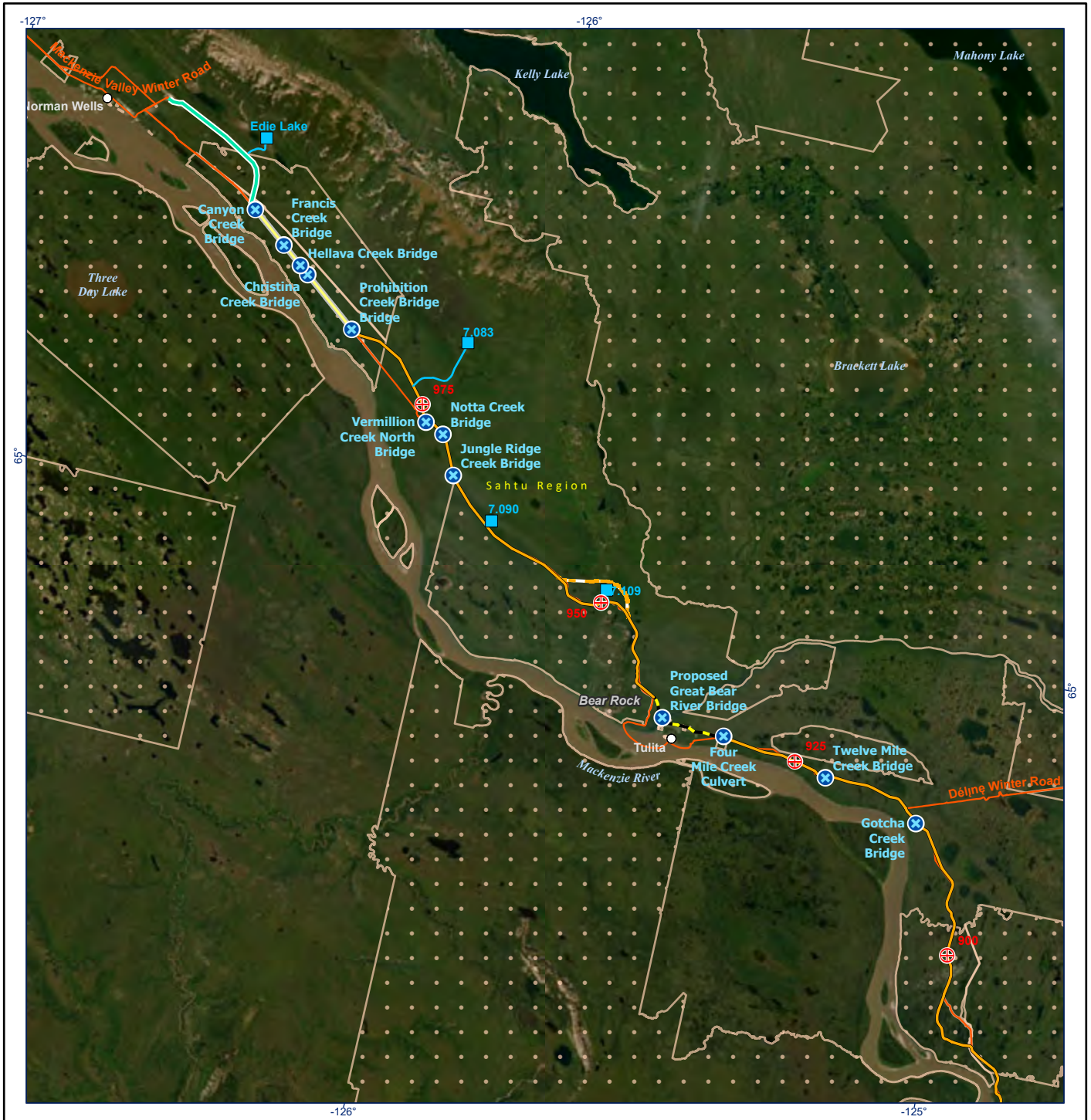


Project Location: Wrigley to Norman Wells, NWT
 Prepared by DS on 8/4/2023
 TR by EB on 8/4/2023

Client/Project: 144903025-0179 REVA
 Government of the Northwest Territories
 Mackenzie Valley Highway Project

Figure No.
1.2.2
 Title

Mackenzie Valley Highway Project - Overview



- Proposed Mackenzie Valley Highway Kilometre Marker (Approximate)
- Existing or Planned Bridge Crossing (Not in Scope of Project)
- Proposed Mackenzie Valley Highway Project Route
- Proposed Bear Rock Alignment Option
- Canyon Creek All Season Access Road (Constructed)
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- Proposed Great Bear River Bridge Project (Not in Scope of Project)
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Project Location Wrigley to Norman Wells, NWT
Client/Project Government of the Northwest Territories Mackenzie Valley Highway Project
 Prepared by DS on 8/4/2023 TR by EB on 8/4/2023
 144903025-0179 REVA

Figure No. 1.2.3
Title Mackenzie Valley Highway Project - Overview
 Page 3 of 3

Notes
 1. Coordinate System: NAD 1983 Northwest Territories Lambert
 2. Data Sources: GNWT (Government of the Northwest Territories) Centre for Geomatics, n.d. Inventory of Landscape Change Map Viewer, GNWT, Centre for Geomatics, n.d. Open Data, MVLWB, n.d. Public Registry, Sahtu Land and Water Board, n.d. Public Registry, Environment and Natural Resources GNWT, Government of Canada, Kalo-Stantec 2022, Stantec, Wilson and Haas 2012, and Caslys Consulting Ltd.
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1.5 The GNWT as a Proponent and Manager of Public Infrastructure and Lands

The Mandate of the GNWT (2019-2023) guides the GNWT's actions to advance the priorities of the 19th Legislative Assembly (GNWT, 2019). The GNWT has committed to make strategic infrastructure investments that will provide the foundational infrastructure to support an improved quality of life and lower cost of living for territorial residents, as well as support the expansion and diversification of the economy.

The GNWT has multiple roles in the environmental assessment process as proponent, subject matter expert, and decision maker. Each of the roles held by the GNWT is further described in the sections below.

1.5.1 Whole-of-Government Approach

The GNWT has developed the DAR using a Whole-of-Government Approach (WGA). The WGA refers to the GNWT's intent to plan and design government projects (where the GNWT is the proponent), and participate in environmental assessments, as one cohesive government, working effectively across departmental portfolios to ensure all departmental perspectives and expertise are considered.

As such, multiple GNWT Departments have contributed to the development of the DAR as subject matter experts. The GNWT is participating in the environmental assessment process as a single party, the proponent, with a commitment to articulating how different departments' input has influenced the project. WGA will not apply to the decision-making phase of the environmental assessment process. More specifically, the Minister of INF will not be one of the responsible Ministers with responsibility for making a decision on the MVEIRB's Report of EA and Reasons for Decision.

1.5.1.1 Department of Infrastructure – Project Lead

The GNWT-INF's mandate is to plan, design, construct, acquire, operate, and maintain public buildings and transportation infrastructure and systems. On behalf of the GNWT as the Proponent GNWT-INF is responsible for leading the Project and will be accountable for providing information about the Project during the environmental assessment process.

GNWT-INF will not have a role in the decision-making process as a responsible minister.

1.5.1.2 Other Departments – Supporting the Project Lead

The GNWT Departments of Environment and Climate Change (ECC) and Health and Social Services (HSS) have responsibilities for management of land, environmental resources, public health and socio-economic development in the NWT. Both the GNWT-ECC and GNWT-HSS have provided subject matter expertise and support to GNWT-INF during the planning stages of the Project and will continue to provide GNWT-INF support during the environmental assessment process.

The GNWT-ECC has also provided support and guidance on the environmental assessment process, coordination of interdepartmental collaboration. GNWT-ECC will continue to provide GNWT-INF support during the environmental assessment process including facilitating interdepartmental collaboration on information requests, review of submissions to the Review Board, and procedural oversight until the start of the decision phase.

Other departments, including the GNWT Departments of Executive and Indigenous Affairs (EIA); Finance (FIN); Justice (DOJ); Education Culture and Employment (ECE); Industry, Tourism and Investment (ITI); Municipal and Community Affairs (MACA); and Housing NWT have also provided subject matter expertise and support to GNWT-INF, as and when required, and will continue to do so during the environmental assessment process.

1.5.2 Collaborative Relationships with Indigenous Governments

In April 2019, the GNWT formed a collaborative partnership with the Sahtu Secretariat Incorporated (SSI) to advance the Project through Environmental Review and Regulatory Processes. The SSI and the GNWT signed a memorandum of understanding for the Project and have established a project-specific Steering Committee and a Working Group. In addition, the GNWT has provided project funding for a SSI liaison position in the region to support project engagement activities.

The GNWT continues to engage with Pehdzéh Kì First Nation and has provided capacity funding for a Pehdzéh Kì First Nation liaison position in Wrigley, as well as the establishment of a Mackenzie Valley Highway specific Working Group with Pehdzéh Kì First Nation.

1.6 The GNWT's Role as a Decision Maker in the Environmental Assessment

Under the MVRMA, the federal Minister has delegated certain environmental assessment decision responsibilities to the Minister of ECC. Upon completion of the Report of Environmental Assessment by the MVEIRB, the Minister of ECC, along with other responsible ministers, will make the final decision based on the relevant evidence provided during the EA. The Ministers may decide to adopt, return for further consideration, adopt with modifications (after consulting the Review Board), or reject and refer to environmental impact review the Review Board's recommendation.

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1.0 Introduction to the Assessment

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When the Review Board provides its Report of Environmental Assessment the Project Assessment Branch (PAB) of GNWT-ECC will lead GNWT's participation in the environmental assessment decision process to support the Responsible Ministers.

GNWT-ECC also carries out Aboriginal consultation on behalf of GNWT as decision maker.

1.7 Acknowledgements

The assessment of the Project's effects on the environment, cumulative effects, and effects of accidents and malfunctions as presented in the DAR has been prepared for the GNWT-INF by K'alo-Stantec Limited, with contributions from DPRA Canada Inc. (Chapter 9, socio-economic impact assessment) and EDI Environmental Dynamics Inc. (Chapter 10, assessment of potential effects on caribou and moose). The GNWT-INF and its consultants acknowledge the important contributions of Indigenous Governments, Indigenous Organizations, and other affected parties who participated during the project-specific engagement program and Traditional Knowledge and Traditional Land and Resource Use studies completed for the Project as of the date of filing of the DAR.

1.8 References

5658 NWT Ltd. and GNWT. 2011. Project Description Report for Construction of the Mackenzie Valley Highway Tulita District, Sahtu Settlement Area. Submitted to the Government of the Northwest Territories.

Dessau. 2012. Mackenzie Valley Highway Extension Pehdzeh Ki Ndeh – Dehcho Region - Project Description Report. Submitted to the Government of the Northwest Territories

GNWT (The Government of the Northwest Territories). 2000. Investing in Roads for People and the Economy: A Highway Strategy for the Northwest Territories. Available at: https://www.inf.gov.nt.ca/sites/inf/files/resources/highway_strategy.pdf#:~:text=Investing%20in%20Roads%20for%20People%20and%20the%20Economy%3AA,access%20to%20commu%20-%20nities%20and%20economic%20developments. Accessed December 2022.

GNWT. 2002. Corridors for Canada. Final draft 3. May 2002. Available at: <http://library.assembly.gov.nt.ca/2002/T/02-0020435.pdf#:~:text=The%20strategic%20investments%20proposed%20in%20Corridors%20for%20Canada,not%20just%20for%20northerners%2C%20but%20for%20all%20Canadians>. Accessed December 2022.

GNWT. 2005. Corridors for Canada II: Building on Our Success. Draft 6 Part A. September 2005. Available at: <http://library.assembly.gov.nt.ca/2005/T/a192561.pdf>. Accessed December 2022.

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1.0 Introduction to the Assessment

October 2023

- GNWT. 2014. A Proposal from the Government of the Northwest Territories under the National Infrastructure Fund: New Building Canada Plan 2014-2024. Available at:
https://www.inf.gov.nt.ca/sites/inf/files/resources/mvh_wrigley_to_norman_wells.pdf
- GNWT. 2015a. Connecting Us – Northwest Territories Transportation Strategy. Tabled Document 267-17(5) Tabled on June 3, 2015. Available at:
<http://library.assembly.gov.nt.ca/2015/T/a344744.pdf>. Accessed December 2022.
- GNWT. 2015b. Mackenzie Valley Highway: Wrigley to Norman Wells Business Case. Submitted to Infrastructure Canada.
- GNWT. 2019-2023 Mandate of the Northwest Territories. Available at:
<https://www.gov.nt.ca/sites/flagship/files/documents/mandate2019-web-en.pdf>
- K'ahsho Development Foundation. 2012. Project Description Report for Construction of the Mackenzie Valley Highway Extension in the K'ahsho Got'ine District Northwest Territories. Submitted to the Government of the Northwest Territories.
- MVEIRB (Mackenzie Valley Environmental Impact Review Board). 2004. Environmental Impact Assessment Guidelines.
- MVEIRB. 2015. Terms of Reference EA1213-02 Mackenzie Valley Highway Extension Project Wrigley to Norman Wells Government of Northwest Territories. February 13, 2015. PR#66.
- Nehtruh-EBA and Mackenzie Aboriginal Corporation. 2011. Project Description Report for the Construction of the Mackenzie Valley Highway Gwich'in Settlement Area, NT. Submitted to the Government of the Northwest Territories.
- Nichols (Nichols Applied Management Inc.). 2017. Economic Study of the Mackenzie Valley All-Weather Highway.

2.0 CONSULTATION AND ENGAGEMENT

This chapter describes the engagement and Consultation activities that have taken place and will continue to take place with Indigenous Governments, Indigenous Organizations, and other affected parties in the development of Mackenzie Valley Highway Project (the Project). Project engagement activities have been documented since 1998 and allow affected parties to express their concerns and provide feedback on the Project. In addition, the Government of the Northwest Territories (GNWT) has a duty to consult with Indigenous Governments and Indigenous organizations whenever it considers carrying out a government action that has the potential to adversely affect asserted or established Aboriginal or treaty rights. The GNWT has initiated Consultation in the summer of 2023 and an overview is provided in Section 2.2.

An Engagement and Consultation Plan (see Appendix 2A) guides the GNWT in their processes to meaningfully engage Indigenous Governments, Indigenous Organizations, and other parties affected by the Project. The plan considered multiple sources in its development. The *Mackenzie Valley Resource Management Act* (MVRMA, 1998) establishes a system for land and water regulation in the Mackenzie Valley of the Northwest Territories (NWT) and establishes boards responsible for land use planning, environmental assessment, and permitting of uses of land and water and deposits of waste. The boards of the Mackenzie Valley, including the Mackenzie Valley Environmental Impact Review Board (MVEIRB), have published numerous plans, policies, and guidance documents for project proponents consistent with their mandates. Some of these relate to the participation of Indigenous Governments, Indigenous Organizations, and other affected parties in the planning, assessment, and permitting of developments.

The MVEIRB does not currently have a formal Consultation and engagement policy; in the interim it has adopted the Mackenzie Valley Land and Water Board (MVLWB) *Engagement and Consultation Policy* (MVLWB, 2018a). Engagement on the Project was carried out with guidance from the following sources:

- Environmental Impact Assessment Guidelines (MVEIRB, 2004)
- Guidelines for Incorporating Traditional Knowledge in Environment Impact Assessment (MVEIRB, 2005)
- Socio-Economic Impact Assessment Guidelines (MVEIRB, 2007)
- Mackenzie Valley Highway Extension Project Terms of Reference (ToR) (MVEIRB, 2015 [Public Registry [PR]#66])
- Mackenzie Valley Engagement and Consultation Policy (MVLWB, 2018a)
- Engagement Guidelines for Applicants and Holders of Water Licenses and Land Use Permits (MVLWB, 2018b)
- Sahtu Land Use Plan (SLUP; Sahtu Land Use Planning Board [SLUPB], 2023)
- Evolving Environmental Impact Assessments in the Mackenzie Valley and Beyond Perspectives Paper (MVEIRB, 2020)

In April 2019, the Sahtu Secretariat Incorporated and the GNWT entered into a Memorandum of Understanding (MOU) to formalize their working relationship to support the development of the Project. The MOU outlines how the parties will work together to advance the environmental assessment and regulatory review process, including completing studies and reports, and facilitating community engagement.

The Pehdzéh Ki First Nation has opted not to move forward with an MOU on the Project. The GNWT continues to work with Pehdzéh Kì First Nation to identify ways to collaborate on the Project.

The following sections describe the GNWT's engagement approach and outcomes, and how the GNWT plans to continue to engage and to consult on the Project.

2.1 Engagement

The GNWT is committed to engaging with Indigenous Governments, Indigenous Organizations, and other affected parties on the Project. Engagement activities were designed to provide relevant and meaningful opportunities for feedback to understand interests and concerns expressed by affected parties, consider and integrate information shared into the Project planning and design, and discuss and develop mitigation measures and monitoring opportunities.

2.1.1 Who the GNWT Engaged

Since the referral of the Project to environmental assessment, the GNWT has carried out engagement with different entities. The GNWT has engaged with regulatory bodies such as MVEIRB, the Mackenzie Valley Land and Water Board (MVLWB), Environment and Climate Change Canada (ECCC), the Department of Fisheries and Oceans (DFO), the Sahtú Land Use Planning Board (SLUPB), and Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC), to provide project updates, attend informational workshops, and to seek subject matter advice on regulatory, policy, and environmental matters to inform the Developer's Assessment Report (DAR).

Engagement on the Project is open to the public. The GNWT is seeking input from people who currently use the Mackenzie Valley Winter Road (MVWR), those who will have access to using the Mackenzie Valley Highway, those who might be affected by the Project, and those who are located in the Sahtu and Dehcho regions. The GNWT staff and project consultants have visited communities and specifically invited Indigenous Governments, Indigenous Organizations, residents, and other affected parties in the Sahtu and Dehcho regions to participate in the GNWT's engagement on the Project.

Mackenzie Valley Highway Project – Developer's Assessment Report

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2.0 Consultation and Engagement

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Affected parties include all entities who may be affected by the Project, including, but not limited to, community governments or designated authorities, land corporations, renewable resource boards and councils, co-management boards, regulatory authorities of the Project, Federal and GNWT departments with associated mandates¹, educational institutions, public service providers, health and cultural organizations, Indigenous Governments and Indigenous Organizations, landowners, private organizations (such as Enbridge), emergency services, local businesses², local residents³, and the public.

Indigenous Governments are defined as governments that have negotiated, or are in the process of negotiating, Lands and Resources and/or Self-Government Agreements (Land Claims) with the GNWT and the Government of Canada.

Indigenous Organizations are defined as organizations that do not meet the definition of an Indigenous Government that have been elected as the sole representative of the collective Aboriginal and/or Treaty rights of its Indigenous membership.

Although feedback is welcomed from all Indigenous Governments, Indigenous Organizations, and other affected parties, including those along the Project right-of-way (ROW), those adjacent to the ROW, and regional parties and the general public, the GNWT provided opportunities for one-on-one meetings and in-person dialogue to those along or in closest proximity to the ROW⁴.

¹ This includes GNWT and Federal departments that have mandates associated with communities, services provided by communities, and community economies (e.g., Department of Municipal and Community Affairs, Health and Social Services, Education, Culture and Employment, Infrastructure, Industry, Tourism and Investment).

² This includes local businesses (e.g., rental companies, airlines, gas stations) and business associations (Chamber of Commerce).

³ This includes community members in Tulita (Tulít'a), hereafter referred to as Tulita; Délı̄ne; Fort Good Hope (K'asho Got'ine), hereafter referred to as Fort Good Hope; Colville Lake (K'áhamítúé), hereafter referred to as Colville Lake; Norman Wells (Tłegóhı̄), hereafter referred to as Norman Wells; Fort Simpson (Łı́ıdlı̄ Kuę), hereafter referred to as Fort Simpson; and Wrigley (Pehdzéh Kı̄ N'deh), hereafter referred to as Wrigley.

⁴ Pehdzeh Ki First Nation and the community of Wrigley were invited to participate in engagement on the Project when engagement was reinitiated in the spring of 2022, however at the request of the Pehdzéh Kı̄ First Nation leadership, the GNWT did not engage with community organizations or community members in Wrigley. The GNWT has, in the interim, continued dialogue with Pehdzéh Kı̄ First Nation leadership on approaches to facilitate a meaningful and agreeable path forward for Pehdzéh Kı̄ First Nation's participation, including through provision of contribution agreements towards traditional knowledge studies, and remains committed to engaging with Pehdzéh Kı̄ First Nation and Wrigley about the Project. Table 2B.1 in Appendix 2B outlines the engagement activities completed with Pehdzéh Kı̄ First Nation. See Appendix 2A for further information on how all affected parties will be engaged throughout the life of the Project.

2.1.2 Engagement Timeline

The extension of the Mackenzie Valley Highway (originally proposed from Fort Simpson to the Dempster Highway) was introduced by the federal government in the 1950s and the first publicly documented engagement with affected communities was held in 1998-1999 (see Sections 2.1.5.1 and 2.1.6.1). During this engagement, communities were asked to share feedback related to the feasibility of the Project and complete preliminary environmental scoping (GeoNorth and Golder Associates, 1999). Subsequently, engagement related to the development of the initial Project Description Reports occurred between 2010 and 2012 (see Sections 2.1.5.2 and 2.1.6.2).

Between 2018 and 2020, the GNWT visited the Sahtu and Dehcho communities to share project information and provide updates after receiving funding for the technical studies and environmental assessment for the Project.

More recently, between 2021 and 2023, the GNWT, represented by the Department of Infrastructure (INF) as the project lead visited Sahtu Region and Dehcho Region communities to share project information and provide updates on the environmental planning and assessment for the Project. The GNWT requested feedback about the Project from Indigenous Governments, Indigenous Organizations, and other affected parties to inform the DAR.

Feedback received during engagement on the Project Description and construction activities (Section 2.1.6.4), assessment activities and project effects (Section 2.1.6.5), mitigation measures and monitoring (Section 2.1.6.6), and the socio-economic impact assessment ([SEIA]; Sections 2.1.6.5.1 and 2.1.6.6.1) was considered alongside Traditional Knowledge and technical studies and has been integrated, where appropriate, into the DAR to inform Project design and planning.

The GNWT will continue to engage with Indigenous Governments, Indigenous Organizations, and other affected parties, in accordance with the Engagement and Consultation Plan, through the life of the Project.

2.1.3 Influence of the Public Health Emergency

The approach to engagement from 2020-2023 was shaped and limited by the ongoing SARS-CoV-2 virus⁵ (hereafter referred to as COVID-19) pandemic and public health emergency. This was due to the gathering and travel restrictions put in place by the territorial Chief Public Health Officer, but also by the needs and requests of participants who live in rural and remote locations who may not have reliable access to the technology required for virtual participation.

The COVID-19 pandemic influenced how people gathered for meetings, whether they were comfortable meeting in-person or virtually, and whether communities were 'open' to visitors. Community preference is typically for regular in-person meetings and the pandemic slowed or otherwise altered the preferred approach to developing the DAR and engaging with Indigenous

⁵ The SARS-CoV-2 virus causes coronavirus disease, and is more commonly referred to as COVID-19.

Governments, Indigenous Organizations, and other affected parties. The pandemic required flexibility and options to optimize the number of people who were able to participate. In response to the challenges encountered, the GNWT chose a hybrid of in-person, virtual, and online engagement activities to collect input. Project information was made available in print and electronic versions and was distributed by email, in-person, by mail or cargo deliveries, and through the GNWT's online engagement portal. See Section 2.1.4 for an overview of the Project engagement methods.

2.1.4 Engagement Methods

To connect with Indigenous Governments, Indigenous Organizations, and other affected parties, a diverse and substantial amount of communication methods were used for engagement activities. Methods for DAR engagement are described in this section and activities, participation, and feedback are summarized in Sections 2.1.5 and 2.1.6. A high-level summary of methods used, participation, and feedback during SEIA engagement activities is also included in these sections. See Section 9.1.2 for a description of the influence of engagement on the SEIA.

In addition to DAR engagement, which included SEIA engagement, the GNWT provided capacity funding for the Tulita Renewable Resources Council, the Norman Wells Renewable Resources Council, and Pehdzéh Kì First Nation to complete project-specific traditional land and resource use (TLRU) studies for the Project. These activities are discussed in Chapter 3 (Traditional Knowledge).

2.1.4.1 Virtual Community Workshops

During April and June of 2022, the GNWT-INF hosted workshops via Zoom in a format that included a mix of presentation and small group discussions. These virtual workshops were arranged because of NWT travel restrictions and community requests, in response to the ongoing COVID-19 pandemic. Facilitated workshops had South Slavey and North Slavey language interpretation and were documented by notetakers and graphic illustrators. Subject matter experts responsible for the DAR, including the SEIA, presented, answered questions, and listened to the interests and concerns raised by community members.

Workshops were advertised publicly by radio, social media, posters in communities, and on the GNWT *Have Your Say* webpages (see Section 2.1.4.7). Indigenous Governments, Indigenous Organizations, and other affected parties received invitations to attend the workshops by email approximately two weeks in advance.

Workshops were scheduled on different days of the week and at different times of day—morning, lunch, afternoon, and evening—to accommodate diverse schedules.

To promote engagement and feedback opportunities, upon the completion of the virtual engagement workshops the GNWT-INF shared the presentation and link to the interactive map (see Section 2.1.4.2) with registered participants.

2.1.4.2 Interactive Map

An online interactive map was developed to allow for site-specific feedback on the project location or activities, such as the proposed highway route, proposed locations of quarries and borrow sources, or proposed locations for camps and construction activities. Members of the public were invited to put a virtual pin on the map, share their thoughts, and identify locations or landscape features that were important to them, including:

- Places important for wildlife, fish, and plants
- Places used for recreation, such as camping and boating
- Active traplines and hunting and harvesting sites
- Locations of cabins, graves, birthplaces, trails and travel routes, camps, and other important areas
- Locations that might be suitable for temporary construction camps
- Areas known for extreme environmental conditions such as flooding or wind gusts

Individuals who volunteered information could choose whether their feedback was made public or whether viewing would be limited to the GNWT and their consultants. The map was opened for comment in April 2022 and will remain open while project planning continues. It is accessible in English and French via the GNWT *Have Your Say* webpage: <https://haveyoursay.nwt-tno.ca/mackenzie-valley-highway-project>.

2.1.4.3 Coffee House One-on-One Meetings

During the virtual workshops in April 2022, community members requested that the GNWT-INF re-initiate in-person engagement. As a result, in May and June 2022, the GNWT-INF staff visited communities in the Sahtu and Dehcho regions primarily to help people use the interactive map, explain project information, and offer an in-person opportunity to discuss questions and concerns with the project team. The GNWT-INF advertised the coffee house meeting dates by posting notices in public locations, advertising on radio and social media, and distributing emails to Indigenous Governments, Indigenous Organizations, and other affected parties. These sessions were informal, and participants could choose to participate as a group or one-on-one. Participants could drop-in or schedule a dedicated meeting time. Affected parties were invited to schedule meetings with the GNWT-INF while they were in town. During these sessions project staff demonstrated use of the interactive map, and if requested, entered data points and comments on behalf of participants.

2.1.4.4 In-Person Community Meetings

During Project Updates engagement (August 2021), and engagement in November 2022 through February 2023, the GNWT-INF hosted in-person community meetings. These meetings were open to the public and included a brief presentation and time for questions and answers. Wall maps and project information were displayed in meeting rooms. Attendees were invited to circulate and discuss the information with the GNWT-INF staff members present and with subject matter experts

responsible for the DAR, including the biophysical, heritage resources, and traditional land use assessments and the SEIA.

Language interpreters were present, and attendees were invited to listen in using a headset. Dinner and door prizes were available at each event to encourage participation. Advertising for these meetings included the same communication methods described in Section 2.1.4.1.

Some additional in-person community meetings were held, separately, to specifically discuss socio-economic concerns and potential social and economic impacts of the Project.

2.1.4.5 Public Drop-in Open Houses

During November 2022 through February 2023 in-person engagement, open houses were hosted by the GNWT-INF. These open houses were open to the public. The project team, including the GNWT-INF staff members, and subject matter experts responsible for the DAR, including the biophysical, heritage resources, and traditional land use assessments and the SEIA, shared project information with each visitor, answered questions, and documented feedback. Similar to the community meetings, lunch and door prizes were available at each event to encourage participation. Advertising for these meetings included the same communication methods described in Section 2.1.4.1.

2.1.4.6 One-on-One Meetings

The GNWT-INF welcomed one-on-one meetings with Indigenous Governments, Indigenous Organizations, and other affected parties when requested. These occurred through the Microsoft Teams or Zoom applications, or in person. The GNWT-INF reached out to Indigenous Governments, Indigenous Organizations, and other affected parties in advance of travelling to a community to offer a scheduled in-person meeting time regarding the Project. One-on-one meetings allowed for information to be exchanged in a private setting. When requested, the GNWT-INF invited subject matter experts to participate and assist in answering questions regarding the Project and language interpreters were in attendance when requested.

As a component of the SEIA, the GNWT-INF also conducted meetings specifically focused on socio-economic considerations with over 200 individuals and small groups of people representing Indigenous Governments, Indigenous Organizations, communities, regulators, and other affected parties. The engagement provided an opportunity for a cross-section of community members – such as Elders, youth, women, health care providers, educators, emergency service providers, leadership, and representatives from economic development and land corporations – to provide input on how they think the Project might positively and/or adversely affect their communities and to identify possible enhancement and/or mitigation measures to address the potential effects.

2.1.4.7 Have Your Say Engagement Webpages

To assist with sharing project information with the public and providing an online option for engagement, the GNWT used their *Have Your Say* engagement webpages. The webpages were open for comment from April 12 until June 30, 2022, and again from November 3, 2022 to February 2, 2023 to support engagement activities. The *Have Your Say* webpages hosted project information, advertised upcoming engagement opportunities, and had two interactive features: a question/comment box and a link to the interactive map (described in Section 2.1.4.2). The *Have Your Say* webpages included contact information for the Project, links to the Project's website on the GNWT-INF's webpage, and the MVEIRB's Mackenzie Valley Highway environmental assessment process. The webpages were accessible in English and French and available at <https://haveyoursay.nwt-tno.ca/mackenzie-valley-highway-project> and <https://haveyoursay.nwt-tno.ca/mvhimpacts>.

2.1.4.8 Email Correspondence

A dedicated email address for receiving project feedback was established in 2019 by the GNWT-INF to communicate with Indigenous Governments, Indigenous Organizations, and affected parties (MVH@gov.nt.ca). For engagement, interested parties could register for workshops via email and provide feedback or questions to the GNWT-INF. This email address is listed on all engagement materials and advertisements and will remain open for the life of the Project. In addition to the project email, the project team also exchanged emails directly with Indigenous Governments, Indigenous Organizations, and other affected parties regarding meeting coordination and feedback about the Project.

2.1.4.9 Posters, Wall Maps, and Mapbooks

Indigenous Governments, Indigenous Organizations, and other affected parties received project maps and posters to help support engagement activities. Hard copy wall maps were provided to reduce barriers associated with relying on the technology of the interactive map. This allowed Indigenous Governments, Indigenous Organizations, and other affected parties to share project information and engage their own membership, clients, and staff on the Project. Renewable Resource Councils and Land Corporations located in Tulita and Norman Wells, and Pehdzéh Kì First Nation also received printed mapbooks at 1:20,000 scale showing the location of the Project to facilitate sharing of site-specific feedback. Members of the public were also invited to keep copies of the mapbooks during community meetings in Tulita, Norman Wells, Délįnę, Fort Simpson, Fort Good Hope, and Colville Lake.

2.1.4.10 Surveys

During 2010-2012 engagement activities to discuss the Project Description, a door-to-door-survey was conducted in Wrigley with Pehdzéh Kì First Nation members. The survey was designed to inform citizens about and gather feedback on the potential project effects and benefits. It sought to understand varying perspectives about the Project and to reach consensus about the design and alignment of the Project. It also requested information about traditional land use and other practices occurring in the project area in order to understand and mitigate project effects. The survey was conducted in November 2011 (Dessau, 2012 [PR#13]).

2.1.4.11 Sahtu Secretariat Incorporated Project Office

In September 2022, the GNWT provided capacity funding to Sahtu Secretariat Incorporated to hire an engagement liaison based in Norman Wells to assist the GNWT with engagement related activities. Sahtu Secretariat Incorporated is currently in the process of setting up a project-specific office in Norman Wells to provide members of the public with project information.

2.1.5 Summary of Engagement Activities

The following sections describe engagement activities that have occurred between August 2021 and February 2023 supporting the DAR. Also included is a high-level summary of engagement activities that occurred in 1998-1999 and 2010-2012 in the Sahtu and Dehcho regions concerning scoping the Project and development of the Project Description.

2.1.5.1 1998-1999 Engagement Activities – Environmental Scoping and Project Feasibility

Engagement activities to discuss the environmental scoping of the Project were held in 1998 and 1999. These engagement activities included community and one-on-one meetings and interviews with Elders and other affected parties. Scoping meetings were held in Fort Simpson, Wrigley, Tulita, Délı̄ne, Norman Wells, Fort Good Hope, and Colville Lake, as well as in Tsiigehtchic and Inuvik (Geonorth and Golder Associates, 1999). Details and results from these engagement activities can be found in the document titled *Mackenzie Valley Highway Extension: Scoping, Existing Information and the Regulatory Regime* (Geonorth and Golder Associates, 1999).

2.1.5.2 2010-2012 Engagement Activities – Initial Project Description

Engagement activities for the initial Project Description were held in Wrigley, Norman Wells, and Tulita between 2010 and 2012. Activities included a combination of community meetings, one-on-one meetings, and Pehdzéh Kì First Nation member surveys. The details and results of the activities were documented in the Project Description Reports for the Dehcho Region (Dessau, 2012 [PR#13]) and Sahtu Region (5658 NWT Ltd. and GNWT, 2011 [PR#16]).

2.1.5.3 2018-2020 Engagement Activities – Project Updates

Engagement activities were held in Wrigley, Fort Simpson, Norman Wells, Tulita, Délı̄ne, Fort Good Hope, and Colville Lake between 2018 and 2020 to provide project updates following the 2015 TOR from MVEIRB and the 2018 project funding announcement. Activities included community and one-on-one meetings.

2.1.5.4 2021-2023 Engagement Activities – Developer's Assessment Report

Engagement activities for the DAR, including the SEIA, were initiated in the summer of 2021. The GNWT-INF team visited Norman Wells and Tulita in the Sahtu Region in August 2021 to provide project updates and engage on the scope of the DAR. The team provided an update on project planning and heard initial concerns and interests with respect to the Project. Engagement activities were paused in the fall of 2021 due to travel and gathering restrictions implemented by the territorial Chief Public Health Office and by community request.

In March of 2022, engagement activities were re-initiated in the Sahtu and the Dehcho regions. Between April 2022 and February 2023, the GNWT engaged with Indigenous Governments, Indigenous Organizations, and other affected parties in Tulita, Norman Wells, Fort Good Hope, Délı̄ne, Colville Lake, and Fort Simpson on:

- Project Description and construction activities
- Assessment findings and project effects
- Project mitigation and monitoring

As previously stated in Section 2.1.1, at the request of the Pehdzéh Kì First Nation leadership, the GNWT did not engage with community organizations or community members in Wrigley. The GNWT has, in the interim, continued dialogue with Pehdzéh Kì First Nation leadership on approaches to facilitate a meaningful and agreeable path forward for Pehdzéh Kì First Nation's participation in the Project. See the Appendix 2A for further information on how all affected parties will be engaged throughout the life of the Project.

In April of 2022, engagement activities were re-initiated in the Sahtu and the Dehcho regions where possible. When deemed safe to meet in person, the GNWT-INF team visited Norman Wells, Tulita, Fort Good Hope, Colville Lake, Délı̄ne, and Fort Simpson. The GNWT-INF continues to work with Pehdzéh Kì First Nation on opportunities to engage on the Project. The GNWT and Pehdzéh Kì First Nation are working to find an agreeable path forward, and the GNWT is committed to engaging with Pehdzéh Kì First Nation and Wrigley about the Project. The GNWT will continue to engage with Indigenous Governments, Indigenous Organizations, and other affected parties, in accordance with the Engagement and Consultation Plan, through the life of the Project.

Table 2.1 provides a summary of 2021-2023 engagement activities. For a comprehensive overview of engagement activities, see Appendix 2B. A summary of engagement feedback was also included in public *What We Heard* reports (see Appendix 2C).

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Table 2.1 Summary of 2021-2023 Engagement Activities

Activity	Timing	Participation
Virtual Community Workshops	April and June 2022	43 participants during six workshops
In-Person Community Meetings	August 2021; November – December 2022; January – February 2023	220 participants during 12 community meetings; 11 participants during 1 community meeting to specifically discuss socio-economic considerations
Public Drop-in Open Houses	November – December 2022; January – February 2023	73 participants during 9 meetings
Online Interactive Map	April – July 2022	70 comments
Coffee House One-on-One Meetings	May - June 2022	32 participants during 15 meetings
One-on-One Meetings (virtual and in-person)	August 2021, November – December 2022; January – February 2023	168 participants during 29 meetings; 205 participants during 105 meetings to specifically discuss socio-economic considerations
Project Website and Online <i>Have Your Say</i> Engagement Platform	April 2022 – February 2023	Approximately 4,400 website visits; 15 participants provided feedback and asked questions
Email Correspondence	Established 2019	Over 900 emails exchanged with Indigenous Governments, Indigenous Organizations, and other affected parties
Posters, Wall Maps, and Mapbooks	April – July 2022; November – December 2022; January – February 2023	32 mailouts; materials hand-delivered during in-person engagement

2.1.6 Summary of Engagement Feedback

The following sections describe feedback that was shared during engagement activities in 1998-1999, 2010-2012, and between August 2021 and February 2023 with Indigenous Government, Indigenous Organizations, and other affected parties in the Sahtu and Dehcho regions. Feedback was used to assist in project planning and design and to inform the DAR, including the SEIA. Feedback that was shared during engagement activities from November to December 2022 and from November 2022 to February 2023 that is specific to the SEIA is described in Sections 2.1.6.5.1 and 2.1.6.6.1, respectively, and discussed in detail in Chapter 9 (SEIA). To respect the privacy of participants per the *Access to Information and Protection of Privacy Act* (ATIPP 1996), the GNWT has not attributed feedback to individuals.

2.1.6.1 Environmental Scoping and Project Feasibility Engagement – 1998-1999

Engagement to discuss the feasibility and preliminary environmental scoping of the Project was held in 1998 and 1999. Discussions were designed to gather feedback on the following topics:

- Understanding communities' interest in the proposed all-season highway
- Identifying environmental, cultural, socio-economic, and other concerns
- Gathering and integrating Traditional Knowledge

In general, there was support expressed for the highway. Communities stated that they would like to understand the opinions of other affected communities, but each community should have a say in whether the Project is built. Communities also wanted to be involved in the project planning and environmental assessment and wanted Traditional Knowledge to meaningfully inform the process (Geonorth and Golder Associates, 1999). Participants stated that the Project should provide local economic and social benefits and mitigation measures for social problems that may result from the Project. Participants also requested that wildlife be protected, hunting be controlled, and social programs be implemented (Geonorth and Golder Associates, 1999; Dessau, 2012 [PR#13]).

A full summary of engagement results is detailed in the *Mackenzie Valley Highway Extension Environmental Scoping, Existing Information and Regulatory Regime* report (Geonorth and Golder Associates, 1999).

2.1.6.2 Initial Project Description Engagement – 2010-2012

Engagement in 2010-2012 focused on the initial Project Description (Dessau, 2012 [PR#13]; 5658 NWT Ltd. and GNWT, 2011 [PR#16]). During engagement activities, participants expressed general support for the Project, noting that there is potential for economic and tourism benefits. A high-level overview of feedback received during these engagement activities has been summarized in Table 2.2. Integration and assessment of this feedback has been considered and assessed in the cross-referenced sections of the DAR that have been specified in the table.

A full summary of engagement results is detailed in the Project Description Reports (Dessau, 2012 [PR#13]; 5658 NWT Ltd. and GNWT, 2011 [PR#16]).

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Table 2.2 Summary of Initial Project Description Engagement Feedback

Comment	GNWT Response	Where Addressed
<p>Participants stated that there needs to be meaningful consideration of Traditional Knowledge and expressed concerns about harvesting areas and resources, and heritage and cultural resources. They requested protection of harvesting areas (including hunting areas, fishing areas, and traplines), burial grounds, and other cultural sites, including Bear Rock (Petınrıah).</p>	<p>The GNWT has since provided capacity funding for the Tulita Renewable Resources Council (TRRC), the Norman Wells Renewable Resources Council (NWRRC), and Pehdzéh Kı First Nation to complete project-specific TLRU studies for the Project.</p> <p>TRRC and NWRRC submitted confidential TLRU studies in 2022 and 2023 respectively and the information has been integrated into the DAR. Pehdzéh Kı First Nation has not yet submitted a TLRU study. Once received, the GNWT will review the information and consider it in the context of the Project in a supplemental report.</p>	<p>For information about harvesting and harvested resources see the following:</p> <ul style="list-style-type: none"> • Section 8.3 (Summary of Caribou, Moose and Harvesting) • Chapter 10 (caribou and moose) • Chapter 17 (fish and fish habitat) • Chapter 19 (wildlife and wildlife habitat) • Chapter 20 (birds and bird habitat) • Chapter 11 (culture and traditional land use, including harvesting) <p>See Chapter 11 and Chapter 22 (heritage resources) for more information about heritage and cultural resources.</p>
<p>Participants expressed concerns about safety, including vehicle collisions.</p>	<p>Vehicle speeds will be limited to 50 kilometres per hour (km/h) on unfinished project road surfaces.</p> <p>An Emergency Response Plan for construction will be developed and implemented.</p> <p>All construction workers will have sufficient safety training to reduce potential for severe accidents.</p> <p>Signage and physical barriers will be used to identify areas of active construction and to provide separation between workspaces and the MVWR for public safety and security.</p> <p>The GNWT will deliver public education around highway safety, provide proper highway signage and maintain the ROW to provide clear line of sight for drivers.</p>	<p>For more information about safety during project construction, see the Emergency Response Plan Framework in Volume 5.</p> <p>The GNWT has committed to developing a Traffic Management Plan.</p>
<p>More information was requested regarding mitigation measures and monitoring, as participants want to avoid environmental damage.</p>	<p>The GNWT will develop and implement mitigation and monitoring plans for the Project.</p> <p>The GNWT is open to and interested in discussing with Indigenous Governments, Indigenous Organizations, and other affected parties how best to integrate community-based monitoring into the Project.</p>	<p>For more information about compliance and effects monitoring and adaptive management see Chapter 23.</p> <p>Draft management plans are included in Volume 5.</p>

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Comment	GNWT Response	Where Addressed
Participants expressed concerns about socio-economic effects, and want to see local economic and social benefits, including skills training and employment.	See next column. The GNWT is committed to ongoing engagement with Indigenous Governments, Indigenous Organizations, and other affected parties during advancement of project design and planning.	For more information about socio-economic conditions and considerations see Chapter 9 (SEIA).

2.1.6.3 Project Updates Engagement – August 2021

The GNWT-INF team visited Norman Wells and Tulita in August 2021 to provide an update on local projects intended to build capacity for the Project, introduce the socio-economic impact assessment for the Project, and share upcoming timelines for engagement on the Project's environmental assessment and Traditional Knowledge studies. The presentation included the following information:

- Status update on the GNWT's Community Capacity Building Projects (not part of the scope of the Mackenzie Valley Highway Project):
 - Canyon Creek All Season Access Road
 - Prohibition Creek Access Road (PCAR)
 - Mount Gaudet Access Road⁶
 - Great Bear River Bridge
- Environmental Assessment
- Socio-Economic Impact Assessment Process
 - Scoping
 - Preliminary Valued Socio-economic Components
- Role of Traditional Knowledge
- Next Steps for the Project

Engagement was delivered through two community meetings and eight one-on-one meetings. In total, 84 people participated in Project Updates engagement events. Much of the discussion focused on the procurement and socio-economic topics. Themes from Project Updates engagement are summarized in Table 2.3. Consideration and integration of this feedback has been assessed in the cross-referenced sections of the DAR that have been specified in the table.

Advice received regarding future engagement activities was used to inform the Project Engagement and Consultation Plan, which is available in Appendix 2A. Feedback received regarding procurement was processed internally by the GNWT. Socio-economic feedback was used to verify the valued components and is discussed further in Chapter 9 (SEIA).

⁶ The Mount Gaudet Access Road has since been included in the scope of the Mackenzie Valley Highway Project.

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Table 2.3 Summary of Project Updates Engagement Feedback

Comment	GNWT Response	Where Addressed
<p>Participants expressed high interest in employment and training, and rehiring local labour from recent community capacity building projects. There was a common perception expressed that education, training, and employment for local people should be included in the government contract for the Mackenzie Valley Highway.</p> <p>Participants requested opportunities for local businesses to bid on Project contracts. Procurement processes on other recent projects in the region have caused concern that the GNWT may contract southern companies.</p>	<p>See next column.</p> <p>The GNWT is committed to ongoing engagement with Indigenous Governments, Indigenous Organizations, and other affected parties during advancement of project design and planning.</p>	<p>For more information about construction employment and contracting and training see Section 5.4.14.</p> <p>For more information about socio-economic considerations see Chapter 9 (SEIA).</p>
<p>Common questions received from participants were whether the funding was in place for construction, and when construction will begin.</p> <p>A common sentiment shared was that there has been talk of the Project for decades and people are anxious for the road to be built. The GNWT-INF received criticism that they keep funding studies but there is still no road.</p>	<p>See next column.</p>	<p>For more information about construction schedule see Section 5.4.1.</p>
<p>Participants from Tulita questioned where the Project will source gravel from, noting that they have a limited supply for their community needs.</p>	<p>See next column.</p> <p>The GNWT is committed to ongoing engagement with Indigenous Governments, Indigenous Organizations, and other affected parties during advancement of project design and planning.</p>	<p>For more information about quarries and borrow sources see Section 5.4.5.</p>

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Comment	GNWT Response	Where Addressed
<p>Participants shared their observations of environmental changes that are of concern to the project design including: changes to permafrost; increased sloughing; changes to caribou, moose, and fish habitat; changes in sediment; and flow of the rivers.</p>	<p>See next column. The GNWT is committed to ongoing engagement with Indigenous Governments, Indigenous Organizations, and other affected parties during advancement of project design and planning.</p>	<p>For more information about project design considerations see Section 5.2.3. For more information about caribou and moose see Chapter 10 (caribou and moose). For more information about effects of the Project on permafrost, see Chapter 14 (terrain, soils and permafrost). For more information about fish and fish habitat see Chapter 17 (fish and fish habitat). For more information about sedimentation and flow of the rivers see Chapter 15 (water quantity) and Chapter 16 (water and sediment quality).</p>
<p>Participants discussed the need to prepare their communities for the social changes that the highway will bring, and the need for federal and territorial funding to educate their communities and prepare for potential changes.</p>	<p>See next column. The GNWT is committed to ongoing engagement with Indigenous Governments, Indigenous Organizations, and other affected parties during advancement of project design and planning.</p>	<p>For more information about socio-economic conditions and considerations see Chapter 9 (SEIA).</p>
<p>When asked how participants would like to be engaged on the Project in the future, Zoom meetings and in-person meetings were the preferred options. Participants informed the GNWT-INF that they should meet with the Elder's groups and Renewable Resource Councils to collect Traditional Knowledge and land use information. Concern was raised for those people who have family cabins near the MVWR.</p>	<p>See next column. The GNWT is committed to ongoing engagement with Indigenous Governments, Indigenous Organizations, and other affected parties during advancement of project design and planning.</p>	<p>For more information about Traditional Knowledge and land use, including cabins see Chapter 11 (culture and traditional land use, including harvesting).</p>

2.1.6.4 Engagement on Project Description and Construction Activities – April to July 2022

Engagement on the Project Description and construction activities focused on sharing the Project Description as well as the construction activities required for the Project and the proposed locations for construction activities. Those who participated in engagement activities were asked to share their interests, concerns, and recommendations related to the following aspects:

- Proposed alignment and route
- Locations of quarries, borrow sources, and access roads
- Construction activities, specifically:
 - Mobilization and staging
 - Clearing
 - Road cuts
 - Culverts and drainage
 - Construction camps
 - Laydown areas
 - Maintenance yards
 - Water use and water sources
 - Waste management
 - Reclamation after construction

From April to July 2022, there were approximately 1,835 points of communication with Indigenous Governments, Indigenous Organizations, and other affected parties, including the public whereby project information was shared and/or interacted with. This included emails, visits to the GNWT-INF website, visits to the GNWT *Have Your Say* webpages, and cargo deliveries of project information.

Engagement occurred through six virtual public workshops, an interactive map, 15 coffee house one-on-one meetings, and the GNWT *Have Your Say* engagement platform. Approximately 90 individuals participated in in-person or virtual engagement activities and 70 comments were shared via the interactive map.

General support for the Project was expressed through these engagement activities. Engagement findings are summarized in Table 2.4. A summary of engagement feedback was also included in a public *What We Heard* report (see Appendix 2C). Integration and assessment of this feedback has been considered and assessed in the cross-referenced sections of the DAR that have been specified in the table. Feedback received during engagement on the Project has been incorporated, where appropriate, into the DAR to inform project design and planning.

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Table 2.4 Summary of Project Description and Construction Activities Engagement Feedback

Comment	GNWT Response	Where Addressed
<p>The existing MVWR alignment has a number of safety concerns. For safety purposes, road design and bridge approaches on the all-season Mackenzie Valley Highway should be cut straight, wide, and not steep.</p>	<p>See next column.</p>	<p>For more information about alignment and road design see Section 5.2.3.</p>
<p>Permafrost thawing, erosion, and landslides are a concern in some areas along the existing MVWR and the proposed highway location. In areas of concern, participants recommend re-routing the proposed highway and working with community Elders to determine where the highway should go.</p> <p>Similar concerns on permafrost thawing were raised regarding quarries, borrow sources, and access roads. Participants recommended that quarries and borrow sources should not be constructed on the west side of the highway alignment due to slumping concerns along the banks of Mackenzie River (Deh Cho).</p>	<p>See next column.</p>	<p>For more information about permafrost thawing, erosion, and landslides see Sections 5.2.3 and 24.4.</p> <p>For more information about quarries, borrow sources, and access roads see Sections 5.2.3 and 5.4.5.</p>
<p>Ice and overflow are a concern at specific locations. Participants recommended avoiding areas with frequent ice and water overflow and road washouts such as Hodgson Creek, Blackwater River north bank, Steep Creek, and Strawberry Creek. Placing culverts at regular intervals to facilitate water and fish movement is strongly supported.</p>	<p>Culverts will be designed and constructed to maintain water flow and fish passage.</p> <p>Routine periodic inspection of culverts will be conducted to determine if they are functioning as per design (e.g., allow fish passage) and for evidence of erosion and sedimentation. If a barrier to fish passage or erosion and sedimentation issues are observed corrective actions would be implemented to correct the problem.</p> <p>Water flow and fish passage will be maintained during construction.</p> <p>Snow accumulation and runoff alongside the highway will be monitored visually. Snow removal methods will be modified if needed in areas presenting excessive snow accumulation/runoff.</p>	<p>For more information about overflow see Section 5.2.3.</p> <p>For more information about culverts see Section 5.4.7.</p> <p>For more information about fish and fish habitat see Chapter 17 (fish and fish habitat).</p>

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Comment	GNWT Response	Where Addressed
<p>Protection of caribou, fish, moose, other fur-bearing animals, and their respective habitats are a priority for community members. Participants recommended re-routing at a number of locations to protect habitat from environmental disturbance and create larger distances from the highway to deter poaching.</p>	<p>See next column. The GNWT is committed to ongoing engagement with Indigenous Governments, Indigenous Organizations, and other affected parties during advancement of project design and planning.</p>	<p>For more information about wildlife and wildlife habitat see Section 8.3 (Summary of Caribou, Moose and Harvesting), Chapters 10 (caribou and moose), 19 (wildlife and wildlife habitat), and 20 (birds and bird habitat).</p>
<p>Participants stated that it is a priority to protect culturally important areas such as Bear Rock (Petinırah), known burial sites, and cabins, and to keep access to the MVWR available for traditional hunters and harvesters.</p>	<p>The area of direct ground disturbance will be limited by following the pre-existing MVWR road alignment to the extent possible. Construction activities will be scheduled to reduce disruption to public and commercial vehicle access on the MVWR, where possible. The GNWT is committed to ongoing engagement with Indigenous Governments, Indigenous Organizations, and other affected parties during advancement of project design and planning. The GNWT will investigate and/or mitigate 'known and suspected sites' as identified by community members during Consultation and engagement and/or through TLRU studies.</p>	<p>For more information about cultural sites and harvesting see Chapter 11 (culture and traditional land use, including harvesting). For more information about heritage resources see Chapter 22 (heritage resources).</p>
<p>It is important to the affected communities that they have input on the selection of work camp locations. Concerns were shared about the capacity of municipal facilities and potential effects from the use of lagoons and burying waste.</p>	<p>See next column. The GNWT is committed to ongoing engagement with Indigenous Governments, Indigenous Organizations, and other affected parties during advancement of project design and planning.</p>	<p>For more information about work camps see Section 5.4.3. For or more information about waste management see Section 5.4.12 and the draft Waste Management Plan (WMP; see Volume 5).</p>

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Comment	GNWT Response	Where Addressed
There are socio-economic concerns regarding construction of the highway and camps. The main concerns expressed include safety, substance abuse, competition for country foods, competition at the grocery stores, and economic and employment benefits for local community members. Concern was also expressed whether there are adequate emergency response services for construction and also once the all-season highway is open.	See next column. The GNWT is committed to ongoing engagement with Indigenous Governments, Indigenous Organizations, and other affected parties during advancement of project design and planning.	For more information about socio-economic conditions and considerations and country food access see Chapter 9 (SEIA). For more information about country food access see Chapter 11 (culture and traditional land use, including harvesting).
Lessons learned from other northern road projects such as the Tłı̄chǫ Highway and the Inuvik to Tuktoyaktuk Highway should be incorporated into the Mackenzie Valley Highway.	See next column.	This is reflected in all chapters, where applicable, as best practices and/or professional experience.

2.1.6.5 Engagement on Assessment Findings and Project Effects – November to December 2022

In November and December 2022 and February 2023, the GNWT-INF invited Indigenous Governments, Indigenous Organizations, and other affected parties, including community members in the Sahtu and Dehcho Regions to engage on early findings in the environmental assessment, discuss project effects, and share their interests and concerns on the Project. The GNWT-INF team visited Tulita, Norman Wells, Délı̄ne, Colville Lake, Fort Good Hope, and Fort Simpson.

Engagement occurred through five one-on-one meetings, four open house drop-in sessions, and six community meetings. In total, 183 individuals participated in engagement activities. In addition, approximately 76 emails were exchanged with Indigenous Governments, Indigenous Organizations, and other affected parties, and people visited the Project website and *Have Your Say* platform approximately 3,000 times between July 2022 and February 2023.

Engagement findings are summarized in Table 2.5. Integration and assessment of this feedback has been considered and assessed in the cross-referenced sections of the DAR that have been specified in the table. A summary of engagement feedback was also included in a public *What We Heard* report (see Appendix 2C). Feedback received during engagement on Assessment Findings and Project Effects has been incorporated, where appropriate, into the DAR to inform project design and planning.

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Table 2.5 Summary of Assessment Findings and Project Effects Engagement Feedback

Comment	GNWT Response	Where Addressed
<p>There is a concern about the effects on fish populations in various waterways due to a range of possible factors. These include culverts, vibration from bridge traffic, seismic and temperature changes, silt fencing, pollution, increases in recreational boating, and the sourcing of water for construction from creeks.</p>	<p>See next column.</p>	<p>For more information about fish see Chapter 17 (fish and fish habitat). For more information about culverts see Section 5.4.7.</p>
<p>Concern was expressed about dust, including how far it will spread and whether there will be chemicals and carcinogens in the dust. Participants recommended appropriate dust suppressants and other control measures near water, including major creeks.</p>	<p>Dust suppression will be conducted as necessary to reduce dust and sediment from entering watercourses or waterbodies.</p>	<p>For information about dust control see Chapter 12 (air quality).</p>
<p>There is concern about hunting rights and the harvesting of wildlife. Many are concerned that the highway will make hunting more convenient and lead to a substantial increase in harvesting from the area, affecting traditional food sources and the communities that rely on them. Some were concerned that this could potentially lead to a loss of hunting rights in the long term. Caribou, moose, and muskox were specifically identified as species of importance.</p>	<p>A Wildlife Management and Monitoring Plan (WMMP) will be developed and implemented. The WMMP will contain detailed monitoring and mitigation measures to be implemented for the duration of the construction and operations of the Project. The GNWT is committed to ongoing engagement with Indigenous Governments, Indigenous Organizations, and other affected parties during advancement of project design and planning.</p>	<p>For more information about hunting and traditional food sources see Chapter 11 (culture and traditional land use, including harvesting). For more information about caribou, moose, and other wildlife see Section 8.3 (Summary of Caribou, Moose and Harvesting), Chapters 10 (caribou and moose), 19 (wildlife and wildlife habitat), and 20 (birds and bird habitat).</p>

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Comment	GNWT Response	Where Addressed
<p>Concern was expressed regarding the environment, ecosystems, and wildlife more broadly. Comments provided were regarding waste clean-up, invasive species, spills and spills containment, increased traffic, off-road parking, and ensuring the various species that live along the route are minimally disrupted and treated with care. Bears, bats, caribou, moose, muskox, beaver, and other furbearers were the wildlife specifically mentioned most often in this context.</p>	<p>A Spill Contingency Plan (SCP) will be developed and implemented. All site personnel will receive SCP training and will have awareness of spill prevention.</p> <p>Equipment originating from outside of the Northwest Territories will be cleaned prior to mobilization to avoid introduction of invasive species.</p> <p>Machinery will arrive onsite and will be maintained in a clean condition and free of invasive species and noxious weeds.</p> <p>A Traffic Management Plan will be developed and implemented.</p> <p>A WMMP will be developed and implemented. The WMMP will contain detailed monitoring and mitigation measures to be implemented for the duration of the construction and operations of the Project.</p> <p>The GNWT is committed to ongoing engagement with Indigenous Governments, Indigenous Organizations, and other affected parties during advancement of project design and planning.</p>	<p>For more information about wildlife see Chapter 19 (wildlife and wildlife habitat).</p> <p>For information about invasive species see Chapter 18 (vegetation and wetlands).</p> <p>For more information about waste management see Section 5.4.12 and the draft WMP in Volume 5.</p> <p>For more information about spills and traffic see Chapter 25 (accidents and malfunctions) and management plans (Volume 5).</p> <p>For more information about environmental protection planning see management plans (Volume 5).</p>
<p>There is concern about various geotechnical or geological issues that may arise or worsen due to construction. Some communities were concerned about erosion, particularly surrounding bridges. Many inquired about gravel and where it will be sourced. Others were concerned about dust and thawing permafrost.</p>	<p>A project-specific Permafrost Protection Plan (PPP), Erosion and Sedimentation Control Plan (ESCP), Quarry Development Plan (QDP) will be developed and implemented.</p> <p>A dust control program using water will be implemented during construction and operations.</p> <p>Culvert design will include requirements for bedding materials and geotextile to protect surrounding permafrost from thaw. Rip rap will be incorporated into culvert design to avoid erosion around each culvert.</p>	<p>For more information about project design considerations see Section 5.2.3.</p> <p>For more information about quarries and borrow sources see Section 5.4.5.</p> <p>For more information about dust control see Section 5.5.2 and Chapter 12 (air quality).</p> <p>For assessment of the Project's effects on soils, terrain and permafrost see Chapter 14 (soils, terrain and permafrost).</p> <p>See also the management plans (Volume 5).</p>

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Comment	GNWT Response	Where Addressed
<p>Project management is an area of concern. Community members expressed frustration over the project timeline and cost and questioned whether funding is available and whether the highway will ever be completed.</p>	<p>See next column. The GNWT is committed to ongoing engagement with Indigenous Governments, Indigenous Organizations, and other affected parties during advancement of project design and planning.</p>	<p>For more information about construction schedule see Section 5.4.1.</p>
<p>There is some concern about a lack of infrastructure and resources for large increases in workers in the short term and tourists in the long term. This included housing, campgrounds with sanitary servicing, parking, emergency services, and communications infrastructure.</p>	<p>See next column. The GNWT is committed to ongoing engagement with Indigenous Governments, Indigenous Organizations, and other affected parties during advancement of project design and planning.</p>	<p>For more information about socio-economic conditions and considerations see Chapter 9 (SEIA).</p>
<p>There is concern about public engagement, how it is being conducted, and support for the Project in other communities. The importance of ensuring all communities along the route are sufficiently consulted was emphasized. Some communities expressed concern about whether other communities supported the Project, thinking that a lack of support will stop the Project from proceeding.</p>	<p>The GNWT is committed to ongoing engagement with Indigenous Governments, Indigenous Organizations, and other affected parties during advancement of project design and planning.</p>	<p>The GNWT's approach to engagement is described in the Engagement and Consultation Plan (Appendix 2A).</p>

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Comment	GNWT Response	Where Addressed
<p>Potential effects on burial grounds, sacred sites, traditional hunting grounds, and other historic or meaningful locations are a concern. Many people stated that Bear Rock (Petinırah) should be avoided, and that the highway should be routed around it. Some are concerned that broader effects on wildlife, fish, water sources, and the ecosystem may negatively affect culturally significant sites. Some expressed skepticism regarding whether Traditional Knowledge was meaningfully considered when making decisions about the Project.</p>	<p>An Archaeological Impact Assessment will be completed prior to construction in areas with known or suspected high archaeological potential.</p> <p>The GNWT will develop a Heritage and Sites Protection Plan.</p> <p>An alignment routing option 2 kilometres (km) north of the MVWR at Bear Rock (Petinırah) has been identified.</p> <p>The GNWT provided capacity funding for the TRRC, the NWRRC, and Pehdzéh Kı First Nation to complete project-specific TLRU studies for the Project.</p> <p>TRRC and NWRRC submitted confidential TLRU studies in 2022 and 2023 respectively and the information has been integrated into the DAR. Pehdzéh Kı First Nation has not yet submitted a TLRU study. Once received, the GNWT will review the information and consider it in the context of the Project in a supplemental report.</p> <p>The GNWT is committed to ongoing engagement with Indigenous Governments, Indigenous Organizations, and other affected parties during advancement of project design and planning.</p>	<p>For more information about burials, cultural sites, and harvesting see Chapter 11 (culture and traditional land use, including harvesting).</p> <p>For more information about heritage resources see Chapter 22 (heritage resources).</p> <p>For more information about wildlife see Chapter 19 (wildlife and wildlife habitat).</p> <p>For more information about fish and fish habitat see Chapter 17 (fish and fish habitat).</p> <p>For more information on water quantity see Chapter 15 (water quantity).</p> <p>For more information on water quality see Chapter 16 (water and sediment quality).</p>

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Comment	GNWT Response	Where Addressed
<p>Socio-economic effects were a concern. The primary issue of concern was drug and alcohol use. Many expressed concerns about workers and work camps leading to an increase in drug and alcohol use in communities in the short term, and the convenient transport route provided by the highway increasing drugs and alcohol prevalence in the long-term. Many asked if there was any way to mitigate this. Some drew a connection between drugs and alcohol and violence against women, which was also a concern. Previous projects have seen an increase in the abuse of Indigenous women by workers who have come to the area for a project. Missing and Murdered Indigenous Women were specifically mentioned as well.</p>	<p>See next column. The GNWT is committed to ongoing engagement with Indigenous Governments, Indigenous Organizations, and other affected parties during advancement of project design and planning.</p>	<p>For more information about socio-economic conditions and considerations see Chapter 9 (SEIA).</p>
<p>There was concern about employment and the broader potential economic benefits from the Project and ensuring that Indigenous people share in that benefit. Many were positive about potential new employment, economic opportunity, and public and private investment that may result. There were many questions about the nature of new jobs and whether workers will be brought in from elsewhere. However, some participants stated they felt excluded from these opportunities in the past and were skeptical of whether the Project will be a net benefit for them and their community.</p>	<p>See next column. The GNWT is committed to ongoing engagement with Indigenous Governments, Indigenous Organizations, and other affected parties during advancement of project design and planning.</p>	<p>For more information about socio-economic conditions and considerations see Chapter 9 (SEIA). For more information about construction employment and contracting and training see Section 5.4.14.</p>

2.1.6.5.1 Socio-economic Impact Assessment Engagement – Assessment Findings and Project Effects

Concurrent with engagement activities to discuss assessment findings and project effects, engagement to discuss potential socio-economic effects of the Project were also held. As a result, 105 one-on-one and small group meetings and one community meeting were held during this engagement period. In total, 203 individuals participated in engagement activities. In addition, approximately 400 emails were exchanged with Indigenous Governments, Indigenous Organizations, and other affected parties in preparation of these socio-economic engagement activities.

The socio-economic engagement activities revealed there is overwhelming support for the Project, but that support is conditional on communities being sufficiently prepared and ready to increase positive effects (e.g., employment, training) and reduce adverse effects (e.g., exacerbation of existing social conditions such as alcohol and drug use, and crime). There was also overall agreement that communities need to work closely with the GNWT and the federal government to plan and prepare for the construction and operation of the Project and that the approach to readiness needs to be community-driven.

The Project was viewed by community members who participated in the engagement as having many potential socio-economic benefits as a result of the Project allowing residents to travel more easily out of communities and between communities. These included:

- Improvements to health and wellness due to increased access to non-emergency health and dental services
- Ability to more easily and cost-effectively leave the community to visit family and friends in other communities and to attend sporting events and cultural games (especially for youth), and
- Access to a greater variety and quality of store-bought foods and supplies

Community members also spoke about the various employment and business and contracting opportunities available during the construction and operations and maintenance phases of the Project. They also commented that all-season road access might lead to:

- An increase in the number of available instructors/teachers
- An increase in the variety of education and skills training programs/courses available locally (e.g., mobile trades truck) or regionally (i.e., through a possible Aurora College satellite campus in Norman Wells) and
- A decrease in the cost of teaching equipment and supplies

Community members also shared that the Project may provide an opportunity to develop additional recreation areas, and for residents to take part in recreational activities such as hiking and fishing in more areas. Additionally, the Project would provide opportunities for the tourism industry to be further developed and would allow for easier and less expensive access to mineral resources in the area.

Community members also expressed concerns about the Project. In particular, they spoke about the Project exacerbating existing alcohol and drug problems as a result of increased access to substances, which in turn would lead to increasing rates of domestic violence, crime, and accidents. Additionally, community members spoke about their concerns that health services may be strained to respond to an increase in community service and support needs, and that emergency services or protective services do not currently have adequate capacity and lack skills, staff, training, or equipment to service an all-season road. There are also concerns that low levels of educational attainment, a lack of skills training, as well as existing social problems, might limit community members' ability to participate in employment and business opportunities and benefit from increased income as a result of employment with the Project.

Community members expressed concern that the Project will bring more outsiders into the community, and this may result in safety concerns for women and youth and vulnerable populations (e.g., kidnapping, sex trafficking) as well as an increase in sexually transmitted infections (STIs) and other diseases (e.g., COVID-19) and an overall decrease in sense of personal safety and community cohesion. There are also concerns that there will be more accidents on the highway and that existing emergency response will not be equipped to handle the volume and seriousness of these accidents because they lack the necessary staff, training, and equipment. Community members are also worried that because traditional lands will be more accessible, outsiders will overharvest traditional food which will lead to increased rates of food insecurity.

To learn more about feedback shared during SEIA engagement activities and the assessments of effects on socio-economic aspects of the environment, see Chapter 9.

2.1.6.6 Engagement on Project Mitigation and Monitoring – November 2022 to February 2023

The GNWT-INF began engagement on mitigation measures and monitoring plans on November 29, 2022. To gather input, the GNWT-INF team visited the communities of Norman Wells and Tulita where they invited Indigenous Governments, Indigenous Organizations, and other affected parties, including community members and residents to engage on mitigation measures, monitoring plans, and share their interests and concerns on the Project.

Engagement occurred through 15 one-on-one meetings, five drop-in public open houses, and five community meetings. In total, 180 participants engaged in the in-person or virtual Project Mitigation and Monitoring engagement sessions. In addition, approximately 45 emails were exchanged with Indigenous Governments, Indigenous Organizations, and other affected parties, and people visited the project website and *Have Your Say* platform approximately 3,000 times between July 2022 and February 2023.

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General support for the Project continued to be expressed through these engagement activities. Engagement findings are summarized in Table 2.6. A summary of engagement feedback was also included in a public *What We Heard* report (see Appendix 2C). Integration and assessment of this feedback has been considered and assessed in the cross-referenced sections of the DAR that have been specified in the table. Feedback received during engagement on mitigation measures and monitoring plans was considered alongside traditional knowledge and technical studies and has been incorporated, where appropriate, into the DAR to inform project design and planning.

Table 2.6 Summary of Project Mitigation and Monitoring Engagement Feedback

Comment	GNWT Response	Where Addressed
<p>Support was received from Tulita Elders and Tulita Renewable Resource Council on a proposed Bear Rock Alignment Option, new quarry access location, and material utilization from development of a road cut to lessen quarry development needs. The new realigned route and quarry option was seen as a potential means to provide desired gravel material for the community in the future and will have less effect on Bear Rock (Petınızah) as a cultural and spiritual site.</p> <p>Although the majority of participants recommended avoiding Bear Rock (Petınızah), some participants who attended the open house shared that they preferred the original route following the existing MVWR, which was thought to be more scenic. Participants noted the views of Norman Wells and Great Bear River were better on the MVWR alignment and stated it will be better for regional tourism.</p>	<p>In response to feedback received during earlier engagement with Tulita organizations on the routing of the highway around Bear Rock (Petınızah), the GNWT presented the Bear Rock Alignment Option located 2 km north of the MVWR at Bear Rock (Petınızah).</p> <p>The GNWT is committed to ongoing engagement with Indigenous Governments, Indigenous Organizations, and other affected parties during advancement of project design and planning.</p>	<p>For more information about project design considerations see Section 5.2.3 and Chapter 7 (Assessment of Alternatives).</p>
<p>Concern was expressed that diverse voices, such as youth, may not be heard at community engagement sessions.</p>	<p>The GNWT is committed to ongoing engagement with Indigenous Governments, Indigenous Organizations, and other affected parties during advancement of project design and planning.</p>	<p>For additional information of who participated in engagement activities, refer to Appendix 2B.</p>

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Comment	GNWT Response	Where Addressed
It is important to the affected communities that they receive local workforce training to prepare themselves for the construction of the Project.	See next column.	For more information about training see Section 5.4.14.
There is some general confusion to what stage the Project is at. Materials are requested that outline the project timeline and provides updates when the Project moves from stage to stage.	See next column. The GNWT is committed to ongoing engagement with Indigenous Governments, Indigenous Organizations, and other affected parties during advancement of project design and planning.	For more information about construction schedule see Section 5.4.1.
There are socio-economic concerns regarding construction of the highway and camps. Concerns expressed included safety, substance abuse, community interactions with foreign workers, and economic and employment benefits for local community members.	See next column. The GNWT will establish a Mackenzie Valley Highway Corridor Working Group (MVHCWG) that will develop and oversee a Community Readiness Strategy. As part of that strategy the GNWT will develop the following plans in relation to the Project: <ul style="list-style-type: none"> • Well-Being Adaptive Management Plan • Road Safety Plan • Safety and Security Plan for Vulnerable Community Members • Contractor Training and Employment Plan • Social Monitoring Plan The GNWT is committed to ongoing engagement with Indigenous Governments, Indigenous Organizations, and other affected parties during advancement of project design and planning.	For more information about socio-economic conditions and considerations see Section 9.16 of the SEIA.

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Comment	GNWT Response	Where Addressed
<p>There are inadequate resources (such as social workers and education) to combat current drug and alcohol problems within communities. Concerns were expressed that the Project will only increase the problem.</p>	<p>See next column.</p> <p>The MVHCWG that will develop and oversee a Community Readiness Strategy. As part of that strategy the GNWT will develop the following plans in relation to the Project:</p> <ul style="list-style-type: none"> • Well-Being Adaptive Management Plan • Safety and Security Plan for Vulnerable Community Members • Social Monitoring Plan <p>The GNWT is committed to ongoing engagement with Indigenous Governments, Indigenous Organizations, and other affected parties during advancement of project design and planning.</p>	<p>For more information about socio-economic conditions and considerations, see Section 9.16 of the SEIA.</p>
<p>Protection of fish, caribou, moose, fur-bearing animals, songbirds, and their respective habitats is a priority for community members. Communities support wildlife management and monitoring plans to examine any effect the Project will have on wildlife (caribou and moose) and harvesting.</p> <p>Further, communities support fishing management and monitoring plans to examine any effect the Project will have on local fish populations and habitat. Communities have specific interest in the use of these plans around bridge construction to monitor whether all-season access will invite overfishing.</p>	<p>A WMMP will be developed and implemented. The WMMP will contain detailed monitoring and mitigation measures to be implemented for the duration of the construction and operations of the Project.</p> <p>The GNWT is open to and interested in discussing with Indigenous Governments, Indigenous Organizations, and other affected parties how best to integrate community-based monitoring into the Project.</p>	<p>For more information about wildlife see Chapters 10 (caribou and moose), 19 (wildlife and wildlife habitat), and 20 (birds and bird habitat).</p> <p>For more information about fish see Chapter 17 (fish and fish habitat).</p> <p>For more information about harvesting see Chapter 11 (culture and traditional land use, including harvesting).</p> <p>For more information about management and monitoring plans see Chapter 23 (Compliance and Effects Monitoring) and Volume 5 (management plans).</p>
<p>Participants requested a moratorium on non-traditional hunting along the highway.</p>	<p>The collection of annual large game harvest success for non-Indigenous hunters will be continued.</p> <p>The WMMP will be designed to determine if the highway is resulting in a pattern or level of harvest mortality for moose and caribou that would suggest a conservation concern or need for additional harvest management actions.</p>	<p>To review the management plans see Volume 5.</p>

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Comment	GNWT Response	Where Addressed
<p>Concern was expressed about noise and vibration, including from blasting and traffic.</p>	<p>Blasting activities will be limited to daytime hours to the extent practical. Blast mats will be used when blasting near receptors sensitive to noise.</p> <p>Decreased powder factor (through a combination of increased hole spacing, decreased column height of explosives, increased depth of stemming material in the blasthole, variable diameter blastholes) will be used to reduce noise when blasting in sensitive environments.</p> <p>Communities will be informed of time periods and characteristics of noise that may exceed the recommended noise threshold.</p>	<p>For more information about noise, including mitigation measures, see Chapter 13 (noise).</p>
<p>Communities are interested in working with the GNWT to explore the effects of the Project on harvesting, in monitoring these effects and creating mitigation measures. Participants recommended that local Guardian programs be implemented to provide active fish and wildlife, harvest management, permafrost, and water run-off monitoring.</p>	<p>See next column.</p> <p>The GNWT is open to further discussions with the Guardian Program to explore how best implement it for the Project. Environmental Monitors will be employed as part of the contracting of the Project.</p> <p>The GNWT will establish a Mackenzie Valley Highway Corridor Working Group (MVHCWG) one year prior to construction, which will provide a forum for information exchange. The MVHCWG will consist of representatives of GNWT departments, Indigenous Governments, Indigenous Organizations, other affected parties, federal government departments, and the contractor.</p>	<p>For more information about harvesting see Chapter 11 (culture and traditional land use, including harvesting).</p> <p>For more information about management and monitoring plans see Chapter 23 (Compliance and Effects Monitoring) and see management and monitoring plans (Volume 5) in detail.</p>

Comment	GNWT Response	Where Addressed
<p>It is important to the communities that the GNWT consult with locals to identify areas of wildlife, fish, trapping, and trails.</p>	<p>The GNWT provided capacity funding for the TRRC, the NWRRC, and Pehdzéh Kì First Nation to complete project-specific TLRU studies for the Project.</p> <p>TRRC and NWRRC submitted confidential TLRU studies in 2022 and 2023 respectively and the information has been integrated into the DAR. Pehdzéh Kì First Nation has not yet submitted a TLRU study. Once received, the GNWT will review the information and consider it in the context of the Project in a supplemental report.</p> <p>The GNWT is committed to ongoing engagement with Indigenous Governments, Indigenous Organizations, and other affected parties during advancement of project design and planning.</p>	<p>For more information about traditional land and resource use see Chapter 11 (culture and traditional land use, including harvesting).</p>

2.1.6.6.1 Socio-economic Impact Assessment Engagement – Project Mitigation and Monitoring

Initial engagement on the mitigation and monitoring of potential socio-economic effects of the Project has been conducted via the one-on-one and small group meetings on socio-economic assessment findings and project effects (as described in Section 2.1.6.5). The following provides a high-level summary of findings related to mitigation and monitoring. To learn more about feedback shared during SEIA engagement activities and the assessments of effects on socio-economic aspects of the environment, see Chapter 9.

To realize benefits from the Project, and to mitigate possible adverse effects, community members consistently emphasized the importance of early planning and preparedness. Some of the new enhancements and mitigation measures they identified included:

- Education and training plans and early availability of construction schedules that identify the types of training, instructors and equipment needed
- Contractor agreements that identify commitments to train (beginning prior to construction) and hire local employees as well as supports for local businesses to prepare them for contract opportunities
- Highway safety awareness campaigns, signage, communications (e.g., satellite phone) and checkpoints/patrols to help address community safety concerns
- Emergency services response plans to address highway accidents and other incidents

- Tourism plans that identify infrastructure needs (e.g., hotel and restaurant services, water and waste) to support annual surges
- Plans to protect the land and wildlife from disturbances (e.g., dust and noise) caused by the Project

Throughout socio-economic engagement activities, community members also spoke about the importance of the role of both the GNWT (as the proponent and as a government) and the federal government (as an interested party) in addressing existing social conditions (e.g., mental health challenges, addictions) and the lack of educational/employment readiness brought about as a result of the legacy of residential schools and other colonial practices. They also spoke about the need to deal with the current gaps in provision of health, wellness, and emergency services and supports in the communities and regions. Some community members suggested that without addressing these existing challenges, the potential benefits arising from the Project may not be realized.

Due to time constraints placed on socio-economic engagement and the late development of mitigation measures for anticipated residual socio-economic impacts of the Project, mitigation measures have been discussed at a high level. The GNWT remains committed to engaging further with Indigenous Governments, Indigenous Organizations, and other affected parties on SEIA mitigation measures.

2.2 Consultation

The duty to consult is grounded in the honor of the Crown. Consultation duties—and, if required, accommodation—form part of the process of reconciliation. The duty to consult arises when the Crown has actual or constructive knowledge of the potential existence of Aboriginal⁷ or treaty rights or title and contemplates conduct that may adversely affect those rights or title. Section 35 of the *Constitution Act, 1982* recognizes and affirms Aboriginal and treaty rights while defining Aboriginal as Métis, First Nation, and Inuit. The MVLWB provides definitions for Crown Consultation, Aboriginal rights, and treaty rights.

- Crown Consultation is defined as: “the Crown’s common law duty to consult regarding adverse impacts to established or asserted Aboriginal and Treaty Rights protected by section 35 of the Constitution Act, 1982” (MVLWB, 2018a).
- Aboriginal rights are defined as: “practices, traditions, and customs integral to the distinctive culture of the Aboriginal group claiming the right that existed prior to contact with the Europeans (for Métis prior to effective European control). Generally, these rights are fact and site-specific” (MVLWB, 2018a).
- Treaty rights are defined as: “rights that are defined by the terms of a historic Treaty, rights set out in a modern land claims agreement, or certain aspects of some self-government agreements” (MVLWB, 2018a).

⁷ The term “Indigenous” is used throughout the DAR except when referencing section 35 of the *Constitution Act, 1982*, wherein “Aboriginal” is the term used.

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The GNWT has consultation roles as the project proponent (GNWT-INF) and as a final decision maker on MVEIRB's recommendations as to whether the Project should proceed or not (Department of Environment and Climate Change). The Sahtu Dene and Métis Comprehensive Land Claim Agreement was reached in 1993.

The GNWT initiated Consultation for the Project with potentially affected Indigenous Governments and Indigenous Organizations in the summer of 2023. The GNWT will also rely on MVEIRB's process during the environmental assessment to assist in fulfilling its consultation obligations for the Project. Proponent-led consultation activities will end when the public record for the environmental assessment is closed.

Indigenous Governments and Indigenous Organizations will have an opportunity to review the DAR during the environmental assessment process. No further discussion of Consultation has been included in this Chapter as formal Consultation has only recently been initiated. A record of this Consultation will be provided to the MVEIRB in a separate document.

2.3 Commitments

Commitments made on aspects of project design, mitigation, and monitoring are included throughout the DAR. Table 2.7 is a compilation of the engagement and communications commitments that the GNWT has made in response to public engagement feedback.

Table 2.7 Commitments to Engagement and Communication

Topic	Commitment
Ongoing Engagement	The GNWT will continue to engage with Indigenous Governments, Indigenous Organizations, and other affected parties, in accordance with the Engagement and Consultation Plan, through the life of the Project.
Ongoing Engagement	The GNWT will share the results of environmental and socio-economic studies completed to advance the Project with Indigenous Governments and Indigenous Organizations, and other affected parties.
Ongoing Engagement	The GNWT provided funding to the Sahtu Secretariat Incorporated who have hired a community engagement liaison to support the GNWT-INF's engagement activities in the Sahtu Region. The GNWT has also provided funding to Pehdzéh Kì First Nation to support engagement activities on the Project.

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Topic	Commitment
Sharing of Information	<p>The GNWT will establish a Mackenzie Valley Highway Corridor Working Group (MVHCWG) one year prior to construction, which will provide a forum for information exchange. The MVHCWG will consist of representatives of GNWT departments, Indigenous Governments, Indigenous Organizations, other affected parties, federal government departments, and the contractor.</p> <p>The objectives of the MVHCWG will be to:</p> <ul style="list-style-type: none"> • Review and provide comments to the GNWT on the design of project-specific monitoring programs • Review project-specific annual and other monitoring reports and provide comments to the GNWT for the following year's project-specific monitoring and mitigation program • Provide advice to the GNWT on project monitoring and mitigation results that may contribute to adaptive management and/or regional cumulative effects monitoring programs
Sharing of Information	<p>The GNWT will share the results of environmental and socio-economic studies completed to advance the Project with Indigenous Governments and Indigenous Organizations, and other affected parties.</p>
Cultural and Heritage Resources	<p>The GNWT will investigate and/or mitigate 'known and suspected sites' as identified by Indigenous Governments and Indigenous Organizations during Consultation, affected parties during engagement, and/or through TLRU studies.</p>
Noise	<p>The GNWT will engage with communities to inform them of the activities and the noise sources that will occur prior to construction.</p>
Noise	<p>Communities will be informed of time periods and characteristics of noise that may exceed the recommended noise threshold.</p>
Noise	<p>GNWT will develop a system to track complaints and responses to manage and mitigate feedback from the public regarding noise concerns.</p>
Wildlife and Harvesting	<p>The GNWT will work with Sahtú Renewable Resources Board (SRRB) and other resource managers to address uncertainty regarding the effects of increased access created by the Project on harvested resources in the study areas. This would include monitoring of harvest that can be used to identify the need for management actions to be taken by the appropriate resource management organization.</p>
Monitoring	<p>The GNWT is open to and interested in discussing with Indigenous Governments, Indigenous Organizations, and other affected parties how best to integrate community-based monitoring into the Project.</p>
Monitoring	<p>The GNWT is open to further discussions with the Guardian Program to explore how best implement it for the Project. Environmental Monitors will be employed as part of the contracting of the Project.</p>
Construction Notice	<p>The GNWT will notify communities of project activities and schedules, including provision of project maps and design components, and discuss key traditional harvesting periods.</p>
Local Social and Economic Considerations	<p>The GNWT will establish a Mackenzie Valley Highway Corridor Working Group (MVHCWG) that supports the development and oversight of a Community Readiness Strategy that outlines the overarching approach to enhancing benefits and minimizing risk.</p>

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Topic	Commitment
Local Social and Economic Considerations	A Community Readiness Strategy has been developed to mitigate the potential negative socio-economic effects of the Project on affected communities and to maximize the potential positive effects.
Local Social and Economic Considerations	The GNWT will establish a Road Safety and Security Sub-Working Group that is responsible for two plans: a Safety & Security Plan for Vulnerable Community Members and a Road Safety Plan.
Local Social and Economic Considerations	<p>To maximize positive effects from the Project the GNWT will establish a Training and Employment Sub-Working Group that informs and supports the development and implementation of a Contractor Training and Employment Plan.</p> <p>The Contractor Training and Employment Plan will be developed in collaboration by the Training and Employment Sub-Working Group with communities and in partnership with Aurora College and other education partners. The plan will outline the overall approach to education, training, and employment readiness for residents of affected communities so they can maximize employment opportunities during construction and operations, will leverage existing programs and augment them through adaptive management and as identified through monitoring.</p>
Local Social and Economic Considerations	The GNWT will establish a Social Monitoring and Adaptive Management Sub-Working Group that develops a Social Monitoring Plan and a Well-Being Adaptive Management Plan and which will be active during project construction and for a period of five years during operations. The Sub-Working Group is responsible for annually monitoring changes in community well-being indicators related to project activities and/or effects and responding with appropriate adaptive management measures.

2.4 References

- 5658 NWT Ltd. and GNWT (5658 NWT Ltd. and the Government of the Northwest Territories). 2011. Project Description Report For Construction of the Mackenzie Valley Highway Tulita District, Sahtú Settlement Area. Available at: https://www.inf.gov.nt.ca/sites/inf/files/resources/project_description_report_for_construction_of_the_mvh_tulita_district.pdf. PR#16.
- Dessau. 2012. Mackenzie Valley Highway Extension Pehdzeh Ki Ndeh – Dehcho Region. Project Description Report. Prepared for Government of the Northwest Territories, Department of Transport. PR#13.
- GeoNorth and Golder Associates. 1999. Mackenzie Valley Highway Extension Environmental Scoping, Existing Information and Regulatory Regime. Available at: https://www.inf.gov.nt.ca/sites/inf/files/resources/description_of_the_regulatory_regime_and_environmental_impact_assessment_process_for_an_extension_of_the_mackenzie_valley_highway_-_geonorth_-_march.pdf. Accessed March 2023.

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GNWT (The Government of the Northwest Territories). No date. Concluding and Implementing Land Claim and Self-Government Agreements: Existing Agreements. Available at: <https://www.eia.gov.nt.ca/en/priorities/concluding-and-implementing-land-claim-and-self-government-agreements/existing-agreements>. Accessed May 2022.

Government of Canada. 2016. Mackenzie Valley Land and Water Board. Available at: <https://www.canada.ca/en/treasury-board-secretariat/services/access-information-privacy/access-information/information-about-programs-information-holdings/mackenzie-valley-land-water-board.html>. Accessed May 2022.

MVEIRB (Mackenzie Valley Environmental Impact Review Board). 2004. Environmental Impact Assessment Guidelines. Available at: <https://reviewboard.ca/process-information/guidance-documentation/guidelines>. Accessed November 2022.

MVEIRB. 2005. Guidelines for Incorporating Traditional Knowledge in Environmental Impact Assessment. Available at: <https://reviewboard.ca/process-information/guidance-documentation/guidelines>. Accessed November 2022.

MVEIRB. 2007. Socio-economic Impact Assessment Guides. *Chapter 3: Conduction SEIA*. Available at: https://reviewboard.ca/upload/ref-library/SEIA_Guidelines_Chapter_3.pdf. Accessed November 2022.

MVEIRB. 2015. Terms of Reference EA1213-02 Mackenzie Valley Highway Extension Project Wrigley to Norman Wells Government of Northwest Territories. February 13, 2015. PR#66. Accessed November 2022.

MVEIRB. (2020). *Evolving impact assessment in the Mackenzie Valley and beyond*. Retrieved from https://mvlwb.com/sites/default/files/review_board_perspectives_paper_and_cover_letter_-_april_2020_1.pdf.

MVLWB (Land and Water Boards of the Mackenzie Valley). 2018a. Engagement and Consultation Policy. Available at: https://mvlwb.com/sites/default/files/mvlwb_engagement_and_consultation_policy_-_nov_25_19.pdf. Accessed November 2022.

MVLWB. 2018b. Engagement Guidelines for Applicants and Holders of Water Licenses and Land Use Permits. Available at: https://glwb.com/sites/default/files/mvlwb_engagement_guidelines_for_holders_of_lups_and_wls_-_october_2_19.pdf. Accessed November 2022.

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Sahtu Dene and Metis Comprehensive Land Claim Agreement. 1993. Comprehensive Land Claim Agreement between Her Majesty the Queen in Right of Canada and the Dene of Colville Lake, Déline, Fort Good Hope and Norman Wells in the Sahtu Region of the Mackenzie Valley as represented by the Sahtu Tribal Council. Published under the authority of the Honourable Ronald A. Irwin, Minister of Indian Affairs and Northern Development. Ottawa. Available at: https://www.eia.gov.nt.ca/sites/eia/files/sahtu_dene_and_metis_comprehensive_land_claim_agreement_0.pdf. Accessed December 8, 2022.

SLUPB (Sahtu Land Use Planning Board). 2023. Sahtu Land Use Plan. Government of Northwest Territories. Fort Good Hope. Ratified but not available as of July 19, 2023; see <https://sahtulanduseplan.org/plan>.

SSI and GNWT (Sahtu Secretariat Incorporated and the Government of the Northwest Territories). 2019. Memorandum of Understanding between Sahtu Secretariat Incorporated (“SSI”) and The Government of the Northwest Territories (“GNWT”). Available at: https://www.inf.gov.nt.ca/sites/inf/files/resources/memorandum_of_understanding_sahtu_secretariat_incorporated_and_the_government_of_the_northwest_territories_0.pdf. Accessed November 2022.

3.0 TRADITIONAL KNOWLEDGE

In response to Section 2.2 of the Terms of Reference (ToR) for the Mackenzie Valley Highway Project (the Project) and in consideration of guidance provided by the Mackenzie Valley Environmental Impact Review Board (MVEIRB) (MVEIRB, 2004, 2015 [PR#66]), the Government of the Northwest Territories (GNWT) has worked with Indigenous Governments, Indigenous Organizations, and renewable resources councils to collect and document Traditional Knowledge (TK) relevant to the Project. Traditional Knowledge has been incorporated into the Project design where applicable and has been used to identify reasonable and practicable mitigation measures. The GNWT's Engagement Plan for the Project is described in Chapter 2.

Traditional Knowledge is generally considered to be qualitative, based on personal experience, oral traditions, and cultural identity and values (MVEIRB, 2005). The TK included in the Developer's Assessment Report (DAR) reflects the comments, observations, and experience of the Indigenous culture holders. Typically, TK is shared orally, passing from one generation to the next. Current observations about the natural environment tend to be rooted in knowledge and experience that extends far into the past. Traditional Knowledge is understood to represent an Indigenous peoples' collective body of knowledge and understanding of a particular natural and cultural environment, accumulated and transmitted through generations of living 'on the land' within a traditional territory or land use area. Traditional Knowledge is cumulative and dynamic, and adapts to social, economic, environmental, spiritual, and political change. The concept denotes a holistic perspective encompassing many aspects of a people's worldview and traditional ways of living. The knowledge is comprised of, but not limited to, knowledge about the environment, including its use and management; values about the environment; and knowledge about traditional social, cultural, and socio-economic phenomena, both past and current.

3.1 Territorial Guidelines

The MVEIRB's *Guidelines for Incorporating Traditional Knowledge in Environmental Impact Assessment* (the Guidelines; 2005) acknowledge that TK is difficult to define due to its dynamic and experiential nature. However, the MVEIRB's guidance and the ToR also recognize that TK can have an important role in project planning and that the inclusion of TK in an environmental assessment can help facilitate meaningful Indigenous participation and contribute to better decision-making about the environmental effects of projects (MVEIRB, 2015 [PR#66]).

The Guidelines note that TK may contribute to environmental assessment in several ways. First, TK can provide factual knowledge about the environment, such as observations about climate and weather patterns, animal populations and migration patterns, flood and fire cycles, and other natural phenomena. Second, TK can provide insights on land use and management practices, including information about land use patterns, archaeological sites, harvesting practices, and harvesting levels, both past and current. Finally, TK can provide information about Indigenous values and preferences; about how the land supports subsistence, medicinal, and ceremonial practices; and about the relationships between humans, animals, and the environment.

The Guidelines direct proponents to integrate TK obtained through meetings, consultations, and information sessions with Indigenous Governments and Indigenous Organizations and TK holders. Proponents are also encouraged to consider any relevant TK that is publicly available. The DAR should explain:

- The steps taken by the developer to work with TK holders for incorporating TK
- How TK and TK holders have influenced the developer's project design, impact assessment, and mitigation measures
- A plan for future cooperation between the developer and TK holders in order to further incorporate TK where applicable, including monitoring and mitigation programs

3.1.1 Sahtu Land Use Plan

Specific to the areas to which the Sahtu Land Use Plan (SLUP) applies, the Project must meet the 13 general conformity requirements (CR) of the SLUP (Sahtú Land Use Planning Board [SLUPB], 2023).

Conformity Requirement #2 requires that:

- 1) *For all applications for land use activities, community organizations and potentially affected community members must be adequately engaged with respect to:*
 - a. *Proposed activities,*
 - b. *Potential impacts of the proposed activities on specific locations, including heritage resources, and other issues of concern identified in the engagement, and*
 - c. *Traditional knowledge that is relevant to the location, scope, and nature of the proposed activities.*
- 2) *The proposed activities must be designed and carried out with due regard for community concerns, and incorporate relevant traditional knowledge (SLUPB, 2023)*

Based on community input, The SLUP additionally advises that:

- *TK rests with the RRC [renewable resource council] and applicants should work through them to coordinate TK collection.*
- *While many residents still have concerns about TK being made public, community leadership agreed that TK can be used in project planning unless specific confidentiality concerns require non-disclosure.*
- *TK is always owned by the Sahtú Dene and Metis.*
- *TK must be specific to the project.*
- *Only a few people have TK and it should be collected from the right people (those with direct knowledge of the area in question).*
- *TK studies should be open to broader community involvement. (SLUPB, 2023).*

3.2 Information Sources

Traditional Knowledge information relative to the Project was obtained through a review of publicly available literature¹ containing TK of Indigenous Governments, Indigenous Organizations, specific other affected parties², such as renewable resource councils and project-specific Traditional Land and Resource Use (TLRU) studies commissioned for the Project. The results of the GNWT's Engagement, including meetings, workshops, and correspondence (see Chapter 2) were also canvassed for relevant information. For example, where Indigenous Governments, Indigenous Organizations, and renewable resource councils shared information about species harvested, harvesting locations and practices, sites of cultural importance, and cultural values that may be affected by the Project, this has been included in the DAR, where appropriate. In addition, government databases and certain Indigenous Governments' and Indigenous Organizations' websites were reviewed to obtain current information about their respective location, demographics, and governance structures. The GNWT acknowledges that TK is the intellectual property of Indigenous Governments, Indigenous Organizations, and knowledge holders.

3.2.1 Literature Review

A literature review of publicly available TK information was completed to address the requirements of the ToR (MVEIRB, 2015 [PR#66]). The review included relevant literature containing TK within the Dehcho and Sahtu regions relative to the Project. Results have been used to characterize the existing conditions for selected valued components (VCs; i.e., harvesting areas, cultural use sites/areas, heritage resources, habituation, cultural, spiritual, and ceremonial practices/areas) within the Project Local Assessment Area (LAA) and Regional Assessment Area (RAA) used for the assessment of potential effects on the Culture and Traditional Land Use and Harvesting Valued Component (see Section 11.2.1). An annotated bibliography of the sources consulted is available in the Technical Data Report (TDR) for Cultural and Traditional Land Use (Appendix 11A, K'alo-Stantec, 2022).

Publicly available TK information has been used to provide context regarding existing conditions, issues, and concerns, and environmental observations that may affect conditions for cultural and traditional use. This includes material collected during the GNWT's previous engagement on the initially scoped project proposed in 2013 (see Section 1.3.1), some of which dates back to 2011, while other reports date earlier. For example, the 2000 report by the Sahtu Heritage Places and Sites Joint Working Group, *Rakekée Gok'é Godi: Places We Take Care Of*, identifies 40 places and sites that are of importance to the Sahtu Dene, describes relevant TK and makes recommendations regarding their protection. Similarly, the Sahtú Land Use Planning Board (SLUPB) Background Report (SLUPB, 2022) was produced by the SLUPB as a supporting document to the Sahtú Land Use Plan. The SLUPB Background Report is intended to capture the main characteristics of the Sahtu

¹ Publicly available information included in the DAR was sourced from the Project Description Reports prepared for the Project in 2011 (5658 NWT Ltd. and GNWT [PR16] and 2012 (Dessau [PR#13]).

² Affected parties include all entities who may be affected by the Project, including, but not limited to, community governments or designated authorities, land corporations, renewable resource boards and councils, co-management boards, Indigenous Governments and Indigenous Organizations, landowners, local residents, and the public.

Region and is a compilation of information from many sources available during the planning process. This report contains TK and information about important cultural areas, trails and traditional placenames, heritage sites, and harvested resources.

Temporal boundaries for cultural and traditional use considers current and future use of lands and resources by Indigenous Governments, Indigenous Organizations, and specific other affected parties during project construction and operation. Current use is defined as extending back from the present time to within one generation. Future use pertains to the opportunities for generations of descendants to practice traditional activities (in modern form) and maintain cultural use practices and values. The one generation timeframe for considering effects of a change in the environment on current cultural and traditional use reflects that knowledge about traditional practices or locales may be lost or may not be passed on if it goes unused for a generation (see also Section 11.1.4.2). Traditional Knowledge information considered in the DAR has been obtained from published TK source materials dating back to 1997; TK information from other sources may date back farther. It is acknowledged that Indigenous peoples have knowledge and experience of the project area that goes back generations and where secondary sources or TLRU studies include observations about events, activities, practices, or traditional resources that occur prior to 1997, this information has been included for context.

Publicly available secondary source material has been referenced to assist in understanding the extent and nature of cultural use activities and practices carried out by members of affected Indigenous Governments and Indigenous Organizations, as well as identifying potential issues and concerns that have been brought forward on other projects that may be applicable to the Project. For instance, concerns raised on other projects that construction could have effects on air quality and noise, which may change the distribution and abundance of traditionally harvested species may reasonably be considered as a potential effect of the Project. The GNWT is committed to protecting the confidentiality of TK information and respects the terms of use for each of the documents reviewed. Confidential TK studies or those stipulating one-time use were excluded from the review of publicly available documents.

3.2.2 Project-Specific Traditional Land and Resource Use Studies

The GNWT-INF provided capacity funding for the Tulita Renewable Resources Council (TRRC), the Norman Wells Renewable Resources Council (NWRRC) and Pehdzéh Kì First Nation to complete project-specific TLRU studies for the Project. The GNWT has prioritized TLRU studies for these Indigenous Governments, Indigenous Organizations, and renewable resources councils based on their role in the regulatory process. Under S. 13.9 of the Sahtu Dene and Métis Comprehensive Land Claim Agreement (1993), each community within the Sahtu Settlement Area (Sahtu Region) has a designated Renewable Resource Council (RRC) whose roles include managing, in a manner consistent with legislation and policies of the Sahtu Renewable Resources Board (SRRB), the local exercise of participants harvesting rights, and encouraging and promoting local involvement in conservation, harvest studies, research and wildlife management in the community.

The RRCs provide comments relevant to their mandate for preliminary screenings and environmental assessments, including providing local TK in an advisory capacity to the SRRB (SLUPB, 2022). A land claim agreement has not been finalized with any Indigenous Government in the Dehcho Region.

Each of the three TLRU studies supported by the GNWT-INF were designed to provide relevant TK and TLRU information to be included in the DAR for the Project.

3.2.2.1 Tulita Renewable Resources Council

The TRRC developed the scope for a proposed TLRU study in August 2022. The TLRU study design was developed by the TRRC, with the GNWT-INF support for scoping. The TRRC conducted interviews with land users and knowledge holders in the fall of 2022 to record important sites and areas relative to the Project, identify potential effects on traditionally harvested resources, discuss concerns and issues, and make recommendations for the mitigation of potential effects. The TRRC requested technical support from K'alo-Stantec Limited (K'alo-Stantec) for reporting and production of figures. The final TRRC TLRU report (TRRC, 2022) was submitted to the GNWT-INF in confidence and TRRC has requested that the TRRC TLRU Report not appear on the MVEIRB's public registry for the Project. Terms of Use of the report state that the TRRC TLRU report is intended to inform the DAR for the Project and outlines that any other use requires the written consent of TRRC. As such, it is not included as an appendix to this chapter.

The TRRC TLRU report shared information about harvesting areas, harvested resources, access to resources and harvesting areas, cabins, trails, sacred areas, and landscape features. The TRRC TLRU report identified hunting, fishing, and plant gathering locations in proximity to the Project, as well as observations about wildlife habitat and animal populations and movement, especially caribou and moose. The TRRC study participants also identified camps, cabins, culturally important sites, and sacred sites near the Project. The TRRC TLRU report expressed concern about potential project effects and recommended ongoing engagement and TK-based monitoring to mitigate project effects. Results of the TRRC TLRU report have been integrated into the DAR in a manner that respects the TRRC's request for confidentiality.

3.2.2.2 Norman Wells Renewable Resources Council

The NWRRC developed the scope for a proposed TLRU study in August 2022. The TLRU study design was developed by NWRRC, with the GNWT-INF support for scoping. In December 2022, NWRRC facilitators completed in-person interviews with knowledge holders and land users to collect information regarding TLRU in the Study Area, including TK, socio-economic information, concerns, and recommendations for mitigation measures. The NWRRC requested technical support from K'alo-Stantec for reporting and production of figures. The final NWRRC TLRU report (NWRRC, 2023) was submitted to the GNWT-INF in confidence and NWRRC has requested that the NWRRC TLRU report not appear on the MVEIRB's public registry for the Project. Terms of Use of the report state that the NWRRC TLRU report is intended to inform the DAR for the and outlines that any other use requires the written consent of the NWRRC. As such, it is not included as an appendix to this chapter.

The NWRRC TLRU report states that Sahtu Dene and Métis land users in Norman Wells have lived on the land for generations and continue to practice traditional activities, including hunting, trapping, fishing and plant gathering. Study participants explained that the NWRRC remains reliant on hunting and harvesting country food as part of their diet all year around, and participants spoke of hunting and harvesting wildlife, plants, and berries throughout the Study Area. The NWRRC TLRU report identifies areas of importance to the NWRRC, including hunting, fishing, and plant gathering locations in proximity to the Project.

Potential project effects on access to resources and harvesting areas, cabins, trails, sacred areas, and landscape features are also considered. The NWRRC TLRU report identifies concerns relating to changes in wildlife behaviour and wildlife habitat from warming temperatures, sensory disturbance and increase of non-resident hunters and travelers that may ultimately affect TLRU at a regional level. While the NWRRC acknowledges that the Project may have benefits for the community, including employment, training, and increased access to services, the NWRRC is also concerned that economic benefits may be transitory and that the Project may negatively impact traditional culture and values. The NWRRC TLRU report offered recommendations to mitigate potential effects to wildlife, water quality, sacred sites, and socio-economic conditions. The NWRRC requested ongoing engagement in the Project and involvement in TK-based monitoring. Results of the NWRRC TLRU report have been integrated into the DAR in a manner that respects the NWRRC's request for confidentiality.

3.2.2.3 Pehdzéh Kì First Nation

The GNWT is committed to ongoing engagement with Pehdzéh Kì First Nation. The GNWT has provided support to Pehdzéh Kì First Nation for a TLRU study, which has yet to be completed at the time of filing. Once received, the GNWT will review the information and consider it in the context of the Project in a supplemental report.

3.3 Conservative Approach

The GNWT acknowledges that the TK information obtained for the DAR is not comprehensive and that project-specific TLRU reports have inherent limitations. However, no TK study process would be fully able to capture the complex and interrelated lived experience of land use and knowledge systems of an individual Indigenous Government or Indigenous Organization in their entirety. The GNWT has compensated for this limitation by adopting a conservative approach which assumes that cultural and traditional use activities have the potential to occur within the RAA, even if Indigenous Governments, Indigenous Organizations, and specific other affected parties, such as renewable resources councils, did not specifically identify cultural and traditional use activities or site-specific uses as occurring there.

The DAR recognises that a lack of TK information for a specific area or activity does not necessarily represent a lack of TK for that location or activity. The DAR also assumes that traditionally used species identified as being present in the RAA could be hunted, trapped, fished, or gathered by Indigenous Governments, Indigenous Organizations, and renewable resources councils. The TK information shared by participants during public engagement generally confirms these conservative assumptions.

3.4 Methods

The GNWT has employed a systematic approach for considering TK shared by Indigenous Governments, Indigenous Organizations, and renewable resource councils in consideration of the project ToR (MVEIRB, 2015 [PR#66]) and the MVEIRB's *Guidelines for Incorporating Traditional Knowledge into the Environmental Impact Assessment Process* (MVEIRB, 2005). Traditional Knowledge gathered by the GNWT was reviewed and summarized into tabular format organized into the categories that reflect the subjects of note and key lines of inquiry (KLOI) outlined in the ToR (MVEIRB, 2015 [PR#66]). The first two information categories attempt to describe the TK information relevant to the Project in a manner that respect the context in which the TK was presented. The final two information categories link the available TK to the relevant DAR section and mitigation measures, where appropriate. The tabular format contains confidential TK information and will not be disclosed publicly:

1. Traditional Knowledge

This includes information shared by Indigenous Governments, Indigenous Organizations, and renewable resource councils regarding existing conditions and potential project effects. The information has been organized under the following DAR categories:

- Traditional Ecological Knowledge
 - Air quality
 - Noise
 - Terrain, soils, and permafrost
 - Water quality and quantity
 - Vegetation
 - Fish and fish habitat
 - Wildlife and wildlife habitat
 - Caribou and moose harvesting
- TLRU
 - Hunting
 - Fishing
 - Trapping
 - Plant harvesting

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- Travel
 - Cultural, spiritual, and ceremonial practices or areas
 - Project design
 - Cumulative effects
2. Location of Sites or Areas

This considers where the specific sites or areas identified by Indigenous Governments, Indigenous Organizations, and renewable resource councils are in relation to the Project, including Project Development Area (PDA), LAA, or RAA, and in geographical reference to specific project components such as the highway right-of-way, quarries and borrow sources, water sources, worker camps, laydown and maintenance yards, and access roads.

3. Relevant DAR Section

This identifies which sections of the DAR the TK and related concerns may be applicable to.

4. Mitigation Measures

This identifies the relevant mitigation measures proposed in the DAR to mitigate potential effects from the Project relative to TK identified in the TLRU Information category.

The purpose of this tabular summary is to categorize applicable TK information within relevant DAR categories to identify the most relevant TK information so that it may be more effectively considered. The tabular summary was developed to facilitate the inclusion of TK throughout the development of the DAR, including the methodology, characterization of existing conditions, assessment of potential effects, identification of thresholds and limits, proposed mitigation measures and monitoring, and consideration of cumulative effects. The tabular summary was provided to DAR authors to review for relevant information to include in various VC and KLOI chapters. For instance, the wildlife and wildlife habitat discipline lead reviewed the tabular summary to identify species of cultural importance identified by Indigenous Governments, Indigenous Organizations, and renewable resource councils.

To demonstrate where and how TK has been integrated into the DAR, each relevant chapter contains a table titled 'Summary of Engagement Feedback' that summarizes TK information obtained from Indigenous Governments, Indigenous Organizations, and other interested parties (e.g., renewable resources councils) and integrated into the VC or KLOI assessment. The 'Summary of Engagement Feedback' table describes the TK that has been included in each chapter, identifies the source of the TK, and lists the specific section of each chapter where TK has been considered. Table 3.1 provides a cross-reference to the Summary of Engagement Feedback table in each VC or KLOI chapter in the DAR and identifies sections where TK has been considered in each VC or KLOI assessment.

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Table 3.1 Overview of Integration of Traditional Knowledge in the Developer’s Assessment Report

DAR Chapter	Table Number	Sections where TK has been Incorporated
Chapter 5: Detailed Project Description	Table 5.2	Section 5.2.3
Chapter 10: Assessment of Potential Effects on Caribou and Moose	Table 10.1	Section 10.1.2 Section 10.2.2 Section 10.4.2 Section 10.4.4 Section 10.4.5
Chapter 11: Culture and Traditional Land Use, Including Harvesting	Table 11.3 Table 11.4 Table 11.5 Table 11.6 Table 11.7 Table 11.8 Table 11.9 Table 11.10 Table 11.11 Table 11.12 Table 11.13 Table 11.14 Table 11.15 Table 11.18 Table 11.19 Table 11.20 Table 11.21 Table 11.23 Table 11.25	Section 11.1.2 Section 11.2.3 Section 11.2.4 Section 11.2.5 Section 11.4.2 Section 11.4.3 Section 11.4.4 Section 11.5.2 Section 11.5.3
Chapter 12: Assessment of Potential Effects on Air Quality	Table 12.2	Section 12.1.2 Section 12.2.2
Chapter 13: Assessment of Potential Effects on Noise	Table 13.1	Section 13.1.2 Section 13.2.2
Chapter 14: Assessment of Potential Effects on Terrain, Soils and Permafrost	Table 14.1	Section 14.1.2 Section 14.2.2
Chapter 15: Assessment of Potential Effects on Water Quantity	Table 15.1	Section 15.1.2 Section 15.2.2

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DAR Chapter	Table Number	Sections where TK has been Incorporated
Chapter 16: Assessment of Potential Effects on Water and Sediment Quality	Table 16.1	Section 16.1.2 Section 16.2.2 Section 16.4.2
Chapter 17: Assessment of Potential Effects on Fish and Fish Habitat	Table 17.1	Section 17.1.2 Section 17.2.2
Chapter 18: Assessment of Potential Effects on Vegetation and Wetlands	Table 18.1	Section 18.1.2 Section 18.2.2
Chapter 19: Assessment of Potential Effects on Wildlife and Wildlife Habitat	Table 19.1	Section 19.1.2 Section 19.2.2 Section 19.4.2
Chapter 20: Assessment of Potential Effects on Birds and Bird Habitat	Table 20.1	Section 20.1.2 Section 20.2.2 Section 20.4.2
Chapter 22: Assessment of Potential Effects on Heritage Resources	Table 22.1	Section 22.1.2
Chapter 24: Assessment of the Effects of the Environment on the Project	Table 24.1	Section 24.1.2
Chapter 25: Accidents and Malfunctions	Table 25.1	Section 25.4
Chapter 26: Cumulative Effects Assessment Summary	Table 26.1	Section 26.1.2

The use of TK in the DAR reflects the information available at the time of submission. The GNWT is confident that the information obtained through the engagement with Indigenous Governments, Indigenous Organizations, and renewable resource councils, review of publicly available sources, and project-specific TLRU reports is valid and reliable and adequate for purposes of this assessment, but acknowledges gaps and uncertainties exist (see Section 11.6.1.1). The GNWT-INF has addressed this by adopting the conservative approach outlined in Section 3.3 and commits to continuing engagement with Indigenous Governments, Indigenous Organizations, and other affected parties, and Consultation with Indigenous Governments and Indigenous Organizations and to review additional TK as it is made available in the context of the Project.

3.5 References

- 5658 NWT Ltd. and GNWT (5658 NWT Ltd. and the Government of the Northwest Territories). 2011. Project Description Report For Construction of the Mackenzie Valley Highway Tulita District, Sahtú Settlement Area. Available at: https://www.inf.gov.nt.ca/sites/inf/files/resources/project_description_report_for_construction_of_the_mvh_tulita_district.pdf. PR#16.
- Dessau. 2012. Mackenzie Valley Highway Extension Pehdzeh Ki Ndeh – Dehcho Region. Project Description Report. Prepared for Government of the Northwest Territories, Department of Transport. PR#13.
- K'alo-Stantec (K'alo-Stantec Limited). 2022. Mackenzie Valley Highway Project. Technical Data Report—Cultural and Traditional Land Use. Prepared for the Department of Infrastructure, the Government of the Northwest Territories, Yellowknife, Northwest Territories.
- MVEIRB (Mackenzie Valley Environmental Impact Review Board). 2004. Environmental Impact Assessment Guidelines. Available at: https://reviewboard.ca/process_information/guidance_documentation/guidelines. Accessed December 8, 2022.
- MVEIRB. 2005. Guidelines for Incorporating Traditional Knowledge in Environmental Impact Assessment. Available at: https://reviewboard.ca/process_information/guidance_documentation/guidelines. Accessed December 8, 2022.
- MVEIRB. 2015. Terms of Reference EA1213-02 Mackenzie Valley Highway Extension Project Wrigley to Norman Wells Government of Northwest Territories. February 13, 2015. PR#66.
- NWRRC (Norman Wells Renewable Resource Council). 2023. Norman Wells Renewable Resources Council Traditional Land and Resource Use Study for Tulita District Mackenzie Highway Project. Prepared by K'alo-Stantec Limited. Prepared for Norman Wells Renewable Resources Council.
- Sahtu Dene and Metis Comprehensive Land Claim Agreement. 1993. Comprehensive Land Claim Agreement between Her Majesty the Queen in Right of Canada and the Dene of Colville Lake, Délı̄ne, Fort Good Hope and Norman Wells in the Sahtu Region of the Mackenzie Valley as represented by the Sahtu Tribal Council. Published under the authority of the Honourable Ronald A. Irwin, Minister of Indian Affairs and Northern Development. Ottawa. Available at: https://www.eia.gov.nt.ca/sites/eia/files/sahtu_dene_and_metis_comprehensive_land_claim_agreement_0.pdf. Accessed December 8, 2022.
- Sahtu Heritage Places and Sites Joint Working Group. 2000. Rakekée Gok'é Godi: Places We Take Care Of. Prepared the Sahtu Heritage Places and Sites Joint Working Group. Available at: https://www.pwnhc.ca/docs/PWNHC-publication-places_we_take_care_of.pdf. Accessed December 8, 2022.

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3.0 Traditional Knowledge

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SLUPB (Sahtú Sahtu Land Use Planning Board). 2023. Sahtu Land Use Plan. Ratified but not available as of July 19, 2023; see <https://sahtulanduseplan.org/plan>.

SLUPB. 2022. eghalatseyeda kesoridatosedehake: Background Report 2022 Edition. Available at: https://sahtulanduseplan.org/sites/default/files/2022-07/slupb-background-report_web.pdf. Accessed December 8, 2022.

TRRC (Tulita Renewable Resource Council). 2022. Tulita Renewable Resources Council Traditional Land and Resource Use Study for Tulita District Mackenzie Highway Project. Prepared by: K'alo-Stantec Limited. Prepared for Tulita Renewable Resources Council.

4.0 ASSESSMENT APPROACH AND METHODS

4.1 Overview of Approach and Methods

The environmental assessment approach for the Mackenzie Valley Highway Project (the “Project”) as presented in the Developer’s Assessment Report (DAR) incorporates the following key considerations from the Terms of Reference (ToR; Mackenzie Valley Environmental Impact Review Board [MVEIRB], 2015; Public Registry¹ [PR]#66):

- Identifying the activities and components of the Project
- Defining the geographic and temporal scope of all phases of the Project
- Identifying valued components (VCs) of the environment and describing existing conditions for the VCs
- Predicting how the Project could cause changes to the environment leading to potential effects on identified VCs
- Proposing measures to mitigate adverse effects on VCs
- Predicting and characterizing the remaining adverse residual effects after the implementation of mitigation measures and whether these residual effects are significant
- Identifying, characterizing, and assessing the significance of the cumulative effects of the Project when combined with the effects of other past, present, and reasonably foreseeable projects
- Assessing the specific effects on key lines of inquiry (KLOI; high-priority environmental receptors) and subjects of note (SON; lower-priority environmental receptors)
- Developing monitoring programs to verify both the accuracy of the effects assessment and the effectiveness of mitigation measures
- Assessing effects of potential accidents and malfunctions

The environmental assessment considers and incorporates Traditional Knowledge (TK) and input from Indigenous Governments, Indigenous Organizations, and other affected parties, as appropriate.

Subsequent sections provide a detailed description of the steps and methods used to complete the effects assessment, including the consideration of TK.

¹ Mackenzie Valley Environmental Impact Review Board Public Registry for EA1213-02 available at <https://reviewboard.ca/node/433/documents>

4.2 The Scope of the Project

The scope of the Project is determined by the MVEIRB in the ToR (MVEIRB, 2015 [PR#66]) and is detailed in Chapter 5 of this DAR. The Project includes construction of approximately 281 kilometres (km) of new all-season highway between Hodgson Creek (located 1 km north of Wrigley and Prohibition Creek (located 28 km southeast of Norman Wells). The Project will connect to existing watercourse crossings (bridges and culverts) along the Mackenzie Valley Winter Road (MVWR), previously constructed highway between Prohibition Creek and Norman Wells, and the Great Bear River Bridge project in Tulita, which is proposed to be advanced separately from the Project.

The Project will also include the construction and operation of temporary and permanent quarry and borrow sources along the proposed highway alignment and the operations and maintenance of a contiguous total of approximately 321 km of highway between Wrigley, Tulita, and Norman Wells by the Government of the Northwest Territories (GNWT).

Chapter 5 describes in detail the Project's highway alignment routing corridor. This is a 1 km wide area expanded to 3 km at certain locations, centered on a preliminary highway alignment route and access roads to borrow sources and quarries. The scope of the Project assessed is based on this preliminary highway alignment route, which generally follows the MVWR, but the Project's final highway alignment may vary within the alignment routing corridor. As such, the alignment routing corridor provides a conservative spatial basis of the assessment by accommodating possible alternate route alignments and route optimizations that will occur during detailed engineering design. Fifteen borrow sources and quarries are scoped into the Project, though alternate sources are identified. The location of other project physical works such as water sources, construction camps and maintenance yards are not confirmed. The Project includes options for these elements of the scope.

The Project will include construction of approximately 281 km of new highway. The new highway will connect to approximately 40 km of existing planned and constructed highway portions, and infrastructure such as existing bridges and bridge approaches along the MVWR, which will be incorporated to complete the full 321 km length of highway to be operated from Wrigley to Tulita and Norman Wells.

Chapter 5 details the project schedule to be used as the basis for the assessment. The Project will take 10 years to construct over a timeframe of 20 years (the "construction phase"). Once constructed, the highway will be operated and maintained indefinitely (the "operations and maintenance phase"). An assessment of alternative methods for construction is presented in Chapter 7.

4.3 Scoping the Assessment

4.3.1 Selection of Valued Components and Assessment of Key Lines of Inquiry

Valued components were selected for assessment based on those identified in the ToR (MVEIRB, 2015 [PR#66]), comments and topics raised during engagement (for example concerns raised about potential effects of the Project on infrastructure and services), and components contributing to the assessment of key lines of inquiry (KLOIs) and subjects of note (SONs). The ToR requires the KLOIs to receive the most attention and analyses in the DAR, as they reflect the topics of greatest concern. The KLOIs reflect interconnected topics identified to the MVEIRB during their scoping meetings held in 2013 as important to communities affected by the Project.

The following KLOIs have been assessed in the DAR, and presented in Volume 2:

- Local social and economic considerations
- Caribou, moose and harvesting

The KLOIs reflect the interconnectedness of multiple aspects (VCs) of the biophysical and human environment, identified based on the description of the KLOI in the ToR. Chapter 8 provides a summary of the KLOIs, and Chapters 9, 10 and 11 provide a detailed assessment of VCs related to the KLOI.

The local social and economic considerations KLOI includes assessment of the following VCs in Chapter 9:

- Employment and economy
- Infrastructure, services and institutional capacity
- Education, training and skills
- Human health and community wellness
- Non-traditional land and resource use

The caribou, moose and harvesting KLOI includes assessment of the following VCs:

- Caribou and moose in Chapter 10
- Culture and traditional land and resource use in Chapter 11

Other VCs assessed relate to the SONs as identified in the ToR. Though some VCs relate only to a SON, the assessment of these VCs is no less robust than for VCs that relate directly to KLOIs. This is to provide confidence in the conclusions presented in the assessment and to reflect the input received during the GNWT's engagement with Indigenous Governments, Indigenous Organizations, and other affected parties. The VCs assessed as SONs in Volume 4 include:

- Air quality

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- Noise
- Terrain, soils and permafrost
- Water and sediment quality
- Water quantity
- Vegetation and wetlands
- Fish and fish habitat
- Wildlife and wildlife habitat
- Birds and bird habitat
- Heritage resources (as SON)

The DAR provides separate individual chapters that describe each VC (and the rationale for its selection), summarize the comments that have been raised during engagement and traditional land and resource use (TLRU) studies and describe the linkages to other VCs and SONs and/or KLOIs. The assessment of VCs is provided in Volume 2 and Volume 3 of this DAR. Each VC chapter includes specific detail on the VC-specific measurable parameters that were identified for each assessment and the rationale for the selection of those parameters.

Climate has not been identified as a VC. Climate is described and informs the assessment of multiple VCs and SONs, and the assessment of effects of the environment on the Project.

4.3.2 Regulatory Requirements and Guidelines for Assessment

The Project is subject to an environmental assessment and the requirements of Part 5 of the *Mackenzie Valley Resource Management Act* (MVRMA). The assessment must also meet the project ToR for the DAR (MVEIRB, 2015 [PR#66]). The DAR provides the MVEIRB with the information they are required to consider in making a determination, per s. 128 of the MVRMA (MVEIRB, 2015 [PR#66]).

The following guidelines are applicable to the environmental assessment:

- Environmental Impact Assessment Guidelines (MVEIRB, 2004)
- Socio-Economic Impact Assessment Guidelines (MVEIRB, 2007)
- Guidelines for Incorporating Traditional Knowledge in Environmental Impact Assessment (MVEIRB, 2005)
- Mackenzie Valley Engagement and Consultation Policy (MVLWB, 2018a)
- Engagement Guidelines for Applicants and Holders of Water Licences and Land Use Permits (MVLWB, 2018b)
- Conformity requirements of Sahtu Land Use Plan (SLUP; Sahtú Land Use Planning Board [SLUPB], 2023)

Regulatory requirements and guidelines specific to the assessment of VCs are identified within each VC assessment chapter, including VC-specific considerations related to the conformity requirements of the SLUP (SLUPB, 2023). The GNWT has taken into consideration the MVEIRB's perspectives on evolving environmental assessment practice in *Evolving Environmental Impact Assessments in the Mackenzie Valley and Beyond* (MVEIRB, 2020).

4.3.3 Identification of Assessment Boundaries

Spatial and temporal boundaries were identified for the assessment. Spatial boundaries set the geographic areas over which the assessment will be conducted. Temporal boundaries set the timeframe to be considered.

4.3.3.1 Spatial Boundaries

Spatial boundaries for the assessment were selected based on the geographic extent over which project activities and their effects on VCs are likely to occur, as well as on other ecological, technical, and social considerations. Three geographic areas were defined for each VC assessment – the Project Development Area (PDA), Local Assessment Area (LAA) and Regional Assessment Area (RAA). Each VC assessment chapter provides rationale for selecting assessment areas.

- PDA: the area of direct project disturbance within which physical works and activities will occur (footprint). This includes a new two-lane gravel highway, 60 metres (m) wide highway right-of-way (ROW), laydown and staging areas, maintenance yards, construction camps, and quarry/borrow sources with access roads on a 30 m ROW.
- LAA: This area is VC-specific, but is generally the area within a 2 km wide corridor (1 km on either side of the preliminary highway alignment route; see description in Section 5.2.3), quarry and borrow source extents, and associated access roads. The LAA is the area within which measurable project-related effects (direct or indirect) are expected to occur.
- RAA: This area is VC-specific, but generally the area within a 20-30 km corridor (10-15 km buffer) centered on the preliminary highway alignment, quarry and borrow source extents, and associated access roads. This area is to account for other existing and future physical activities that may have effects that act cumulatively with the project effects and to provide context for project-related effects and cumulative effects.

As noted in Section 4.2 and further discussed in Section 5.2.1, the final highway alignment has not been finalized. The GNWT's objectives for the Project's highway alignment include following the MVWR as much as possible and tying into existing watercourse crossing structures (bridges and culverts) along the MVWR. The presented alignment route upon which the assessment is based, applies these objectives along with design criteria related to safety and avoidance of sensitive terrain, but is not a final design alignment. The final design alignment may deviate locally from the presented alignment within a 1 km corridor (the alignment routing corridor). The LAAs and RAAs are appropriate to accommodate these local deviations. Confidence in assessment predictions is presented in each VC assessment.

4.3.3.2 Temporal Boundaries

Temporal boundaries for the assessment address the potential effects arising from the Project's construction, operations, and maintenance activities over relevant timescales. The overall project schedule used for the basis of the assessment is presented in Chapter 5. The temporal assessment is based on consideration of alternative methods as presented in Chapter 7.

The temporal boundaries for the Project consist of the following phases, which are described in more detail in Section 5.4.1:

- Construction phase: The Project will take approximately 10 years to construct over a timeframe of up to 20 years. The schedule used for this assessment is conceptual and reflects a phased approach to construction, as the Project is not likely to be constructed as a single, continuous project. The conceptual schedule assumes the alignment will be constructed in three consecutive segments, beginning in approximately 2026:
 - Segment 1: Wrigley to the Dehcho–Sahtu border (102 km)
 - Segment 2: Tulita south to the Dehcho–Sahtu border (134 km)
 - Segment 3: Tulita north to the Prohibition Creek Access Road (45 km)

The timing and duration of each construction segment is dependent on the GNWT securing funding and regulatory approvals. Conceptually, two years between construction of segments is assumed, during which permitting and procurement would be completed. The conceptual schedule assumes the Project would be fully constructed and provide all-season connection to Norman Wells sometime between 2041 and 2046.

- Operations and maintenance phase: Operations and maintenance activities include public use of the highway and activities that are necessary to operating the highway as a public highway under the *Motor Vehicles Act*. The operations and maintenance phase will commence in a staged manner once construction of each segment has been constructed. The operations and maintenance phase is considered indeterminate as the highway is intended to be permanent infrastructure.

A closure and reclamation phase is not applicable to the Project. Closure and reclamation of temporary workspaces, and borrow sources and quarries used only for construction are included within the construction phase.

4.4 Existing Conditions

Existing conditions for each VC have been established based on existing and new data collected during baseline studies involving desktop analyses, field programs, interviews, engagement, and from TLRU studies. An overview of the existing environment is presented using current information about the existing condition and includes the identification of data gaps for the effects assessment, if applicable. Influences of past and present projects and physical activities on the VC condition leading to the present time is presented along with a discussion of the current condition of the VC. The existing environmental (including socio-economic) conditions are described in each of the VC chapters (Volumes 2 and 3). Additional supporting baseline material for the VCs is provided in the baseline technical data reports attached as appendices to each volume of the DAR.

4.5 Effects Assessment

The Project's potential residual effects are assessed relative to each of the VCs existing condition following the application of standard and project-specific mitigation measures. The method for determining significance of the residual effects is presented in Section 4.6.

4.5.1 Identification of Interactions between the Project and the Environment

The potential interactions between Project activities and the environment were considered for each VC for the construction and operations and maintenance phases of the Project. The identification of project activities and their potential interactions with VCs was based on engagement with Indigenous Governments, Indigenous Organizations and other affected parties, the professional judgement of technical specialists involved in the assessment based on experience with other similar projects, and a review of previous assessments and experience with existing and recently constructed highway projects in the Northwest Territories (NWT; Inuvik to Tuktoyaktuk Highway, Tẖcẖ Highway, Canyon Creek All Season Access Road). Components and activities that do not interact with the VC are also identified and the reason for the lack of interaction is explained.

4.5.2 Potential Effects, Effect Pathways and Measurable Parameters

The assessment of potential effects begins with a description of the mechanisms whereby specific project activities interact with the existing environment (impact) to result in a measurable change in one or more VCs (effect). These are identified as potential effects before the application of project-specific mitigation measures to reduce or eliminate such effects. The term "effect" is used instead of "impact" throughout the DAR to reflect its purpose of characterizing changes to the environment. In this DAR, one or more measurable parameter(s) have been selected to measure potential residual effects and cumulative effects of the Project on VCs. Examples of measurable parameters include the area of wildlife habitat that may be altered or the expected number of workers that will move into the area for project construction. The amount of change in these measurable parameters is used to help characterize the environmental effects and to assist in evaluating their significance.

4.5.3 Mitigation Measures

Each VC assessment section identifies and describes mitigation measures that will eliminate, reduce, or control each potential effect. The mitigation measures were selected based on regulatory requirements, published guidance, best practice, professional judgment, and input from engagement and TLRU studies. Mitigation measures are identified in the VC-specific effects assessment sections and, where applicable, in project-specific management plans included in Volume 5.

4.5.4 Characterization of Adverse Residual Effects

Following the analysis of environmental effects pathways and mitigation measures, adverse residual effects (i.e., the effects that remain after mitigation has been applied) are described for each VC. Characterizations of adverse residual effects are unique to each VC and are based on regulatory requirements, guidelines, input from the engagement program or professional experience. For example, a “low” magnitude effect for culture and TLRU use is defined differently from a “low” magnitude effect for water quality. All adverse residual effects on VCs are characterized according to the following basic and general parameters:

- **Direction** – the relative change compared to existing conditions (i.e., adverse or neutral). Positive effects are discussed but not characterized
- **Likelihood** – the probability that the residual effect will occur is described as certain, possible or unlikely
- **Magnitude** – the amount of change in a measurable parameter or variable relative to existing conditions, defined for each VC as low, moderate, high, or other qualifier as deemed appropriate
- **Geographic Extent** – The geographic area where the residual effect of a defined magnitude occurs, defined for each VC based on definitions of PDA, LAA, and RAA, as appropriate
- **Timing** - considers when the residual effect is expected to occur. Timing considerations are noted in the evaluation of the residual effect, where applicable or relevant
- **Duration** – The time required until the measurable parameter or the VC returns to its existing condition, or the residual effect can no longer be measured (e.g., short-term, mid-term, long-term)
- **Frequency** – how often the residual effect might occur (e.g., one time or multiple times) in a specified time period
- **Reversibility** – whether a measurable parameter or the VC can return to its existing condition or other target (such as a remediation target) after the project activity ceases

Quantitative measures, where possible, and qualitative considerations where quantitative measurement was not possible, were developed to characterize residual effects, taking into considerations the requirements of the ToR for KLOIs and SONs (MVEIRB, 2015 [PR#66]). A summary of the characterization of residual effects is provided in tabular form for each VC. An example summary table is provided in Table 4.1.

Table 4.1 Example Residual Effects Summary Table Used in Assessment

Residual Effect	Residual Effects Characterization							
	Direction	Likelihood	Magnitude	Geographic Extent	Timing	Duration	Frequency	Reversibility
Residual Effect 1								
Residual Effect 2								
Residual Effect 3								

Residual effects characterized as adverse were carried forward to the cumulative effects assessment (see Section 4.5) and considered further regarding their significance (see Section 4.6).

4.6 Assessment of Cumulative Effects

The residual effects of past and current projects inherently contribute to existing baseline conditions upon which effects of the Project on VCs are assessed. Additional incremental effects resulting from residual effects of the Project combined with the effects of reasonably foreseeable future and certain current projects and activities result in cumulative effects on a VC. The cumulative effects assessment has considered residual effects of the Project in combination with detectable residual effects from other physical activities (projects) that overlap in time or space. The Project’s contribution to the cumulative effect has been evaluated. The approach used for completing the cumulative effects assessment for the Project follows the MVEIRB guidance (MVEIRB, 2004), best practice, and the ToR (MVEIRB, 2015 [PR#66]).

Future projects that are reasonably foreseeable are those that (a) have obtained the necessary authorizations to proceed or are in the process of obtaining the required authorization, or (b) have been publicly announced with the intention to seek the necessary authorizations to proceed.

Two conditions must be met to initiate an assessment of cumulative effects on a VC:

- The Project is assessed as having measurable adverse residual effects on a VC.
- The adverse residual effects on a VC from the Project may overlap spatially and temporally with measurable residual effects of other physical activities on the same VC.

If either condition is not met for a VC, an assessment of cumulative effects would not be completed.

Other projects and physical activities whose effects might act cumulatively with the Project have been identified and presented in the project inclusion list (PIL), which is discussed further in Section 4.6.1. The cumulative effects assessment considers how current environmental conditions were created by past and present physical activities and resource uses for each VC. How the Project and other existing and reasonably foreseeable future projects and activities affect the environment cumulatively is then discussed. For each potential cumulative effect, the interactions by which the

cumulative effect may occur and the change in the state of the VCs relative to existing conditions have been characterized.

The cumulative effects assessment follows the same iterative process and format used for residual effects; namely, description and analysis of cumulative effects, mitigation of cumulative effects, and characterization of residual cumulative effects as discussed (Section 4.6.2). A determination of the significance of residual cumulative effects has then been made using the same standards or thresholds for significance developed for the VC. The Project's contribution to those cumulative effects is also analyzed and discussed. Information from engagement activities and regulators was also used to inform the cumulative effects assessment. The results of the cumulative effects assessment are described in each VC chapter and summarized in Chapter 26.

4.6.1 Identification of Other Projects and Activities

The PIL identifies certain known past, present, and reasonably foreseeable human activities whose residual effects are detectable and could overlap spatially and temporally with the residual effects of the Project. Table 4.2 presents the type of activities, names, proponents, regulatory reference, general location, and timing and duration of these activities. These projects were identified from:

- Public records available on the Mackenzie Valley Land and Water Board and Sahtu Land and Water Board public registries and geospatial data provided by staff at these boards dating back to approximately 1998
- NWT Cumulative Impact Monitoring Program Inventory of Landscape Change Web Viewer
- NWT Centre for Geomatics

These sources were used to help ascertain whether projects could have detectable effects that continue to, or could in the future, overlap spatially or temporally with an area within 15 km of the PDA, which corresponds to the largest RAA for biophysical VCs. Table 4.2 is a list of all potential projects to be considered in the cumulative effects assessment. Figure 4.1 and Figure 4.2 present the locations of these existing and known future physical activities.

While the PIL identifies *all* projects and physical activities whose effects could interact with the residual effects of the Project, the list of projects and activities that could interact cumulatively with the residual effects on each VC is *specific to each VC*. Each VC uses a unique subset of projects in the cumulative effects assessment, as they are unique to the effect being considered. The potential cumulative interaction of residual effects for each VC are described further in each of the VC chapters (Volumes 2 and 3).

The PIL does not include other contributing sources to changes on VCs, such as traditional and non-traditional land and resource use, climate change, forest fires, and regional policies and programs. These types of contributions to cumulative changes to VCs, where applicable, are discussed for each VC.

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Table 4.2 Past, Present, and Reasonably Foreseeable Project Inclusion List

Activity ID ¹	Type of Activity	Project Name/Description	Proponent/ Owners	Regulatory Reference (if available)	Location	Timing and Duration
Past and Present Projects and Physical Activities within 15 km of the PDA						
1	Geotechnical	Parks Canada Visitor Centre Geotechnical Program: Four assessments will be conducted on a property located at 30 and 30A Bear Rock Drive within the Hamlet of Tuli't'a prior to construction of a Visitor Centre, office, and warehouse in support of Nááts'ihch'oh National Park Reserve.	Parks Canada	LUP S21S-003	Max Latitude: 64.902044 Max Longitude: - 125.586002	August 3, 2021 to August 2, 2026
2	Geotechnical	Tulita Health Centre Geotechnical Program: Drilling of boreholes to assess the engineering properties of the soil at the proposed location of the new Health Centre in Tulita.	GNWT- Department of Infrastructure (INF)	LUP S18X-002	Max Latitude: 64.90153 Max Longitude: - 125.572583	July 3, 2018 to July 2, 2020
26	Geotechnical	Prohibition Creek Access Road (PCAR) Geotechnical Program: A geotechnical drilling program to support engineering design of the road.	GNWT-INF	LUP S20S-001	Centroid 65° 13' 57" N, - 126° 27' 3" W (within the MVWR ROW)	March, 2020

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Activity ID ¹	Type of Activity	Project Name/Description	Proponent/ Owners	Regulatory Reference (if available)	Location	Timing and Duration
3	Infrastructure	Canyon Creek All Season Access Road: Construction of approximately 14 km of all-season access road from Quarry Road in the Town of Norman Wells to approximately 450 m beyond the existing bridge at Canyon Creek. The project also includes the development of a haul road to a proposed new quarry, upgrades to the access road to Jackfish Lake, and development of a road to proposed camping/recreational areas on Sahtu Lands at Canyon Creek.	GNWT-INF (Sahtu)	LUP S15E-004, WL S15L8-004	Centroid 65° 20' 32" N, - 126° 40' 17" W	December 20, 2015 to December 19, 2022
5	Infrastructure	Déline Winter Road: Highway Winter Road Construction & Maintenance Operations, KM 0 to KM 107 of the Déline Access Road.	GNWT -INF	LUP S02E-001	KM 0 to KM 107 of the Déline Access Road	2002-present (Winter Season)
6	Infrastructure	Mackenzie Highway (NWT Highway #1) Operations and Maintenance: Ongoing highway, airport, marine services, winter roads operations, and maintenance activities	GNWT -INF	LUP MV2008E0033 MV2016E0006	Alberta/NWT border to Wrigley	1940 to present
7	Infrastructure	Mackenzie Valley Winter Road and Déline Winter Road: To construct and maintain the Mackenzie Valley Winter Road and the Déline Winter Road through the Tulita District within the Sahtu Settlement Area.	GNWT-INF (Sahtu)	WL S04L8-013	Located from approximately KM 794 to KM 1083 of the Mackenzie Valley Winter Road in the Tulita District	December 23, 2004 to December 22, 2014

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Activity ID¹	Type of Activity	Project Name/Description	Proponent/ Owners	Regulatory Reference (if available)	Location	Timing and Duration
8	Infrastructure	Mackenzie Valley Fibre Link: Fibre optic cable installation.	GNWT-INF	LUP MV2014X0009 WL MV2014L1-0003 LUP MV2014X0027 LUP MV2014L1-0011	Fort Simpson, Wrigley, Déłıne, Tulita, Norman Wells, Fort Good Hope(K'asho Got'ine), Colville Lake (K'áhbamítúé), Tsiigehtchic, Inuvik	2014-2016
9	Infrastructure	Norman Wells Pipeline Operations and Maintenance: on and off right-of-way activities to operate and maintain the Norman Wells (Line 21) pipeline from Norman Wells to the Alberta/NWT border. The pipeline was commissioned in 1985. Ongoing permitted activities include use and maintenance of cleared fireguard areas, seasonal trails and shoo flies, all-season roads, campsites, workspaces, borrow source, an airstrip, and application of herbicides. Previously permitted under MV2006P0018 and MV2013P0011. Also included are activities for replacement of a segment of the Line 21 pipeline southeast of KM 158 near Little Smith Creek in the NWT.	Enbridge Pipelines (NW) Inc.	LUP MV2020P0006, WL S20L1-001, LUP S20P-003	From Norman Wells, Tulita, Déłıne, Wrigley, Fort Simpson, Fort Liard to halfway to Fort Providence, and all the way to the Alberta/NWT border, see associated map on MVLWB's website.	July 23, 2020 to July 22, 2025

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Activity ID ¹	Type of Activity	Project Name/Description	Proponent/ Owners	Regulatory Reference (if available)	Location	Timing and Duration
9	Infrastructure	Norman Wells Pipeline Operations and Maintenance: General operations and maintenance of the pipeline, plus support activities: Erosion protection activities on and around Hodgson Creek, near where the creek crosses Enbridge's Line 21 pipeline at KM 305, approximately 10 km northeast of Wrigley; general maintenance; pipeline digs; Great Bear and Mackenzie River Crossing; pipeline construction and operation.	Enbridge Pipelines (NW) Inc.	LUP MV2012X0024, LUP MV2002P0009, LUP S99P-009, LUP S17P-005, WL S17L1-004	GPS 63° 20'03" N, 123° 27'30" W	December 18, 2012 to December 17, 2019. October 9, 2002 to October 8, 2007. October 14, 1999 to October 7, 2006. February 7, 2018 to February 6, 2020.
11	Mining Exploration	Diamond Drilling and Exploration (Wrigley Zinc property): Near Wrigley.	Devonian Metals Ltd.	LUP MV2020C0015, LUP MV2008C0020	Min lat 63°07'00", max lat 63°10'00", min long 123°35'00", max long 123°40'00"	July 2, 2009 to July 1, 2016
12	Oil and Gas	2D Seismic Acquisition (Tulita): 60.18 km of 2D seismic acquisition northwest of the Hamlet of Tulita, Tulita District, Sahtu Settlement Area.	Explor Geophysical Ltd.	LUP S09B-002	In the area northwest of the Hamlet of Tulita, Tulita District, Sahtu Settlement Area, excluding those portions within the Tulita Block Land Transfer	January 12, 2010 to January 11, 2015
13	Oil and Gas	Exploratory Oil and Gas Drilling (Tulita): 7 to 15 km south of Tulita. Proposal to conduct a one to two horizontal fracking operation south of Tulita on exploration licence 466.	MGM Energy	LUP S12A-001, WL S12L1-001, LUP S12A-003, WL S12L1-003	Minimum latitude: 64° 40' N Maximum latitude: 65° 00' N Minimum longitude: 125° 35' W Maximum longitude: 126° 00' W	July 23, 2012 to July 22, 2017 & December 19, 2010 to December 18, 2018

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Activity ID¹	Type of Activity	Project Name/Description	Proponent/ Owners	Regulatory Reference (if available)	Location	Timing and Duration
14	Oil and Gas	Exploratory Oil and Gas Drilling (Windy Island): Approximately 8 km north of Tulita.	MGM Energy	WL S10L1-001	Well site windy island J-39 located at latitude 64 ° 58' 42.4" N and longitude 125° 36' 22.8" W; well site windy island contingent wellsite – max latitude 65° 00' N min latitude 64° 53' N and max longitude 125° 47' W min longitude 125° 26' W	December 19, 2010 to December 18, 2018
15	Oil and Gas	Exploratory Oil and Gas Drilling Project (Summit Creek).	Husky Oil Operations Ltd.	LUP S05A-007 WL S05L1-004	Summit Creek/Keele River Area approximately 60 km, Southwest of Tulita.	November 3, 2005 to November 2, 2010
16	Oil and Gas	Mackenzie River Dredging (IOLRVL Operations): To facilitate access.	Imperial Oil Resources Ltd.	WL S17L8-005	Max Lat: 65.279236 Max Long: -126.875789	January 29, 2018 to January 28 2020
17	Oil and Gas	Mackenzie River Water Withdrawal (IOLRVL Operations): 3,500,000 cubic metres (m ³) of water per year for process cooling and injection into the oil reservoir.	Imperial Oil Resources Ltd.	WL S03L1-001	Latitude 65° 17' N., Longitude 126 0 51' W	August 29, 2004 to March 24, 2015

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Activity ID¹	Type of Activity	Project Name/Description	Proponent/ Owners	Regulatory Reference (if available)	Location	Timing and Duration
18	Oil and Gas	Slater River Project: Consolidation of various land use permits (LUPs) and water licenses (WLs) into this one which will act as an Operations Permit and Licence. Consolidated Permits and Licences are S11T-002, S11L3-002, S12F-007, S12L8-007. Husky Oil Operations Ltd. is permitted to increase camp capacity, increase fuel storage, extend the airstrip, convert a winter well pad to new helipad, convert a winter well pad into a new storage area, convert to an all-season barge landing, and allow additional water usage from the Mackenzie River (Deh Cho), hereafter referred to as Mackenzie River, and water use from groundwater well MW-09A and Vermillion Creek.	Husky Oil Operations Ltd.	WL S13L1-006 LUP S13X-003	Minimum Latitude: N 64°35' Maximum Latitude: N 65° 15' Minimum Longitude: W 125°40' Maximum Longitude: W 126°50'	October 24, 2013 to October 22, 2020
19	Oil and Gas	Birch Island Barge Landing/Staging Site: Staging construction and drilling equipment in support of winter drilling programs and equipment in support of summer heli-portable seismic operations.	Husky Oil Operations Ltd.	LUP S07T-014	Staging area located at the confluence of Dahadinni and Mackenzie Rivers approximately 120 km SSW of Tulita	September 26, 2007 to September 25, 2012
20	Oil and Gas	Little Bear River Staging Area: Staging of equipment in an existing staging area.	EnCana Corporation	LUP S03T-003	Confluence of the Little Bear River and Mackenzie River	October 12, 2003 to October 11, 2008

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Activity ID¹	Type of Activity	Project Name/Description	Proponent/ Owners	Regulatory Reference (if available)	Location	Timing and Duration
34	Municipal	Hamlet of Tulita municipal water use, disposal of waste at the solid waste facility and disposal of wastewater at the sewage lagoon	Hamlet of Tulita	WL S16L3-001, preceded by S15L3-003, S05L3-001	Hamlet of Tulita	Ongoing; current licence expires November 2, 2026
35	Municipal	Town of Norman Wells municipal water use, disposal of solid waste and wastewater	Town of Norman Wells	WL S18L3-003, preceded by S18L3-003, N3L3-0095	Town of Norman Wells	Ongoing; current licence expires November 18, 2028
23	Quarrying	Little Bear River Quarry: Winter quarrying and gravel haul to acquire granular material for the purpose of stockpiling for community-based infrastructure projects.	Hamlet of Tulita	LUP S16Q-003	Approx. 3.0 km SW of Hamlet of Tulita, on Little Bear River (west side of Mackenzie River) Max Lat: 64.882844 Max Long: -125.914375	February 10, 2017 to February 9, 2022
24	Quarrying	Sand Bar Quarrying: To remove sand from the sandbars downstream of Islands 4, 5, and 6 near Norman Wells. The sand will be used for various existing projects.	Imperial Oil Resources Ltd.	WL S12L8-004, LUP S12Q-004	Islands 4, 5 and 6 in the Mackenzie River near Norman Wells, within Crown Land which Imperial Leases	October 25, 2012 to October 24, 2017
25	Remediation	Norman Wells Soil Treatment Facility: To deposit waste associated with the construction and maintenance of a land treatment facility accepting and then remediating petroleum hydrocarbon-impacted soils.	KBL Environmental Ltd., Mackenzie Valley Environmental Contractors Ltd.	WL S18L1-002, WL S13L8-003	Max Lat: 65.282303 Max Long: -126.746068	March 17, 2013 to October 21, 2023

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Activity ID¹	Type of Activity	Project Name/Description	Proponent/ Owners	Regulatory Reference (if available)	Location	Timing and Duration
30	Infrastructure	Wrigley Water Treatment Plant and Reservoir	Pehdzéh Kì First Nation Non-Profit Society	LUP MV2014X0014	Wrigley	June 19, 2014 to June 18, 2019
31	Infrastructure	25 Bridge and Arch Culvert watercourse crossing installations along the Mackenzie Valley Winter Road.	GNWT - Department of Transportation	MV2010L8-0010, S00L8-004, S00L8-005, S03L8-006, S03L8-014, S03L8-003, S03L8-018, S03L8-004, S03L8-019, MV2010X0003, MV2010L8-0002, MV2004L8-0004, MV2004X0047, MV2000E0050, MV2000E0048, S04E-014, S04L8-017, S12E-008, S12L8-008, S12E-009, S03L8-005	25 watercourse crossings along the MVWR between Wrigley and Norman Wells	2001 to 2016
33	Quarrying	HRN Quarry: development and operation of quarry and 8 km winter road	HRN Contracting Ltd.	S13L8-008, S13Q-004	35 km southeast of Norman Wells, north of Vermillion Creek; same location as proposed quarry source 7.083 and access road	Winter 2013-2014

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4.0 Assessment Approach and Methods

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Activity ID ¹	Type of Activity	Project Name/Description	Proponent/ Owners	Regulatory Reference (if available)	Location	Timing and Duration
4	Infrastructure	Prohibition Creek Access Road: Construction of 13 km all-season access road from the southern end of the Canyon Creek All Season Access Road to the Prohibition Creek Bridge. This project includes the operation of a quarry (Edie Lake Quarry). No camp is required for the project.	GNWT-INF (Sahtu)	LUP S20E-005 WL S20L8-002	Centroid 65° 13' 57" N, - 126° 27' 3" W	November 19, 2020 to November 18, 2025
Reasonably Foreseeable Projects within 15 km of the PDA						
10	Infrastructure	Proposed Great Bear River Bridge: construction of a permanent bridge spanning the Great Bear River and access roads (2 km north of Great Bear River and 4 km south of Great Bear River)	GNWT-INF (Sahtu)	WL S06L8-001 expired; applications for new authorizations not yet submitted	Great Bear River and Tulita, KM 932.0 to 951.5 of the Mackenzie Valley Winter Road (also KM 901.8 to 939.2 of the Project)	Winter 2024- Winter 2027
21	Oil and Gas	Construction and operation Potential Future Maintenance Camp: 80 person camp in support of Enbridge Line 21.	MYB Construction Ltd.	LUP S20J-003	Adjacent to the current Enbridge project maintenance shop facility at KM 160 south side of Little Smith Creek; 65° 16' 55.23" N Longitude: 126° 45' 33.92" W	Reasonably Foreseeable project - timing unknown
22	Quarrying	Dhu-1 Quarry: Development of a new quarry Dhu-1 and winter access.	GNWT-INF (Sahtu)	LUP S21Q-004	Dhu-1 Quarry Development and Operation Project, 16 km northwest of Tulita	November 22, 2021 to November 21, 2026

Mackenzie Valley Highway Project – Developer's Assessment Report

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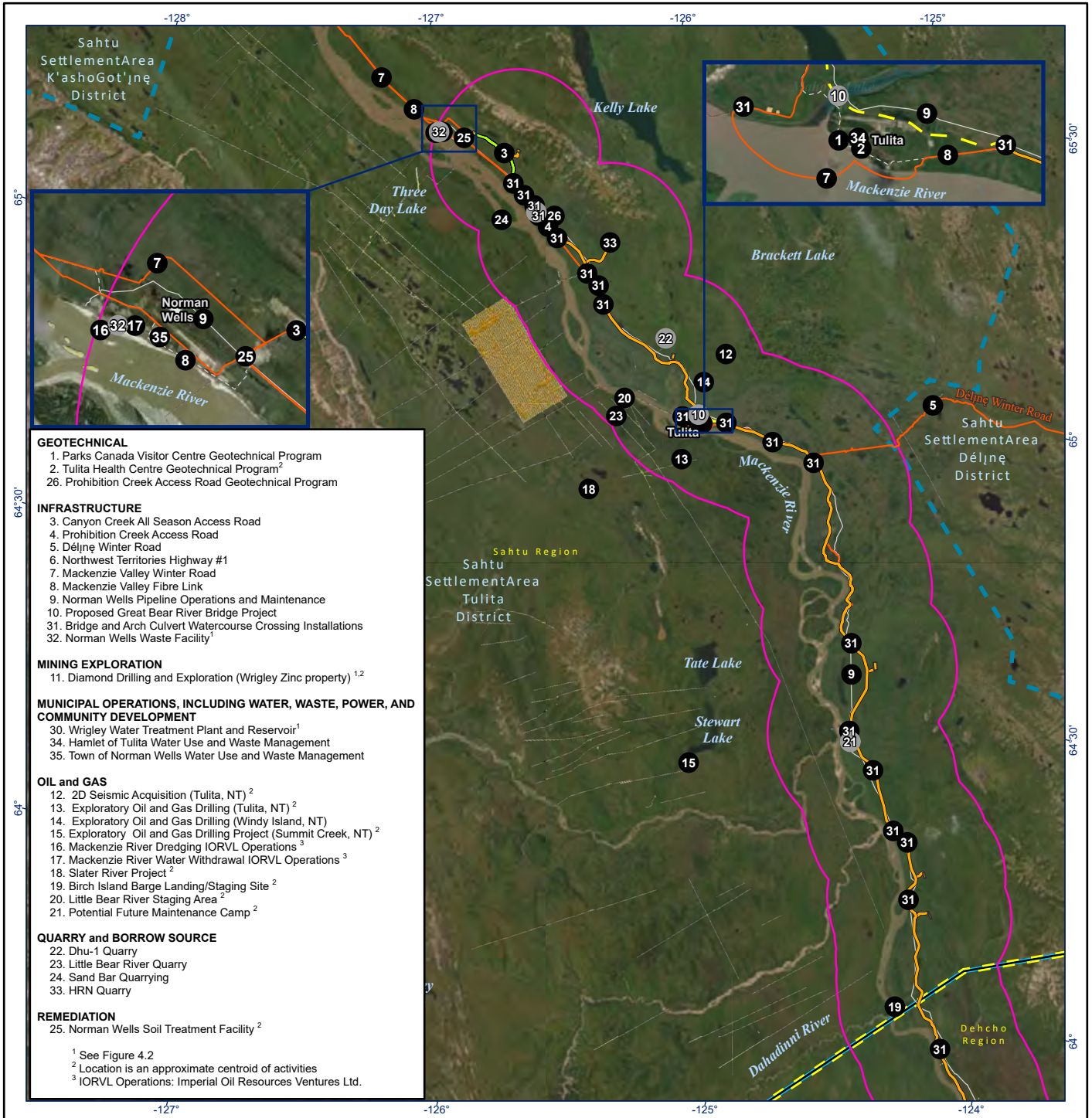
4.0 Assessment Approach and Methods

October 2023

Activity ID¹	Type of Activity	Project Name/Description	Proponent/ Owners	Regulatory Reference (if available)	Location	Timing and Duration
32	Remediation	Norman Wells Waste Facility may be used for the long term and secure containment of non-treatable soils and wastes generated by closure and reclamation activities on the Norman Wells Operations.	Imperial Oil Resources N.W.T. Ltd.	Applications withdrawn – not included in cumulative effects	Town of Norman Wells	Not considered a reasonably foreseeable project – timing unknown – scope unknown

Note:

¹ – Corresponds with numbered locations on Figure 4.1 and Figure 4.2



- GEOTECHNICAL**
- 1. Parks Canada Visitor Centre Geotechnical Program
 - 2. Tulita Health Centre Geotechnical Program²
 - 26. Prohibition Creek Access Road Geotechnical Program
- INFRASTRUCTURE**
- 3. Canyon Creek All Season Access Road
 - 4. Prohibition Creek Access Road
 - 5. Déljné Winter Road
 - 6. Northwest Territories Highway #1
 - 7. Mackenzie Valley Winter Road
 - 8. Mackenzie Valley Fibre Link
 - 9. Norman Wells Pipeline Operations and Maintenance
 - 10. Proposed Great Bear River Bridge Project
 - 31. Bridge and Arch Culvert Watercourse Crossing Installations
 - 32. Norman Wells Waste Facility¹
- MINING EXPLORATION**
- 11. Diamond Drilling and Exploration (Wrigley Zinc property)^{1,2}
- MUNICIPAL OPERATIONS, INCLUDING WATER, WASTE, POWER, AND COMMUNITY DEVELOPMENT**
- 30. Wrigley Water Treatment Plant and Reservoir¹
 - 34. Hamlet of Tulita Water Use and Waste Management
 - 35. Town of Norman Wells Water Use and Waste Management
- OIL and GAS**
- 12. 2D Seismic Acquisition (Tulita, NT)²
 - 13. Exploratory Oil and Gas Drilling (Tulita, NT)²
 - 14. Exploratory Oil and Gas Drilling (Windy Island, NT)
 - 15. Exploratory Oil and Gas Drilling Project (Summit Creek, NT)²
 - 16. Mackenzie River Dredging IORVL Operations³
 - 17. Mackenzie River Water Withdrawal IORVL Operations³
 - 18. Slater River Project²
 - 19. Birch Island Barge Landing/Staging Site²
 - 20. Little Bear River Staging Area²
 - 21. Potential Future Maintenance Camp²
- QUARRY and BORROW SOURCE**
- 22. Dhu-1 Quarry
 - 23. Little Bear River Quarry
 - 24. Sand Bar Quarrying
 - 33. HRN Quarry
- REMEDIATION**
- 25. Norman Wells Soil Treatment Facility²
- ¹ See Figure 4.2
² Location is an approximate centroid of activities
³ IORVL Operations: Imperial Oil Resources Ventures Ltd.



- Past, Present and Reasonably Foreseeable Project**
- Past / Present
 - Reasonably Foreseeable
 - Proposed Mackenzie Valley Highway Project Route
 - Canyon Creek All Season Access Road (Constructed)
 - Prohibition Creek Access Road (In Construction)
 - Proposed Great Bear River Bridge

- Regional Assessment Area
- Community
- Northwest Territories Highway
- Winter Road
- Existing Development Footprint³
- Fibre Optic Line
- Pipeline
- District Boundary
- Region Boundary
- Settlement Area Boundary

0 10 20 Kilometres
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Project Location Wrigley to Norman Wells, NWT
Client/Project Government of the Northwest Territories Mackenzie Valley Highway Project
 Prepared by CES on 8/4/2023
 TR by CA on 8/4/2023
 144903025-0107 REVA

Notes

1. Coordinate System: NAD 1983 Northwest Territories Lambert
2. Data Sources: Centre for Geomatics Government of NWT, Government of Canada, Stantec
3. Existing Development Footprint: Human Development Footprint (points, lines, areas) source - GNWT (Government of the Northwest Territories) Centre for Geomatics. n.d. Inventory of Landscape Change Map Viewer, Northwest Territories Cumulative Impact Monitoring Program (CIMP), GNWT. Centre for Geomatics. n.d. Open Data, MWLWB. n.d. Public Registry, d. Sahtu Land and Water Board. n.d. Public Registry, and Caslys Consulting Ltd. 2015-2016
4. Background: Esri, FAO, NOAA, USGS, NRCAN, Earthstar Geographics, Esri, USGS Imagery date: 2021

Figure No.
4.1
Title
Past, Present and Reasonably Foreseeable Projects - Sahtu Region

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.



4.6.2 Cumulative Effects Pathways

The assessment of each cumulative effect begins with a description of the adverse residual effects and an analysis of the pathways whereby they might interact with the residual effects from other projects and activities.

4.6.3 Mitigation Measures for Cumulative Effects

Mitigation measures that can reduce cumulative effects are described, with an emphasis on those measures that are under the control of the GNWT as the proponent that would help to reduce the interaction of the project effect with the effects from other projects and activities. These additional mitigation measures that would assist in reducing potential cumulative effects are described for the various VCs presented in Chapter 26.

In developing mitigation measures for adverse cumulative effects, it is the primary responsibility of the GNWT to manage cumulative effects to which the Project contributes.

Three types of mitigation may be applicable to the management of cumulative effects. These are identified in each VC assessment, as applicable:

- Actions implemented solely by the GNWT specifically for the Project; for example, developing a project-specific Waste Management Plan
- Those implemented by the GNWT in cooperation with proponents of other projects (such as the GNWT-INF as the MVWR operator), Indigenous and public governments, and/or communities (such as resource co-management boards); for example, monitoring of barren-ground caribou by GNWT-Environment and Climate Change and other organizations
- Those implemented independently by proponents of other projects, Indigenous, territorial or municipal governments or regulators; such as community development plans

The degree to which the GNWT can influence the implementation of other proponents' measures is noted in each VC assessment, where known.

The GNWT is committed to mitigating the Project's contribution to cumulative effects. The GNWT also recognizes that it has a role in some policies and programs that help to understand and mitigate cumulative effects on a regional basis beyond the scope of the Project. These include:

- Programs and policies related to the GNWT's actions related to climate change such as the GNWT's Climate Change Action Plan (GNWT, n.d.) and 2030 NWT Climate Change Strategic Framework (GNWT, n.d.)
- GNWT Land Use Sustainability Framework
- Water Stewardship Strategy
- NWT Cumulative Impact Monitoring Program
- Boreal Caribou Range Planning

4.6.4 Characterization of Residual Cumulative Effects

As with residual effects, residual cumulative effects are described using the same characterizations: direction, likelihood, magnitude, geographic extent, timing, frequency, duration, and reversibility. The same qualitative or quantitative measures as for residual effects are used.

Residual cumulative effects (i.e., the environmental effect of all past, present, and reasonably foreseeable projects and physical activities in combination with the environmental effect of the Project) are described, and the contribution of the Project to cumulative effects is discussed.

4.7 Significance Determination

For each VC, threshold criteria or standards beyond which a residual effect is considered significant are identified, if available. The thresholds are defined in consideration of regulatory requirements, standards, objectives, or guidelines as applicable to the VC. Where thresholds are not set by guidelines or regulations, a threshold may be developed, if possible, using the measurable parameters established for the VC, along with professional judgement of the assessors. The thresholds define the limits of a change in a measurable parameter or state of the VC beyond which it would be considered significant, based on resource management objectives, community standards, limits established by Indigenous Governments, Indigenous Organizations, or other affected parties, scientific literature, or ecological processes (e.g., desired states for fish or wildlife habitats or populations). Quantitative thresholds are preferred; however, qualitative thresholds for significance (such as observations) may be used where quantitative thresholds are lacking.

A determination of significance of adverse residual effects is made using the definition of significance for the VC. Generally, the determination of significance depends in part on the magnitude, duration, frequency, geographic extent, timing, and/or reversibility of the residual effects.

If a residual effect is determined to be significant, the VC assessment includes further consideration of the likelihood of occurrence of that significant environmental effect. The assessment of significance of cumulative effects is based on comparison to current conditions and includes an analysis of the Project's contribution to these cumulative effects.

4.8 Prediction Confidence, and Gaps and Uncertainties

The determination of significance of residual effects and residual cumulative effects includes a discussion of the level of confidence in the residual and cumulative effects predictions, and gaps and uncertainties applied to the assessment. Confidence in the prediction considers:

- Quality and quantity of data and the understanding of the effect pathways
- Known effectiveness of the mitigation measures, or estimated effectiveness as based on professional judgement

- Complexity of a dynamic and changing physical, biological and human environment
- The duration of the Project and phased approach to construction over a timeframe of up to 20 years (as described in Section 5.4.1)

The assessment of each VC considers how external factors such as climate change, the natural variability of biological populations and people's values and behaviors may impact the confidence in the assessment predictions over the long timeframe of the Project. Where this applies, actions have been identified to address the uncertainty, for example additional data collection to support permitting, or monitoring programs that fit within a process to identify and implement changes to mitigation measures implemented to prevent significant effects on the environment.

To support the information requirements of permitting, the GNWT will conduct certain additional site-specific data collection programs. Should the data from these programs suggest that conditions for a VC differ from those presented in the DAR to the extent that they could change the predictions of residual effects made in the DAR, the GNWT will commit to update the effects assessment for review by appropriate agencies.

4.9 Management Plans and Compliance and Effects Monitoring

The following draft management plans for the Project have been developed to support the environmental assessment. They are included in Volume 5:

- Emergency Response Plan (framework only)
- Draft Erosion and Sedimentation Control Plan
- Draft Fish and Fish Habitat Protection Plan
- Draft Heritage and Sites Protection Plan
- Draft Permafrost Protection Plan
- Quarry Development Plan (framework only)
- Draft Spill Contingency Plan
- Draft Waste Management Plan (including Incinerator Management Plan)
- Draft Wildlife Management and Monitoring Plan (Tier 2)

Additional project-specific management plans will be developed prior to construction, including the following:

- Traffic Management Plan
- Explosives Management Plan
- Safety and Security Plan for Vulnerable Communities
- Road Safety Plan
- Contractor Training and Employment Plan

- Social Monitoring Plan
- Well-Being Adaptive Management Plan

Management Plans will be developed/updated following the completion of the environmental assessment, and will reflect ongoing input from Indigenous Governments, Indigenous Organizations, and other affected parties as appropriate.

Compliance and effects monitoring will be used to verify the accuracy of key predictions and effectiveness of key mitigation measures to mitigate adverse effects and cumulative effects. Compliance monitoring will verify compliance with the requirements of permit conditions, approvals, or authorizations issued under laws or regulations. Proposed compliance and effects monitoring is presented in Section 23.

Adaptive management is the core element to be applied to the implementation of the management plans and the monitoring program. Adaptive management is a planned process for responding to uncertainty or to unanticipated and/or underestimated project effects (as discussed in Section 4.8). Information learned from monitoring actual project effects will be applied and compared to predicted effects. Where a variance between the actual and predicted effects occurs, a determination will be made as to whether modifications or other actions are necessary to revise the existing mitigation measures. There may be cases where there may be no other mitigating options available. Additional detail of proposed adaptive management of the Project is presented in Section 23.2.

In all cases, appropriate information sharing (such as reporting, data sharing and data review) will occur on a timely basis. Plans for information sharing with Indigenous Governments, Indigenous Organizations, and other affected parties regarding follow-up and monitoring activities and environmental management, including development and implementation of the program and public reporting, are included in the management plans. Chapter 23 provides additional detail of the project-specific compliance and effects monitoring programs.

4.10 References

GNWT (Government of the Northwest Territories) Centre for Geomatics. No date. Inventory of Landscape Change Map Viewer. Accessed January 2022 at:
https://www.maps.geomatics.gov.nt.ca/Html5Viewer_PROD/Index.html?viewer=CIMP_ILC_Webmap.ILC_Viewer

GNWT. Centre for Geomatics. No date. Open Data. Accessed January 2022 at:
<https://www.geomatics.gov.nt.ca/en/services/spatial-data>

MVEIRB (Mackenzie Valley Environmental Impact Review Board). 2004. Environmental Impact Assessment Guidelines. Mackenzie Valley Environmental Impact Review Board, Yellowknife, Northwest Territories.

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4.0 Assessment Approach and Methods

October 2023

- MVEIRB. 2005. Guidelines for Incorporating Traditional Knowledge in Environmental Impact Assessment. Mackenzie Valley Environmental Impact Review Board, Yellowknife, Northwest Territories.
- MVEIRB. 2007. Socio-Economic Impact Assessment Guidelines. Mackenzie Valley Environmental Impact Review Board, Yellowknife, Northwest Territories.
- MVEIRB. 2015. Terms of Reference EA1213-02 Mackenzie Valley Highway Extension Project Wrigley to Norman Wells Government of Northwest Territories. February 13, 2015. PR#66.
- MVEIRB. (2020). *Evolving impact assessment in the Mackenzie Valley and beyond*. Retrieved from https://mvlwb.com/sites/default/files/review_board_perspectives_paper_and_cover_letter_-_april_2020_1.pdf.
- MVLWB (Mackenzie Valley Land and Water Board). 2018a. Land and Water Boards of the Mackenzie Valley Engagement and Consultation Policy. Available at: https://mvlwb.com/sites/default/files/mvlwb_engagement_and_consultation_policy_-_nov_25_19.pdf. Accessed October 2022.
- MVLWB. 2018b. Land and Water Boards of the Mackenzie Valley Engagement Guidelines for Applicants and Holders of Water Licences and Land Use Permits. Available at: https://mvlwb.com/sites/default/files/mvlwb_engagement_guidelines_for_holders_of_lups_and_wls_-_october_2_19.pdf. Accessed October 2022.
- MVLWB. No date. Public Registry. Accessed January 2022 at: <https://mvlwb.com/registry>
- Sahtu Land and Water Board. No date. Public Registry. Accessed January 2022 at: <https://slwb.com/registry>
- SLUPB (Sahtú Sahtu Land Use Planning Board). 2023. Sahtu Land Use Plan. Ratified but not available as of July 19, 2023; see <https://sahtulanduseplan.org/plan>.

5.0 DETAILED PROJECT DESCRIPTION

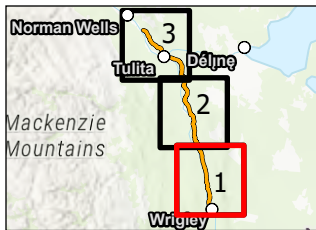
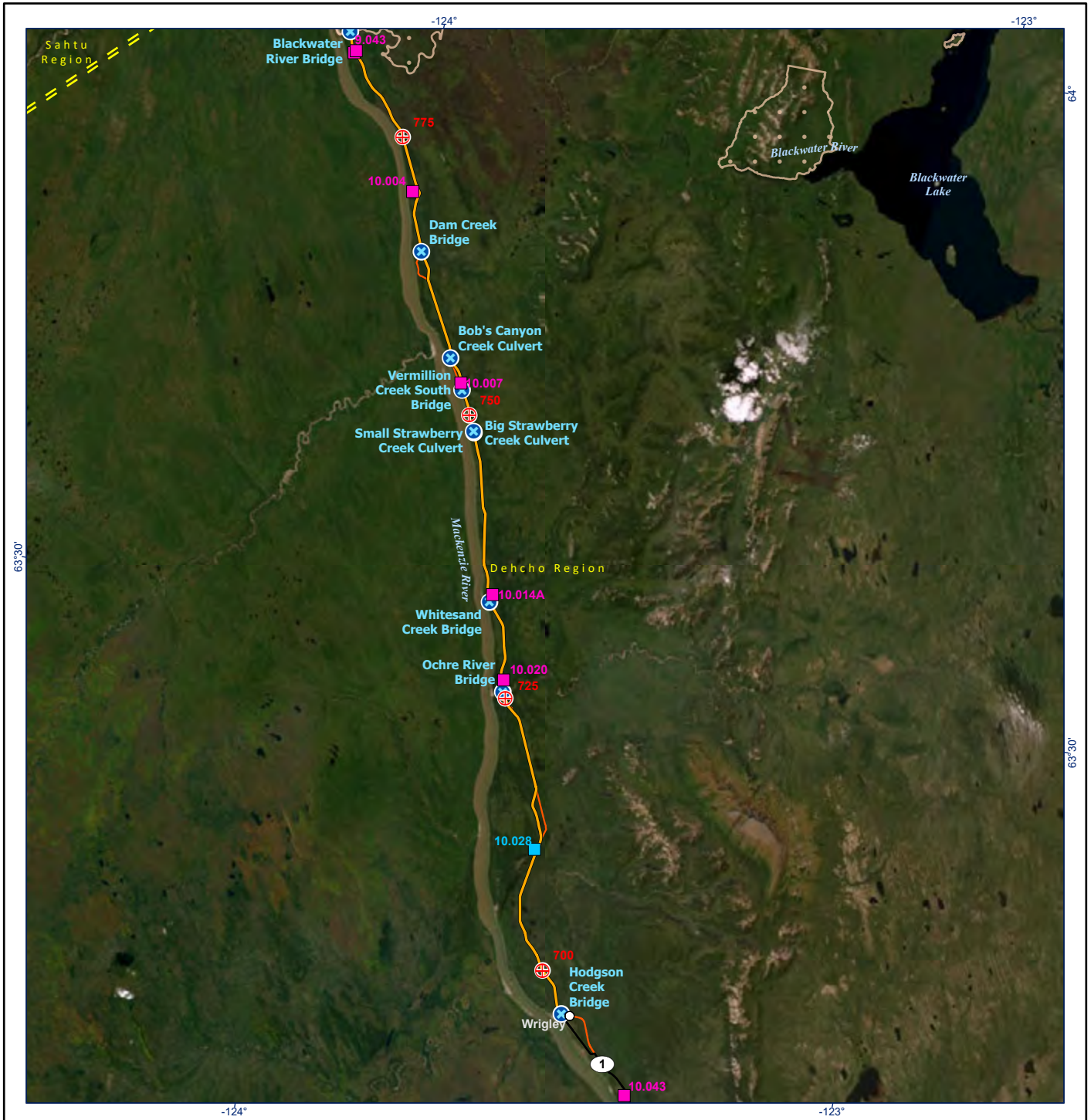
This chapter provides detailed information about the physical works and activities included within the scope of the Government of the Northwest Territories (GNWT)'s proposed Mackenzie Valley Highway Project (the Project). The Project is led by the Department of Infrastructure (GNWT-INF) and involves the extension of the all-season Mackenzie Highway (Northwest Territories Highway #1) between Wrigley, Tulita and Norman Wells to replace the seasonal Mackenzie Valley Winter Road (MVWR) along this portion. The works and activities described in this chapter are based on meeting the requirements of Section 6 of the Terms of Reference (ToR) for the Project (Mackenzie Valley Environmental Impact Review Board [MVEIRB], 2015 [Public Registry {PR}#66]) and are provided to a level of detail needed to complete the assessment of effects on the biophysical and human environment. The detail is intended to facilitate identifying potential Project-environment interactions. This chapter is complementary to the project mapbook, which is included in Appendix 5A of this Developer's Assessment Report (DAR). The project mapbook shows the detailed location of project physical works and activities to be used as the basis of the environmental assessment and other relevant non-project features referenced throughout the DAR (such as the MVWR). This chapter also describes the design basis, the level of design development, and the relationship of the Project to existing and planned infrastructure.

5.1 Project Overview

The Project will include construction of approximately 281 kilometres (km) of new all-season gravel highway between Hodgson Creek (located 1 km north of Wrigley) and Prohibition Creek (located 28 km southeast of Norman Wells). The Project will connect to existing watercourse crossing structures (bridges and culverts) along the MVWR, previously constructed highway between Prohibition Creek and Norman Wells, and the Great Bear River Bridge project in Tulita, which will be advanced as a separate project.

The Project will also include the construction and operation of temporary and permanent quarry and borrow sources along the proposed highway alignment, as well as the operations and maintenance of a contiguous total 321 km of highway between Wrigley, Tulita, and Norman Wells.

The Project is located on public lands and Sahtu Settlement Lands within the Dehcho Region and Sahtu Region, as shown in Figure 5.1.1 to Figure 5.1.3. The Project will connect to and make use of the MVWR and the Great Bear River Bridge project (if completed) during construction. As segments of the highway are constructed and opened for public use, corresponding segments of the MVWR will be closed and reclaimed.



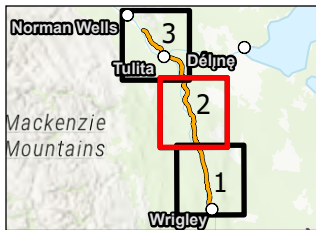
Notes
 1. Coordinate System: NAD 1983 Northwest Territories Lambert
 2. Data Sources: GNWT (Government of the Northwest Territories) Centre for Geomatics, n.d. Inventory of Landscape Change Map Viewer, GNWT, Centre for Geomatics, n.d. Open Data, MVLWB, n.d. Public Registry, Sahtu Land and Water Board, n.d. Public Registry, Environment and Natural Resources GNWT, Government of Canada, Kálo-Stantec 2022, Stantec, Wilson and Haas 2012, and Caslys Consulting Ltd.
 3. Background: World Topographic Map: Northwest Territories, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NRCAN, Parks Canada
 World Imagery: Earthstar Geographics
 World Hillshade: Esri, USGS
 Imagery dates: 2015 - 2021

- Proposed Mackenzie Valley Highway Kilometre Marker (Approximate)
- Existing or Planned Bridge Crossing (Not in Scope of Project)
- Proposed Mackenzie Valley Highway Project Route
- Proposed Bear Rock Alignment Option
- Canyon Creek All Season Access Road (Constructed)
- Prohibition Creek Access Road (In Construction)
- Proposed Great Bear River Bridge Project (Not in Scope of Project)
- Proposed Granular Borrow Source
- Proposed Rock Quarry Source
- Proposed Granular Borrow Access
- Proposed Rock Quarry Access
- Community
- Northwest Territories Highway
- Mackenzie Valley Winter Road (Not in Scope of Project)
- Region Boundary
- Sahtu Land

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 (At original document size of 8.5x11)
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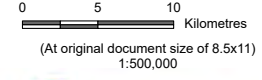
Project Location Wrigley to Norman Wells, NWT
Client/Project Government of the Northwest Territories Mackenzie Valley Highway Project
 Prepared by DS on 8/4/2023
 TR by EB on 8/4/2023
 144903025-0179 REVA

Figure No. 5.1.1
Title Mackenzie Valley Highway Project - Overview
 Page 1 of 3



Notes
 1. Coordinate System: NAD 1983 Northwest Territories Lambert
 2. Data Sources: GNWT (Government of the Northwest Territories) Centre for Geomatics, n.d. Inventory of Landscape Change Map Viewer, GNWT, Centre for Geomatics, n.d. Open Data, MVLWB, n.d. Public Registry, Sahtu Land and Water Board, n.d. Public Registry, Environment and Natural Resources GNWT, Government of Canada, Kalo-Stantec 2022, Stantec, Wilson and Haas 2012, and Caslys Consulting Ltd.
 3. Background: World Topographic Map: Northwest Territories, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NRCAN, Parks Canada
 World Imagery: Earthstar Geographics
 World Hillshade: Esri, USGS
 Imagery dates: 2015 - 2021

- Proposed Mackenzie Valley Highway Kilometre Marker (Approximate)
- Existing or Planned Bridge Crossing (Not in Scope of Project)
- Proposed Mackenzie Valley Highway Project Route
- Proposed Bear Rock Alignment Option
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- Proposed Great Bear River Bridge Project (Not in Scope of Project)
- Proposed Granular Borrow Source
- Proposed Rock Quarry Source
- Proposed Granular Borrow Access
- Proposed Rock Quarry Access
- Community
- Northwest Territories Highway
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- Region Boundary
- Sahtu Land



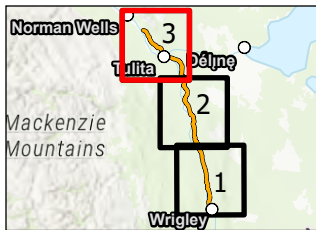
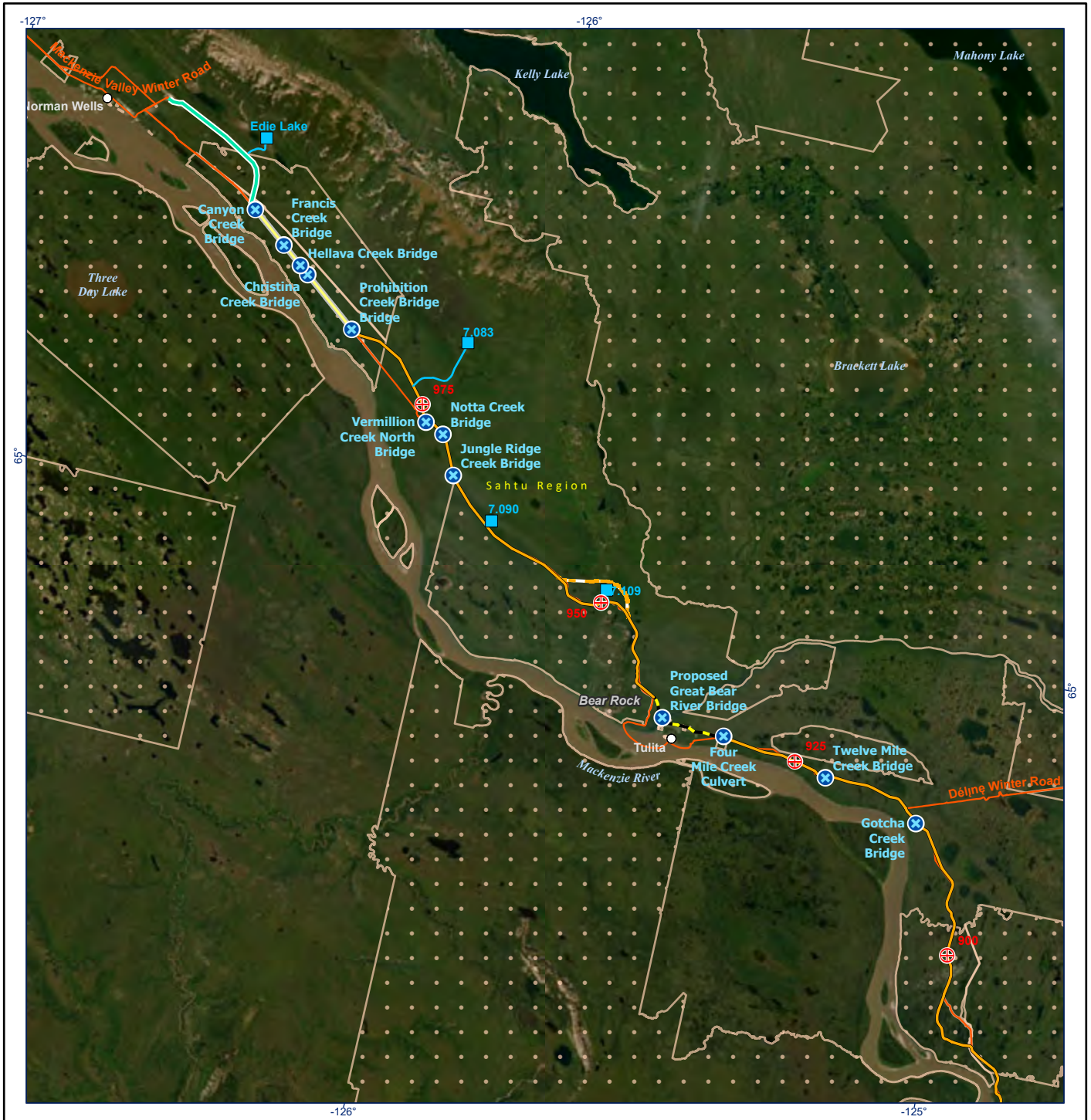
Project Location: Wrigley to Norman Wells, NWT
 Prepared by DS on 8/4/2023
 TR by EB on 8/4/2023

Client/Project: 144903025-0179 REVA
 Government of the Northwest Territories
 Mackenzie Valley Highway Project

Figure No. **5.1.2**
 Title

Mackenzie Valley Highway Project - Overview

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- Proposed Mackenzie Valley Highway Kilometre Marker (Approximate)
- Existing or Planned Bridge Crossing (Not in Scope of Project)
- Proposed Mackenzie Valley Highway Project Route
- Proposed Bear Rock Alignment Option
- Canyon Creek All Season Access Road (Constructed)
- Prohibition Creek Access Road (In Construction)
- Proposed Great Bear River Bridge Project (Not in Scope of Project)
- Proposed Granular Borrow Source
- Proposed Rock Quarry Source
- Proposed Granular Borrow Access
- Proposed Rock Quarry Access
- Community
- Northwest Territories Highway
- Mackenzie Valley Winter Road (Not in Scope of Project)
- Region Boundary
- Sahtu Land

0 5 10 Kilometres
(At original document size of 8.5x11)
1:500,000

Project Location: Wrigley to Norman Wells, NWT
Prepared by DS on 8/4/2023
TR by EB on 8/4/2023

Client/Project: 144903025-0179 REVA
Government of the Northwest Territories
Mackenzie Valley Highway Project

Figure No. 5.1.3
Title: Mackenzie Valley Highway Project - Overview

Notes
1. Coordinate System: NAD 1983 Northwest Territories Lambert
2. Data Sources: GNWT (Government of the Northwest Territories) Centre for Geomatics, n.d. Inventory of Landscape Change Map Viewer, GNWT, Centre for Geomatics, n.d. Open Data, MVLWB, n.d. Public Registry, Sahtu Land and Water Board, n.d. Public Registry, Environment and Natural Resources GNWT, Government of Canada, Kalo-Stantec 2022, Stantec, Wilson and Haas 2012, and Caslys Consulting Ltd.
3. Background: World Topographic Map: Northwest Territories, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NRCAN, Parks Canada
World Imagery: Earthstar Geographics
World Hillshade: Esri, USGS
Imagery dates: 2015 - 2021

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The Project includes the following physical works and activities:

- Widening of the existing cleared MVWR right-of-way (ROW) and clearing of intermittent sections of new ROW
- Construction of approximately 281 km of new all-season gravel highway embankment (102 km in the Dehcho Region, 179 km in the Sahtu Region) and intermittent pullouts
- Construction of approximately 85 culverts as watercourse crossing structures
- Construction and operation of approximately six temporary borrow sources and quarries and associated all-season access roads
- Construction and operation of approximately nine permanent borrow sources and quarries and associated all-season access roads
- Water withdrawal and water use for road construction and maintenance
- Construction and operation of temporary support infrastructure and workspaces, including camps, maintenance yards, laydown and staging areas, and fuel storage areas
- Staging, supply and resupply of equipment, materials, fuel, and personnel
- Construction and operation of permanent maintenance yards
- Closure and reclamation of temporary borrow sources, quarries, and workspaces
- Demobilization of equipment and materials
- Closure and reclamation of portions of the MVWR ROW not used for the Project
- Operations and maintenance activities including snow clearing, grading, dust control, and bridge and culvert maintenance
- Use of the highway by the public

The Project does not include:

- Construction of the Great Bear River Bridge project, which is being advanced as a separate project.
- Operations and maintenance of the MVWR as required for public safety, including repair or upgrades of existing watercourse crossing structures, until such time that segments of the Mackenzie Valley Highway (the Project) are opened to traffic and replace the MVWR. All existing watercourse crossing structures (bridges and culverts) along the MVWR as well as the Great Bear River Bridge (after it is constructed) will be integrated into the operations and maintenance of the Project.
- Use of existing and authorized municipal, commercial, or public infrastructure or services, such as municipal solid waste and wastewater facilities, transportation services and the MVWR.

5.2 Design Basis and Considerations

The following subsections describe the project design basis, design parameters and objectives, design considerations, and design development.

5.2.1 Design Basis

The Project's design is guided by:

- Safety requirements
- Engineering and environmental standards and best practices
- Engagement input, including Traditional Knowledge

The current project highway alignment (route) design is at approximately 25% design definition. This level of design is appropriate for environmental assessment as it provides the basis for a highway alignment routing corridor within which to assess effects while providing flexibility for future iterations of design. Future updates to design, up to the final design to be constructed, will include refinements to horizontal and vertical highway design as based on additional geotechnical and environmental investigations, engagement and Consultation input, land ownership considerations and relevant inputs from the environmental assessment. The route of the project highway, as indicated in the mapbook included in Appendix 5A, is shown as line at the center of an approximately 1 km wide alignment routing corridor, which is anticipated to accommodate refinements to the highway route as the design advances within the parameters of the design criteria.

The project highway route has been informed by previous routing studies completed by Public Works Canada in the 1970s; published environmental, geotechnical, and Traditional Knowledge studies completed by Imperial Oil Resources Ventures Limited in support of the Mackenzie Gas Project in the late 1990s and early 2000s; and input received during community engagement on the Project by the GNWT since 2010. The current project highway route improves the route previously presented in Project Description Reports for the Dehcho Region (Dessau, 2012 [PR#13]) and Tulita District of the Sahtu Region (5658 NWT and GNWT, 2011 [PR#16]), taking into account updated design principles and criteria. Key studies and engagement activities completed since 2012 that have, and will continue to, inform updates to the project design, including the highway routing, are:

- Acquisition of updated light detection and ranging (LiDAR) imagery
- Prospective borrow source data compilation and field reconnaissance (K'alo-Stantec, 2021)
- Terrain mapping and alignment routing analysis (K'alo-Stantec, 2022a)
- Climate change and resilience assessment (K'alo-Stantec, 2022b)
- Archaeological Impact Assessments
- Hydrotechnical assessments (Tetra Tech, 2021, 2022)
- Fish and fish habitat assessments (K'alo-Stantec, 2022c)

- Desktop-based assessments of water availability (K'alo-Stantec, 2022d, 2023)
- Tulita Renewable Resources Council Traditional Land and Resource Use Study (Tulita Renewable Resource Council [TRRC], 2022)
- Norman Wells Renewable Resources Council Traditional Land and Resource Use Study (Norman Wells Renewable Resource Council [NWRRC], 2023)
- Engagement with Indigenous Governments, Indigenous Organizations, and other affected parties in the Sahtu and Dehcho regions 2009 to 2022 (as detailed in Chapter 2)

5.2.2 Design Parameters and Objectives

The following design parameters and objectives have been and will continue to be applied to the project design. These design parameters have been selected because they reflect published standards and best practices and the findings of the climate change and resilience assessment. The Project applies the following design guidelines, parameters and objectives:

- Meet Rural Arterial Undivided (RAU)-90 design designation (Transportation Association of Canada [TAC], 2017)
- Expected traffic volume is 50 vehicles per day, for an indeterminate time (see Section 5.5.9.1)
- Use the existing MVWR alignment to the extent possible to reduce the area of new disturbance
- Align the highway route to all existing MVWR watercourse crossing structures (bridges and bridge-sized culverts) to reduce new disturbance in and near watercourses
- Limit ROW width to 60 metres (m) in width, except where large cut or fill sections are required
- Situate the highway near to, and prioritize use of, existing and proximal quarries and borrow sources where possible, to reduce the area of new disturbance and need for new access roads
- Reduce footprint through areas of traditional, cultural, and ecological importance
- Avoid known archaeological and heritage resources where practicable
- Avoid known and potential ice-rich and unstable terrain where practicable (sensitive terrain)
- Avoid areas of wetlands, to the extent possible
- Optimize use of natural topography to reduce material requirements (such as avoiding the need for deep fills)
- Reflect community engagement input to the extent practicable
- Maintain cost-effectiveness in construction, operations, and maintenance

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The specific design criteria applied to highway and bridge-culvert design are detailed in Table 5.1. The posted speed limit will be 80 kilometres per hour (km/h) except in specific locations where the speed limit will be reduced for safety (such as the approach to bridges). The embankment height will generally be 1.4 to 1.8 m above the ground surface, dependent on soil and ground conditions. Weaker and finer soils require thicker embankment than competent soils or rock. The sideslopes of the embankment will generally be at a ratio of one vertical unit to three horizontal units (1V:3H). This may be increased to 1V:2.5H in specific areas such as deep fills. A typical highway cross section is shown in Figure 5.2.

Table 5.1 Road and Bridge-Culvert Design Criteria/Standards for the Project

Criterion	Value	Detail
Design Designation	RAU - 90	Rural Arterial Undivided (Low Volume Road – Average Daily Traffic not exceeding 200 vehicles per day)
Design Speed	90 km/h	Posted Speed Limit – 80 km/h
Design Guidelines and Reference		<p>All design parameters must meet or exceed the National Standards established by applicable governing/regulatory bodies. For exemptions to any of the criteria established herein, a technical memo must be submitted to the Director of Highways and Marine Division with substantiation and rationale for the change prior to approval.</p> <p>The following resources govern the design:</p> <ul style="list-style-type: none"> TAC Geometric Design Guidelines March 2020 for Special Roads (TAC, 2020) TAC Geometric Design Guidelines June 2017 (TAC, 2017)
Roadway Design		
Horizontal Alignment		
Desirable Curve Radius	600 m	The desirable radius is applicable for the entire length of roadway. Minimum radii should be avoided wherever possible. The minimum radius is also applicable for the entire length of the roadway; however, exceptions will be permitted on a site-specific basis.
Minimum Curve Radius	340 m	
Minimum Passing Sight Distance	610 m	Horizontal sight distances are to be verified on all curves.
Stopping Sight Distance (minimum)	160 m	There is no requirement for continuous passing opportunities for the entire length of roadway. However, the design will endeavor to allow for passing opportunities as per TAC minimum requirement.
Superelevation (e max)	0.06 m/m	As based on appropriate Superelevation Tables for minimum and desirable “A” Parameters for each curve radius and design speed. Spirals not required on all curves requiring superelevation.
Minimum Spiral Parameter - “A” Value	N/A	

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Criterion	Value	Detail
Intersections with highway	WB20 design vehicle for turning	Acceleration and deceleration lanes are required on the Mackenzie Valley Highway. The lanes do not have to be chipsealed.
Vertical Alignment		
Minimum Stopping Sight Distance	160 m	Where the minimum Stopping Sight Distance is used, the sight should be verified using an object height of 0.38 m and an eye height of 1.05 m. Where the minimum Decision Sight Distance is used, the sight should be verified using an object height of 0.15 m and an eye height of 1.05 m. Where the minimum Passing Sight Distance is used, the sight should be verified using an object height of 1.30 m and an eye height of 1.05 m. Variances may be accepted by the GNWT on a case-by-case basis.
Minimum Decision Sight Distance	275 m	
Minimum Passing Sight Distance	610 m	
Minimum Crest “K” Value	39	As per TAC Geometric Design Guidelines March 2020 for Special Roads; variances may be accepted by the GNWT on a case-by-case basis.
Minimum Sag “K” Value	38	As per TAC Geometric Design Guidelines March 2020 for Special Roads; variances may be accepted by the GNWT on a case-by-case basis.
Minimum Length of Vertical Curve	90 m	Variances may be accepted by the GNWT on a case-by-case basis.
Maximum Gradient	6%	Variances may be accepted by the GNWT on a case-by-case basis.
Cross Section		
Finished Roadway Width	9.0 m	In guardrail installation areas, an additional 1.0 m in width shall be added for each side that guardrail is installed.
Travel Lane Cross Slope	4%	-
Lane Width	3.75 m	Roadway will accommodate two lanes at 3.75 m each
Shoulder Width including Rounding	0.75 m	Shoulders will be constructed on both sides of the roadway
Side Slope / Fill Slope Ratio Normal	3:1	Use rock fill only in the water.
Minimum (with Toe of Slope in water area)	3:1	
Slope Stabilization Requirements	>4.0 m	Slope stabilization features shall be designed for fills over 4.0 m in height (for example, benched embankment and Mechanically Stabilized Earth [MSE] wall) based on recommendations in Thermal Analysis Report for further recommendations/direction.
Minimum Embankment Height (Above Original Ground Level)	TBD	To be determined during detailed design

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Criterion	Value	Detail
Surface Gravel Thickness	200 mm	200 millimetre (mm) thick surfacing course and 150 mm to 250 mm thick sub-base course (20 mm and 50 mm minus materials). To be confirmed in detailed design.
Roadside Pullouts		
Location	TBD	Roadside pullouts to be provided at approximate one half (1/2) hour travel intervals per the GNWT-INF Standard drawings
Guardrails		
Location	TBD	Guardrail shall be designed for in areas with embankment heights of 4.0 m or greater and/or areas where water bodies are close enough to the highway to be considered a hazard. The British Columbia Ministry of Transport Warrant Guide and practical safety considerations will be used for determining barrier installation locations.
Delineator and Reflectors	As needed	Traffic delineators are required on all horizontal radii and shall be spaced appropriately for the design speed and horizontal curvature of the radii. When required, as a minimum, delineators have to be provided on the outside of curve.
Drainage/Equalization Culverts (Up to 1,500 mm Diameter)		
Detailed Specifications	800 mm to <1,500 mm diameter	Per the GNWT Standard drawings and Specifications: <ul style="list-style-type: none"> SD-400-01-51 Standard Specifications – Division 4 Structures Sections 1 – Supply and Installation of Corrugated Steel Pipe (CSP) Culverts
Bridge-Culverts (Greater than 1,500 mm Diameter¹)		
Design Guidelines and Reference	-	<ul style="list-style-type: none"> Canadian Highway Bridge Design Code CAN/CSA Standard S6-current Transportation Association of Canada's Guide to Bridge Hydraulics – current edition Alberta Transportation's Design Guidelines for Bridge Size Culverts Alberta Transportation's Roadside Design Guide and related Design Bulletins
Type	-	Open-bottomed or closed structures which meet regulatory requirements Corrugated Steel Pipe (CSP) is not acceptable
Minimum Cover	1.5 m	As measured vertically from the culvert obvert to the roadway shoulder
Minimum Clear Roadway	10.0 m	Clear distance between guardrails where present, or embankment shoulder to shoulder where guardrails are not present
Bedding Camber	-	All bridge-culverts must be installed with camber suitable for the geotechnical conditions.

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Criterion	Value	Detail
Hydrotechnical	-	<ul style="list-style-type: none"> Freeboard shall be measured above the high-water or high-high ice level plus one-sixth the culvert rise to allow for events related to freshet, icing conditions (aufeis), and the dike effect of the new road embankment. The minimum invert burial depth shall equal 10% of the culvert rise to a maximum depth maximum of 500 mm. The structure shall be designed for a 1:100 year flood event and the dike effect caused by the new road embankment. Technical requirements of AT Bridge Conceptual Design Guidelines; Design Bulletin #45; and Bridge Best Practice Guideline #7 shall be satisfied, except for the criteria as specified in this document.
Structural Bedding	-	<p>Bedding is to be founded on stable, structurally suitable soils:</p> <ul style="list-style-type: none"> Poor sub-soils are to be excavated and removed. An engineered foundation is required when permafrost is encountered.
Structural Backfill	-	Provide source and specifications of material/methods to be used which meet or exceed Canadian Highway Bridge Design Code (CHBDC) requirements; engineered geosynthetic reinforced soil backfill is acceptable
Ends	Required	Must be beveled as per CHBDC
End Treatments	Required	Must protect against hydraulic uplift, piping, undermining and ice jacking (for example using cut-off walls, impermeable barriers, sufficient load on bridge-culvert ends to prevent uplift, etc.)
Scour Protection	Required	Transportation Association of Canada's Guide to Bridge Hydraulics – current edition requirements must be satisfied or exceeded.
Plate Thickness	-	Provide engineering rationale for selected metal thickness to meet the design life and to accommodate expected rate of section loss
Corrosion Protection	-	Select appropriate bridge-culvert material and coating to suit site conditions (water, soil, and abrasion)
Solarity Effects	-	At northern latitudes, the sun is lower on the horizon and there are longer daylight hours resulting in differential temperatures across a structure; which requires the application of larger thermal expansion coefficients than provided in CHBDC.

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Criterion	Value	Detail
Sustainability, durability and functionality	-	<ul style="list-style-type: none">• Climate change and sustainability issues to be identified and addressed in the design report• Include effects from forest fires on surface drainage and streams; such as loss/changes in vegetation, burned mineral soils, etc.• Logistics: Length, heights, and mass of pre-fabricated elements must be carefully planned to suit transportation/haul constraints, and launching/lifting machinery• Minimize maintenance requirements• Beaver activity, debris collection, ice/snow accumulation in bridge-culverts and under bridges, overflow (aufeis), freshet, etc.• Erosion and sediment control

Notes:

km: kilometre

m: metre

mm: millimetre

m/m: numeric value for superelevation

TBD: to be determined

¹ culverts >1,500 mm are designed based on hydrotechnical site conditions and in accordance with applicable design standards for flow and fish passage

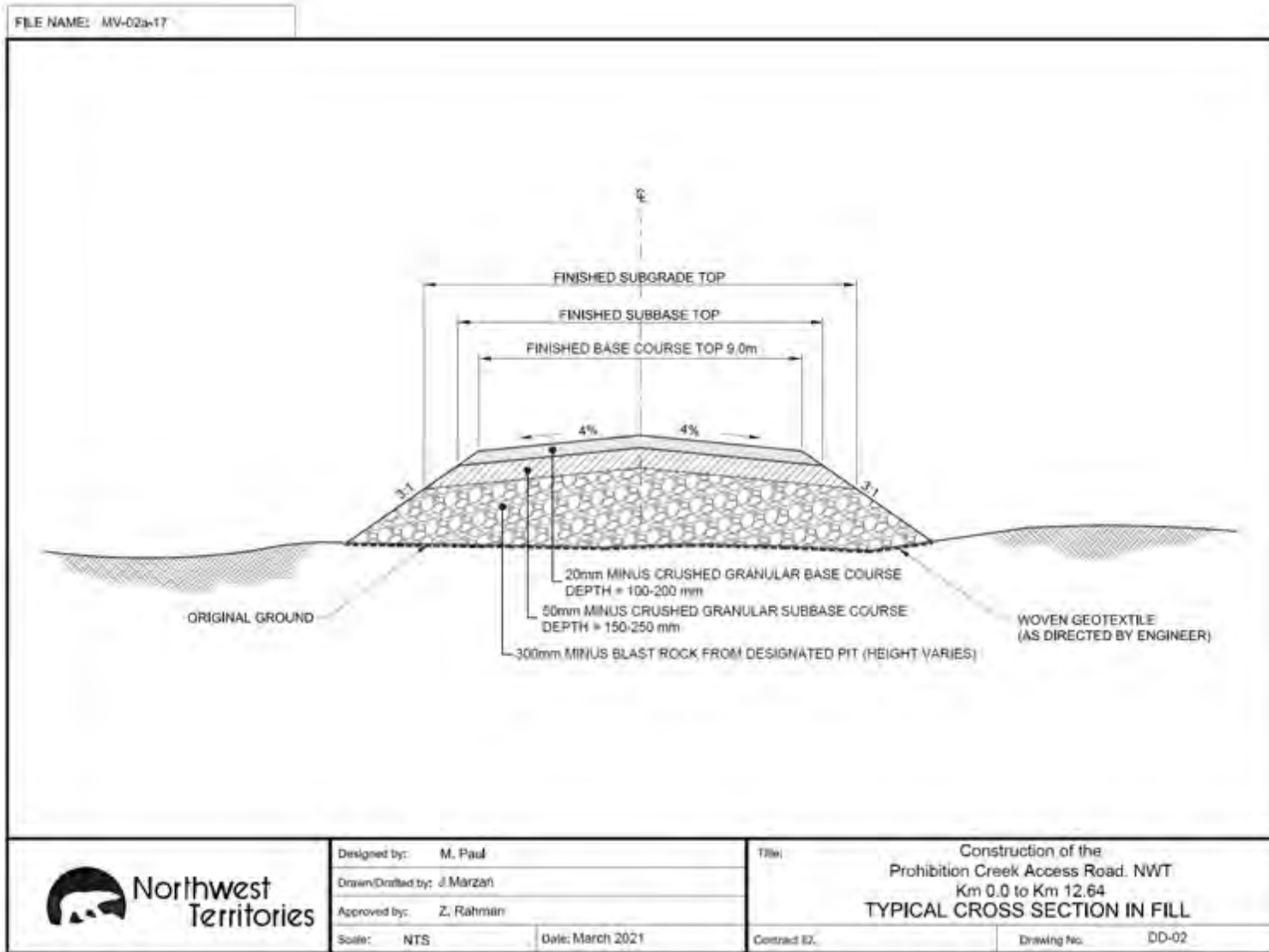
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Figure 5.2 Typical Highway Cross Section



5.2.3 Design Considerations

The current project highway alignment route, as indicated in the mapbook included in Appendix 5A, is currently at approximately 25% design definition as discussed in Section 5.2.1. The alignment may change as design progresses but will remain within an approximately 1 km wide alignment routing corridor, except at five specific watercourse crossing locations and two route alternatives where the alignment routing corridor is extended to accommodate the consideration of additional alignment design options. Alignment changes within this corridor may be required to address geometric requirements, environmental or geotechnical constraints, and/or input received during the environmental assessment process leading up to the design of the final highway alignment to be constructed.

Proposed quarries and borrow sources have been identified based on known or suspected rock and granular material suitability, material volume, source spacing, and proximity to the highway. The material sources selected to proceed to development as either temporary or permanent quarries and borrow sources will be confirmed during detailed design, as construction material quantities are confirmed. The currently proposed list of material sources is considered reasonable and reflects best available information at this stage of design. The potential routing of access roads to these material sources is shown in the mapbook (Appendix 5A) and, similar to the highway alignment route, a 1 km alignment routing corridor has been applied.

Exceptions to design criteria may be needed in some areas where terrain conditions constrain the final design alignment. For example, to maintain required sight distance when crossing a steep valley, the design speed limit may locally be reduced from 90 km/h to reduce the amount of fill required to achieve the corresponding vertical curve, or a different design approach may be used (such as a road cut). Design exceptions may be applied to horizontal curves, vertical curves, speeds, and grades.

The project highway alignment route reflects community input and Traditional Knowledge obtained during project engagement and traditional land and resource use (TLRU) studies. Table 5.2 summarizes how the project design has been influenced by comments or concerns raised during project engagement to date with Indigenous Governments, Indigenous Organizations, and other affected parties in Norman Wells, Tulita, Wrigley, Délı̄ne, Colville Lake (K'áhbamítúé), hereafter referred to as Colville Lake, Fort Good Hope (K'asho Got'ine), hereafter referred as Fort Good Hope, and Fort Simpson (Łı́ıdlı́ Kųę).

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Table 5.2 Summary of Consideration of Engagement Input on Design

Location/Topic	Community Recommendation	Design Response
Wrigley	Alignment should avoid direct access to Wrigley ^{1,2}	Access to the Project through the community of Wrigley will be confirmed during detailed design.
General alignment Dehcho Region	Move alignment as far as possible from Mackenzie River (Deh Cho), hereafter referred to as Mackenzie River; recommend at least 5 km from Mackenzie River, though remaining as close as possible to the optimized alignment and MVWR ^{1,3} CN alignment is preferred ⁴ Move the highway away from the river and up onto “the bluff”; the bridges can all be moved except for Blackwater River. ¹⁶	The project highway alignment route follows the MVWR as much as possible and ties into existing bridges at Ochre River, White Sand Creek, Strawberry Creek (culvert), Vermillion Creek South, Bob’s Canyon Creek, Dam Creek, and Blackwater Creek. The GNWT is not proposing to relocate existing bridges.
MVWR kilometre marker (KM) 709.5 to 711 north of Mount Gaudet	Avoid going through moose pasture; recommend following cutline to west of MVWR ^{1,3}	The alignment routing corridor has been moved to the west as recommended and has been expanded in this area to accommodate a route alternative.
Ochre River (MVWR KM 724)	Move alignment and bridge further from Mackenzie River to avoid moose sensitive area ^{1,5}	The GNWT is not proposing to relocate existing bridges. The alignment will tie into the existing bridge at Ochre River.
White Sand Creek (MVWR KM 732)	Move alignment and bridge further from Mackenzie River to avoid moose sensitive area ^{1,6}	The GNWT is not proposing to relocate existing bridges. The alignment will tie into the existing bridge at White Sand Creek.
Vermillion Creek South (MVWR KM 748 to 754)	Move bridge upriver to protect traditional hunting ground; alignment should take a straight line from KM 749 to 754 instead of following the MVWR ^{1,7}	The GNWT is not proposing to relocate existing bridges. The alignment will tie into the existing bridge at Vermillion Creek South.
Vermillion Creek Bridge (MVWR KM 750.1)	Vermillion Creek Bridge is too close to the Mackenzie River, to moose pasture areas and to hunting grounds; bridge should be moved further east to avoid negative effects on sensitive areas ^{1,7}	The GNWT is not proposing to relocate existing bridges.

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Location/Topic	Community Recommendation	Design Response
Bob's Canyon Creek (MVWR KM 753.5)	Important moose hunting area ^{1,8,9}	Noted. The GNWT is not proposing to relocate existing bridges. The alignment will tie into the existing culvert at Bob's Canyon Creek.
Dam Creek (MVWR KM 764)	Move alignment further from Mackenzie River to avoid moose sensitive area ^{1,10}	The GNWT is not proposing to relocate existing bridges. The alignment will tie into the existing bridge at Dam Creek.
Blackwater River (MVWR KM 784)	Highway construction should avoid as much as possible the northern part of Blackwater River due to its major importance for cultural heritage ^{1,11,12}	The alignment routing corridor has been widened in this area to evaluate route options.
Blackwater River Bridge	The alignment must pass on the existing Blackwater River Bridge ^{1,12}	The alignment will tie into the existing bridge at Blackwater River.
Steep Creek (MVWR KM 816)	North of Steep Creek, road is overflowed and icy in winter going uphill. ^{13,14}	The highway embankment will be elevated above the existing ground surface and will incorporate drainage culverts as needed.
Bear Rock (Petnırah)	Minimize disturbance near Bear Rock (Petnırah) ¹⁶	An alignment routing option 2 km north of the MVWR at Bear Rock (Petnırah) has been identified.
Alignment and Road Design	Bridge approaches and road design on the Project need to be cut to be straight, wide, and not steep. The winter road has minimal signage and limited visibility of oncoming traffic. ¹⁶	The highway design will meet design criteria applicable to a Rural Arterial Undivided (Low Volume Road) with a posted speed limit of 80 km/h. This means the highway will be wider, straighter, and less steep than the current MVWR.
Road Design	Avoid areas of washout and overflow. ¹⁶	The Project will incorporate small-diameter culverts to promote and maintain drainage through the embankment.
Permafrost Considerations	Avoid all areas of erosion, slumping, overflow, washouts, and plan for more permafrost thaw in future. ¹⁶ Permafrost thawing, erosion, and landslides are a concern in some areas along the existing MVWR and the proposed highway location. In areas of concern, participants recommend re-routing the proposed highway and working with community Elders to determine where the highway should go. ¹⁶	The project design will avoid known and potential ice-rich and unstable terrain where practicable. Several design and construction measures have been proposed to address potential permafrost thaw.

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Location/Topic	Community Recommendation	Design Response
Ice and Overflow Considerations	Ice and overflow are a concern at specific locations. Participants recommended avoiding areas with frequent ice and water overflow and road washouts such as Hodgson Creek, Blackwater River north bank, Steep Creek, and Strawberry Creek. Placing culverts at regular intervals to facilitate water and fish movement is strongly supported. ¹⁶	Site-specific culvert design and installation at watercourse crossings will take into account topography, road geometry, substrate material, fish passage and fish habitat, and other considerations such as icing (aufeis), as applicable. Drainage culverts will be installed to promote and maintain drainage through the embankment.
Quarries and Borrow Sources	If possible, quarry pits should not be located on the [Mackenzie] river side of the [highway] because there is more potential for slumping. ¹⁶	This will be further evaluated as project planning advances.
General Alignment – Sahtu Region	Stay on the [winter road] alignment as much as possible ¹⁵ There are big landslides along the [Mackenzie] river with the permafrost thawing; don't think should follow the winter road because it may slide downhill. ¹⁶	Following the MVWR has been applied as a project design objective. Design advancement will consider site-specific considerations.
General Alignment – Sahtu Region	Stay out of wetland areas without creating a longer distance. Move closer to mountain away from wetlands. ¹⁶	The alignment corridor deviates from the MVWR in areas of wetlands.
General Alignment	Protection of caribou, fish, moose, other fur-bearing animals, and their respective habitats are a priority. Recommendations were made re-routing at a number of locations to protect habitat from environmental disturbance and create larger distances from the highway to deter poaching. ¹⁶	The GNWT is committed to ongoing engagement with Indigenous Governments, Indigenous Organizations, and other affected parties during advancement of project design and planning.
General	Consider access to and view from tourism spots such as Mount Gaudet and Bear Rock (Petinı́zah) ¹⁵	Ongoing engagement during detailed design will be used to provide input into the location of pullouts.

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Location/Topic	Community Recommendation	Design Response
General	Engagement participants shared feedback through the online interactive mapping system regarding areas of interest.	Site-specific information gathered from engagement input will continue to be considered as the project design advances.

Notes:

- ¹ Dessau (2012 [PR#13]); Table 11, Table 12
- ² Dessau (2012 [PR#13]: 129)
- ³ Dessau (2012 [PR#13]: 39)
- ⁴ Dessau (2012 [PR#13]: 114); “CN alignment” likely refers to the route of the historical telephone line along the MVWR
- ⁵ Dessau (2012 [PR#13]: map – sheet 3)
- ⁶ Dessau (2012 [PR#13]: map – sheet 4)
- ⁷ Dessau (2012 [PR#13]: map – sheet 6)
- ⁸ Dessau (2012 [PR#13]: 44)
- ⁹ Dessau (2012 [PR#13]: map – sheet 6)
- ¹⁰ Dessau (2012 [PR#13]: map – sheet 7)
- ¹¹ Dessau (2012 [PR#13]: 37)
- ¹² Dessau (2012 [PR#13]: 129)
- ¹³ 5658 NWT and GNWT (2011 [PR#16]: Appendix D)
- ¹⁴ 5658 NWT and GNWT (2011 [PR#16]: 628)
- ¹⁵ GNWT Engagement 2018 to 2020 (Section 2.1.5.3)
- ¹⁶ GNWT Engagement 2021-2023 (Section 2.1.5.4)

Note: For all citations, the page number refers to the document page number.

5.2.4 Design Development from Environmental Assessment to Construction

The current level of design development is adequate for assessing the significance of effects of the Project on the environment. The progression from the current level of design to a constructable design will not change the scope of project works and activities upon which the environmental assessment (EA) is based, except where influenced by the outcomes of the EA. The project design will further advance to support regulatory applications and construction tender. Additional studies that have or will be completed to support detailed design and permitting include:

- Additional hydrotechnical and icings (aufeis) investigations at watercourse crossings for culvert design as needed
- Detailed terrain analysis, geotechnical and thermal investigations, and topographic survey for embankment design
- Archaeological impact assessment for mitigation planning
- Geotechnical and geochemical investigations at borrow/quarry sources to prove material volumes, quality, and acid rock drainage (ARD)/metal leaching (ML) potential

These studies will be subject to their own regulatory approvals, including requirements for Consultation and engagement.

5.3 Existing Infrastructure

The Project will overlap spatially and temporally with the following existing and planned infrastructure, as described in the following subsections. These are described here to provide full context of these projects in relation to the Project being assessed.

- Mackenzie Valley Winter Road, including existing watercourse crossing structures
- Canyon Creek All Season Access Road (CCASAR) and Prohibition Creek Access Road (PCAR)
- Mackenzie Valley Fibre Link
- Norman Wells Pipeline
- Great Bear River Bridge

Additional past, present, and reasonably foreseeable projects used for the cumulative effects assessment are described in Chapter 4.

5.3.1 Mackenzie Valley Winter Road

The existing MVWR is part of the GNWT's public highway system. The MVWR provides winter access to Sahtu communities north of Wrigley, including Tulita, Norman Wells, and Fort Good Hope. Additional winter roads connect to the MVWR, providing seasonal access to Délı̄ne and Colville Lake. The MVWR is an approximately 20 m wide ROW within which a travel surface is annually cleared and packed with snow and ice for use. The MVWR between Wrigley and Norman Wells includes 28 existing and planned single-lane bridges and bridge-sized culverts which extend the operating season of the road, and an ice crossing at the Great Bear River. The MVWR is open to traffic during the following times, with an approximate average traffic load of 50 vehicles per day:

- Wrigley to Tulita: December 23 to March 28 (20-year average)
- Tulita to Norman Wells: December 25 to April 1 (20-year average)

The Project will share the ROW of the MVWR along most of its length, and construction of the Project will be ongoing when the MVWR is open to public traffic. Public access along the MVWR will be maintained during project construction, including portions of the MVWR that need to be operated until the full highway is connected from end to end. Measures to be implemented to maintain public access and safety include:

- A Traffic Management Plan (TMP) will be implemented that:
 - Identifies the sections of the MVWR to be affected by construction
 - Illustrates work zones and construction equipment movements
 - Illustrates public vehicle detours
 - Specifies requirements for escorts, signage, lighting, and speed reductions

- Specifies work times and measures for public safety during non-work times
- Specifies communication protocols between the project construction team and MVWR operations team
- Construction activities will be scheduled to reduce disruption to public and commercial vehicle access on the MVWR, where possible

The annual maintenance of the MVWR includes snow clearing, grading, culvert and bridge maintenance, and vegetation management (brushing) within the ROW, and water withdrawal from the Mackenzie River and other waterbodies and watercourses in accordance with existing authorizations.

5.3.2 Canyon Creek All Season Access Road and Prohibition Creek Access Roads

The CCASAR and PCAR are all-season roads that together extend 28 km southeast of Norman Wells to Prohibition Creek. The CCASAR was constructed to replace the MVWR with a new ROW located approximately 2.8 km to the northeast between Norman Wells and Canyon Creek. The PCAR will replace the MVWR between Canyon Creek and Prohibition Creek with a 60 m ROW and fill roadway following the MVWR alignment. Construction of 7 km of the PCAR from Canyon Creek to Christina Creek is underway and expected to be complete in 2023, with the schedule of construction of the remaining 7 km not yet determined. Maintenance activities along the CCASAR-PCAR include snow clearing, grading, dust control, bridge and culvert maintenance, and vegetation management. The CCASAR is currently accessible to the public year-round from Norman Wells only. The CCASAR and PCAR will become part of and will be operated and maintained as part of the Mackenzie Valley Highway and are designed to the same highway standard.

5.3.3 Mackenzie Valley Fibre Link

The Mackenzie Valley Fibre Link (MVFL) is a fibre optic cable located within a 6 m wide ROW, mostly paralleling the MVWR, buried at a depth between 0.3 to 0.5 m below the ground surface. The location of the MVFL is marked with utilidor markers along the length of its ROW. The Project may cross the MVFL in places, though this will be determined in final design. Prior to start of construction, the GNWT (or its contractor) will identify the location of the MVFL and will work with the operator of the MVFL to implement appropriate precautions to prevent damage. The location of the MVFL will be communicated to site personnel and the area will be avoided during construction.

5.3.4 Norman Wells Pipeline

Enbridge Pipelines (NW) Inc. (Enbridge) has operated the Line 21 (Norman Wells Pipeline) since 1985. The Norman Wells Pipeline carries crude oil from Norman Wells to Zama, Alberta. The pressurized pipeline is buried within a 25 m wide cleared ROW located within 0 km to 5 km of the MVWR. The Project will cross the pipeline in several locations. Crossing agreements will be obtained from Enbridge. The final design will be in accordance with Enbridge's requirements for safety and access, for example specific requirements for depth of fill.

5.3.5 Great Bear River Bridge

The Great Bear River Bridge is anticipated to be constructed between 2024 and 2027. The bridge will provide an all-season crossing of the Great Bear River at Tulita to replace the MVWR ice crossing and will include new road approaches on both sides of the river, extending approximately 4 km to Four Mile Creek southeast of the Hamlet of Tulita and to the municipal boundary 2 km northwest of the river. The road approaches of the Great Bear River Bridge are designed to the same highway standard as the Mackenzie Valley Highway. As with the CCASAR and PCAR, the Great Bear River Bridge will become part of and will be operated and maintained as part of the Mackenzie Valley Highway once constructed.

5.4 Construction Schedule and Activities

The project schedule and activities to be completed during the construction phase are described in the following sections.

5.4.1 Construction Schedule

The Project will take approximately 10 years to construct, over a timeframe of up to 20 years. The schedule used for this assessment is conceptual and reflects a phased approach to construction, as the Project is not likely to be constructed as a single, continuous project. The conceptual schedule assumes the alignment will be constructed in three consecutive segments, beginning in approximately 2026:

- Segment 1: Wrigley to the Dehcho–Sahtu border (102 km)
- Segment 2: Tulita south to the Dehcho–Sahtu border (134 km)
- Segment 3: Tulita north to the Prohibition Creek Access Road (45 km)

The timing and duration of each construction segment is dependent on the GNWT securing construction funding and regulatory approvals. Conceptually, two years between construction of segments is assumed, during which permitting and procurement would be completed. The conceptual schedule assumes the Project would be fully constructed sometime between 2041 and 2046.

Mobilization of equipment and material would generally occur in summer (April to November) via barge and using existing all-season roads, or in winter (December to March) by winter road. Construction would generally occur year-round, with certain specific activities to be completed in winter or summer only as discussed in Sections 5.4.2, 5.4.6 to 5.4.9, 5.4.11, and 5.4.15. The conceptual schedule assumes the Project would be fully constructed and provide all-season connection to Norman Wells sometime between 2041 and 2046.

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The conceptual schedule used as the basis for the environmental assessment is presented in Figure 5.3. Consideration of alternate schedules associated with alternate construction approaches is presented in Section 7.3.1. Within the realistic though conceptual schedule, one or more of the segments may take more or less time to construct than what is depicted. Confidence in the assessment in consideration of this uncertainty is discussed in each chapter of Volumes 2, 3 and 4.

Figure 5.3 Conceptual Project Schedule

		Dehcho Segment							Tulita South Segment							Tulita North Segment					Operations	
Project Activity		2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043+	
Planning	Environmental Assessment Decision	Green																				
	Detailed Design		Green																			
	Permitting			Green																		
	Funding Secured				Green																	
	Tender and Contract Award					Green																
Construction	Mobilization				Yellow																	
	Construction				Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	
	Demobilization								Yellow						Yellow						Yellow	
Operations	Use of Tulita North Segment									Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	
	Use of Tulita South Segment									Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	
	Full Connection and Use																				Blue	

NOTES:
 Gray = winter season (December to March)
 White = summer season (April to November)
 Green = Planning activity
 Yellow = Construction activity
 Blue = Operations and Maintenance activity

The assessment does not explicitly consider a schedule where there is a considerable time gap (for example 5 or more years) between construction of segments, which could extend the overall schedule of the Project beyond 20 years. Under such a scenario, it is possible that existing environmental and socio-economic conditions, land and water management regimes, regulations, aspirations of Indigenous Governments, Indigenous Organizations, and other affected parties could change to the extent that the findings presented in the assessment may no longer be valid. The GNWT’s commitment to adaptive management and ongoing engagement with Indigenous Governments, Indigenous Organizations, and other affected parties would establish a process for identifying the need for additional studies and mitigation measures to address uncertainty in predicting effects associated with a construction schedule extending beyond 20 years.

As each of the project segments is constructed, that segment of highway will be opened to public vehicle traffic. This is considered operations and maintenance and further described in Section 5.5. As the segments are constructed, each of the three affected communities of Wrigley, Tulita, and Norman Wells will experience project effects and benefits associated with construction and operations and maintenance, which are discussed in Chapter 9.

5.4.2 Mobilization, Staging and Resupply

Project construction will require that all equipment, materials, fuel, camps, and other supplies be mobilized to designated construction start locations. Based on the conceptual schedule, and for the purpose of the assessment, it is anticipated that construction will advance simultaneously from two locations for each construction segment. This could include start points at either end of the segment, or mid-points. The start points will be based on the need to develop material (quarry or borrow) sources and the availability of staging areas. Staging areas are areas where equipment and materials brought during annual or periodic resupply are temporarily stored prior to or after project use. Fuel will be transferred from staging areas to approved project fuel storage tanks in designated areas. Staging areas that have been identified for potential use include:

- End of the existing Mackenzie Highway near Wrigley
- Existing staging areas within municipal boundaries (Norman Wells, Tulita, Wrigley)
- Locations of permanent borrow/quarry sources
- Mackenzie River at Blackwater River or Borrow Source 9.043
- Other suitable areas, including previously disturbed areas that may be identified during community engagement

Equipment, materials, fuel, and other supplies are anticipated to be mobilized by Marine Transportation Services (MTS) barges on the Mackenzie River during the open-water season, using existing barge landings in Wrigley, Tulita and Norman Wells. Equipment, materials, fuel, and other supplies will also be mobilized by the MVWR in the winter, or any time of year on existing all-season roads. Some equipment and supplies may be locally available in Norman Wells, Tulita, and Wrigley. Approximately 10 barges and/or 500 trucks may be required to complete each mobilization.

Temporary staging and laydown areas will be established as project construction progresses to facilitate efficient movement of equipment and materials. These locations will include temporary fuel and refueling facilities, culverts, geotextile, granular materials, erosion control materials, spill response equipment, emergency shelter, and first aid facilities. These temporary laydown areas may be relocated once or twice per year as construction progresses. The locations of permanent and temporary staging areas will be confirmed by the contractor prior to construction.

Resupply to the Project will be completed annually or semi-annually for bulk items such as fuel, geotextile, and culverts. Other supplies such as equipment parts and camp supplies are anticipated to be delivered more regularly using the Mackenzie Highway and MVWR. Five to ten barges and/or 50 to 100 trucks may be required annually to resupply each construction segment. This is not expected to contribute to an increase in the traffic volume beyond the current annual average of 50 vehicles per day.

5.4.3 Camps and Maintenance Yards

Details about the proposed workforce are provided in Section 5.4.14. It is assumed that two dedicated project construction camps will be established for each construction segment, to be confirmed by the contractor. Locations being considered for construction camps currently include:

- Existing camp facilities within Norman Wells
- Dedicated camp locations within municipal boundaries of Norman Wells, Tulita, and/or Wrigley
- Locations outside of municipal boundaries such as at one or more borrow sources or quarries to be accessed from the MVWR, including Source 9.002 near Big Smith Creek

Community input will be considered in determining the location of camps. Through the project-specific engagement process, engagement participants stated preference for camps to be located at existing disturbed areas such as borrow sources, and away from the community. In Norman Wells, engagement participants asked that consideration be given to repurposing construction camps to provide housing. The GNWT will consider repurposing construction camps once construction is complete. Each construction camp will consist of mobile trailers for accommodations, office, kitchen, laundry and washroom facilities, and first aid facilities. Each camp will include parking for light vehicles, waste transfer, and temporary waste management facilities. Camps are assumed to supply their own heating and power for lighting and auxiliary equipment using diesel fueled generators and heaters.

Potable water for camps is anticipated to be obtained from the closest municipal supply; whereas, non-potable water may be obtained from municipal supply or proximal water sources, if adequate and suitable for this purpose. The location of water sources to be approved will be presented in regulatory applications (see Section 5.4.11).

Certain camp wastes such as sewage, greywater, and domestic wastes unsuitable for incineration will be disposed of at licenced municipal facilities subject to approval of the community government and the Inspector as required, or in accordance with applicable guidelines (GNWT, 2015a). Other wastes, such as recyclables and hazardous wastes, will be transferred to an accredited waste transfer company for disposal. Wastes suitable for incineration, such as food waste and cardboard, will be incinerated on site in accordance with applicable guidelines.

Maintenance yards will be used for storage and maintenance of heavy equipment and equipment refueling and may include temporary material stockpiles. Any of the borrow/quarry sources used for construction may be used as temporary maintenance yards, though areas proximal to the alignment are preferred. Temporary maintenance yards will include:

- Maintenance shelter
- Material stockpile
- Fuel storage

- Equipment parking area
- Waste management area

All camps and temporary maintenance yards will have controlled access to project personnel only.

5.4.4 Clearing and Access

Where the project highway alignment follows the MVWR, the ROW will need to be widened to 60 m. In some places, a new ROW will need to be cleared. Access roads to quarry and borrow sources, where needed, will be cleared to 30 m width. Trees and standing deadfall will be cleared using heavy equipment, in winter when the ground is frozen to reduce effects on the environment. Hand felling will be used where required to protect sensitive terrain. Merchantable timber (>14 centimetres [cm] diameter at breast height) will be limbed and decked in a dry area and made available to a receiver holding an authorization, such as a timber cutting permit or licence from the GNWT. Non-merchantable trees will be limbed and stacked for community salvage, where possible.

Where needed to be removed, tree stumps and roots will be removed by grubbing. Organic topsoil will be salvaged and stockpiled for use in reclamation of other areas. Through the project-specific engagement program, engagement participants requested that unused topsoil removed during construction be given to communities for their use. Brush and unsalvageable timber will be walked down and temporarily windrowed at the edge of the ROW before being mulched and spread across the ROW once the embankment is constructed. In other cleared areas, it will remain windrowed at the edge of the cleared area.

A summary of the approximate new areas to be cleared for project activities is provided in Table 5.3. The table also approximates the areas not needed for operations and maintenance, to be reclaimed during the construction phase. Reclamation is further discussed in Section 5.4.9.

As noted in Section 5.2.4, the ultimate design alignment of the highway has not been finalized. The summary of areas to be cleared in Table 5.3 is approximate and based on the current (preliminary) alignment. To address potential uncertainty associated with the new clearing on the assessment of effects on the environment, the assessment (where applicable), provides metrics associated with clearing an entire new ROW (unlikely), though discusses effects based on a shared Project and MVWR ROW, consistent with the GNWT's objective of following the MVWR as much as possible to limit areas of new clearing.

Finally, not all areas to be cleared in Table 5.3 will be cleared at the same time. According to the construction schedule (Section 5.4.1), segments of the Project will be completed in sequence, such that some areas will be reclaimed before new areas are cleared.

Table 5.3 Summary of Areas to be Cleared

Type of Clearing	Description	Approximate Area to be Cleared (ha)	Approximate Area to be Reclaimed (ha)
Quarry/borrow sources and access roads -temporary ¹	Areas to be developed for construction only	235	235
Quarry/borrow sources and access roads – permanent ¹	Areas to be developed for long-term use	388	Up to 355 ⁴
Temporary camps, maintenance yards, staging and laydown areas	Assume these will all be located at previously cleared sites where possible	0	Unknown
ROW ^{2,3}	Widening of existing MVWR to 60 m and clearing of new ROW to 60 m width	1,685	560 ⁵
	Total	2,308 ⁶	

Notes:

- ¹ Based on preliminary list of quarry/borrow sources (see Table 5.4); includes previously cleared areas
- ² Based on current preliminary alignment used for environmental assessment
- ³ Based on average MVWR ROW of 20 m (existing ROW width varies from 11 m to 35 m and includes up to 6 m width for the MVFL)
- ⁴ Based on progressively reclaiming borrow/quarry areas; access roads will not be reclaimed
- ⁵ Area of MVWR to be abandoned (where new ROW does not follow MVWR)
- ⁶ Not all areas will be cleared at the same time

ha: hectare

5.4.5 Quarrying

5.4.5.1 Material Requirements

The Project is estimated to require 14.7 million cubic metres (m³) of granular and rock material for road embankment, road base, borrow/quarry source access roads, workspaces/staging areas, permanent maintenance camps, and erosion protection, based on the estimates for the “optimized alignment” as presented in Dessau (2012) and 5658 NWT Ltd and GNWT (2011). These estimates are considered (+/- 50%) based on the current level of design. These material requirement estimates include:

- 11.1 million m³ of 300 mm minus embankment (blast rock)
- 1.8 million m³ of 50 mm minus sub-base (granular or crushed rock)
- 1.8 million m³ of 20 mm minus base course (granular or crushed rock)

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Fifteen material sources have been identified for construction of the Project (seven granular borrow source[s] and eight rock quarries), as shown in Figure 1.2. These are identified as primary material sources. Of these, nine will continue to be used for road maintenance during project operations and as such will become permanent quarries. Table 5.4 identifies material sources anticipated to be used for the Project, including those that will be used for construction only (temporary) and those that will be used for construction and operations (permanent). These sources have been identified based on their probable volumes of material, quality of material, and other considerations as reported in K'alo-Stantec (2021), with total probable volume of 57.4 million m³. All primary temporary and permanent borrow sources and quarries are also identified in Appendix 5A.

Alternate material sources have been identified (see Table 5.5). Though these are not proposed for development at this time, they are identified here as additional sources of material that could be considered for use in construction, should the primary sources not be able to be developed. The alternate (additional) sources are not assessed as part of the Project, as doing so would overestimate the project effects. The GNWT may apply to use alternate sources instead of primary sources, applying the same mitigation measures. The need to develop alternate sources may be identified as geotechnical and environmental investigations, design and community engagement progresses prior to permitting. Factors affecting the selection of final sources to be included in permit applications include:

- Geotechnical investigations to confirm material suitability, including geotechnical properties and ice content
- Geochemical analyses to test material's ARD/ML potential
- Land access and ownership
- Community input and Traditional Knowledge
- Identification of unmitigable environmental constraints such as critical habitat for species at risk
- Material type quantity requirements per highway section and haul distance

Quarries and borrow sources will be accessed year-round. Those sources that are not directly on the alignment will require construction of an access road.

In addition to the primary material sources, rock or granular material may be sourced from road cuts, thus reducing the number of quarries or borrow sources to be developed, or the volume taken from these sources. The location of road cuts and suitability of material will be assessed further following geotechnical investigations and design advancement (see Section 5.4.6).

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Table 5.4 Proposed Primary Material Sources (Borrow Sources and Quarries) to be Used for Construction and Operations and Maintenance

Source ID ¹	Location on Alignment (KM) ²	Distance from Alignment (km)	Ownership & Status ³	Material Type	ARD/ML Assessment Completed ⁴	Probable Volume (millions m ³)	Temporary or Permanent
10.043	n/a	7 km S of Wrigley on Highway #1	Territorial, Existing	Granular	None	1.0	Temporary
10.028 ⁶	711	0.1 km W	Territorial (Land Withdrawal ⁵)	Rock	Partial	3.4	Permanent
10.020	726.5	0.1 km E	Territorial, Existing	Granular	None	5.8	Temporary
10.014A	734.6	0.1 km E	Territorial (Land Withdrawal ⁵)	Granular	Partial	2.5	Permanent
10.007	753	0 km	Territorial (Land Withdrawal ⁵)	Granular	Partial	0.7	Permanent
10.004	770.3	0.3 km W	Territorial	Granular	None	2.3	Temporary
9.043	783.5	0 km	Territorial, Existing	Granular	Partial	0.9	Permanent
9.025B	813	2.6 km E	Private (Sahtu)	Rock	None	8.5	Temporary
9.019	821.6	1.6 km E	Territorial	Rock	Partial	7.3	Permanent
9.002	850.4	0.1 km E and 0.1 km W	Private (Sahtu), Existing	Granular	Screening	3.1	Permanent
8.039	865.7	1.6 km E	Territorial/ Private (Sahtu)	Rock	Partial	7.3	Permanent
7.109	949.3 or 951.0 (Alignment Option)	0.1 km S	Territorial	Rock	Partial	4.3	Permanent
7.090	962.7	0.6 km NE	Territorial	Rock	None	5.0	Temporary
7.083	976.8	7 km NE	Territorial, Existing	Rock	Partial	1.5	Permanent

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Source ID¹	Location on Alignment (KM)²	Distance from Alignment (km)	Ownership & Status³	Material Type	ARD/ML Assessment Completed⁴	Probable Volume (millions m³)	Temporary or Permanent
Edie Lake Quarry	n/a	7 km S of Norman Wells on CCASAR	Territorial, Existing	Rock	Yes	2.5	Temporary
Total						56.1	

Notes:

¹ As reported in K'alo-Stantec (2021)

² Per Appendix 5A (map book)

³ "Existing" means a portion of the source has been developed in the past

⁴ As of March 2021

⁵ Interim Land Withdrawal R-048-2014 (as amended in 2022)

⁶ This location has been identified as a sacred site based on information provided by Pehdzéh Kì First Nation and will be withdrawn as a proposed primary material source

S: south; E: east; W: west; NE: northeast

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Table 5.5 Alternate (Optional) Material Sources (Borrow Sources and Quarries)

Source ID ¹	Access from Alignment (KM)	Distance from Alignment	Ownership	Material Type	Probable Volume (millions m ³)
10.041	695.0	0.3 km W (in Wrigley)	Territorial	Granular	1.5
10.037	700.2	1.9 km S	Territorial	Rock	1.2
10.001	779.7	0.5 km E	Territorial	Granular	4.4
9.044B	783.5	1.2 km E	Territorial	Granular	5.2
9.037	798.3	3.0 km S	Territorial	Granular	6.3
9.010	839.2	0.8 km W	Territorial	Granular	5.7
9.002A	852.0	0.7 km E	Territorial	Granular	2.4
20.086P	889.0	0 km	Private (Sahtu)	Granular	1.2
8.058P	907.3	0 km	Territorial	Granular	0.2
7.155A	n/a ²	2.6 km E	Private (Sahtu)	Rock	4.3
Dhu1 ³	954	1.6 km E	Territorial	Rock	4.3
Dhu2	950	3.1 km N	Territorial	Rock	2.7
Total					38.0

Notes:

¹ As reported in K'alo-Stantec (2021)

² Located on west side of Mackenzie River near Tulita

³ Existing authorized source

5.4.5.2 Material Geochemistry – Acid-Rock Drainage and Metal Leaching Potential

Rock material sources to be used for the Project will be tested for ARD and ML potential prior to seeking authorizations (such as Quarry Permits) in general accordance with methods in the Mine Environmental Neutral Drainage (MEND) Prediction Manual (Price, 2009), or other Northwest Territories (NWT) guidance as may be applicable at the time. Additional samples will be collected from each proposed quarry and rock cut source (as applicable), based on the proposed tonnage of material to be extracted. Results of analytical testing will be used to classify materials based on their Neutralization Potential Ratio (NPR), where:

$$NPR = \frac{\textit{Neutralization Potential (NP)}}{\textit{Acid Potential (AP)}}$$

Rock sources with NPR less than 1.0 are considered potentially acid generating (PAG) and will not be used for the Project. Rock sources to be used for the Project with NPR greater than 3.0 are considered to have low acid generating potential and suitable for use on the Project. Project sources with NPR between 1.0 and 3.0 that cannot reasonably be avoided will be further evaluated to identify if PAG can be mitigated through measures such as site-specific planning, designated use of material, and water management. A partial geochemical evaluation has been completed for some sources identified in Table 5.4, including borrow material sources where material could require crushing. These sources were found to have non-acid generating, non-metal leaching material (K'alo-Stantec, 2021). Generally, rock material sources proposed are anticipated to have low ARD potential due to their location within geological units dominated by carbonate and dolomitic rocks with high neutralization potential. As stated previously, additional testing will be completed at all sources proposed for development where crushing will be required, in accordance with applicable guidance.

5.4.5.3 Quarry and Borrow Source Development and Operations

Quarries are rock material sources. The development of quarry sources will require:

- Constructing all-season access roads to sources
- Stripping of overburden vegetation and soils
- Development of an area to be used for explosives storage and mixing
- Blasting
- Crushing and sorting
- Stockpiling at the source and at specified locations along the ROW

Borrow sources are granular material sources. The development of borrow sources will require:

- Constructing all-season access roads to sources
- Stripping of overburden vegetation and soils

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- Ripping and excavation of material
- Material sizing and sorting
- Stockpiling at the source and at specified locations along the ROW

Access roads to quarry and borrow sources are anticipated to consist of a 30 m wide cleared ROW and 8 m wide granular embankment to accommodate equipment at speeds of up to 50 km/h. Final routing and design of access roads will coincide with alignment design. Access roads are anticipated to be constructed following the methods for constructing embankment (see Section 5.4.6). The development and operation of quarries and borrow sources will coincide with the timing of embankment construction, which may occur year-round.

A Quarry Development Plan (QDP) will be developed for each material source, in accordance with the Northern Land Use Guidelines – Pits and Quarries (GNWT, 2015b) and as required by the Quarrying Permit Application. Notably, the QDPs will describe the activities to be conducted at each quarry and measures to be implemented to mitigate effects on the environment, such as erosion and sedimentation control, water management, wildlife protection, and use and storage of explosives. Best practices to be incorporated into quarry planning and QDPs include:

- The Project will limit clearing to areas required for construction and safe operations.
- The Project will implement measures to reduce ponding, erosion, and damage to permafrost during borrow source and quarry operations and closure.
- Borrow sources will not be located in areas where there is a high groundwater table.
- Only material with low ARD and/or ML potential will be used for the Project (per Section 5.4.5.2).
- Borrow source and quarry development and operations will follow measures specified in the Wildlife Management and Monitoring Plan (WMMP).
- Borrow source and quarry design and development operations will take into account public safety.
- Vegetation buffers will be used as visual barriers and to protect riparian vegetation, as appropriate.
- Organic material and topsoil will be set aside for use during reclamation.
- Blasting will not occur within 100 m of fish-bearing waterbodies such that instantaneous pressure will be less than 50 kilopascal (kPa) where fish may be present and particle velocity will be less than 13 millimetres per second (mm/s) near a spawning bed where eggs or larval fish may be present.

Regarding transportation, manufacture, use and transportation of explosives, details of these activities will be developed by the contractor selected by the GNWT to construct the Project. The assessment assumes that explosives will be transported to quarries along constructed portions of the Project and quarry access roads, and that some quantity of explosives may be stored at the quarry during construction and/or operation of the quarry.

5.4.6 Embankment Construction

The road may be constructed year-round, with embankment (the coarsest material placed at the base) generally placed in winter, and the sub-base and base course (upper layers) placed and compacted in summer. Winter construction (during frozen conditions, December to March) is favoured where:

- The MVWR is needed for project access
- Sensitive soils and permafrost need to be protected
- Culverts need to be constructed in no or low flow conditions to protect fish and fish habitat
- There is consideration of mitigating disturbance to certain wildlife, such as migratory birds

Winter construction comes with challenges, such as working in colder temperatures and shorter daylight hours, maintaining equipment, extracting frozen borrow material, achieving desired compaction, and potentially disturbing overwintering wildlife.

Construction during unfrozen (summer) conditions (April to November) has the following advantages:

- Material can be placed when dry (unfrozen)
- It can be easier to install culverts
- Material can be compacted
- Construction does not disrupt MVWR operations
- It is easier to maintain equipment
- There are longer daylight hours
- Barge supply/resupply is available during part of the summer

Challenges associated with seasonal construction will be acknowledged and mitigated in the Permafrost Protection Plan (PPP), QDP, Erosion and Sedimentation Control Plan (ESCP), WMMP, and contractor's Health and Safety Plan.

Generally, embankment construction will proceed as:

1. Clearing and grubbing (where needed) of the ROW in winter
2. Placement of geotextile on original ground in winter
3. Placement of embankment by end-dumping material in winter
4. Installation of culverts in summer or winter
5. Placement of sub-base and base course and compaction in summer

Clearing has been described in Section 5.4.4. Geotextile will be placed on the cleared ground surface. Where construction of embankment proceeds in winter, snow will be cleared from the ROW before geotextile placement.

5.4.6.1 Winter Travel Lane

In winter, portions of the existing MVWR will be used as a travel lane for movement of equipment working to construct new embankment within the shared ROW of the MVWR and Project. Where the project ROW departs from the MVWR, a winter travel lane may be constructed for the Project alongside the embankment to facilitate movement of equipment. Water for constructing the project winter travel lane, where needed, will be sourced from the Mackenzie River and other sources as authorized for water withdrawal (see Section 5.4.11).

5.4.6.2 Embankment Placement

Embankment, consisting of blast rock and granular fill, will be placed directly on the geotextile in varying thicknesses to meet the design parameters. Generally, thicker fills are required in areas of sensitive soils and in valleys. Material will be placed by end-dumping embankment material off previously placed embankment, then leveling the fill material, thus advancing the working area. Embankment placement may be completed in several “lifts” or layers until the specified thickness is achieved. The embankment may be allowed to settle for a full year prior to placing sub-base and base course.

As part of tying in the new double-lane embankment to single-lane existing bridges, some work around existing bridges may be required to extend rip rap to accommodate the wider embankment approaches in accordance with the final design.

5.4.6.3 Road Base, Compaction and Surfacing

Placement of sub-base and base course on top of embankment will occur during unfrozen conditions, which allows material to be compacted. These activities will be conducted using the constructed embankment as the travel and work surface for equipment. Placement of the final surface material (the driving surface) will be completed in the final year of construction. This material will be sourced from specific quarry or borrow sources with suitable material. During compaction and surfacing, water is needed for compaction and dust control. Water used for compaction will be sourced from the Mackenzie River and other authorized sources (see Section 5.4.11).

5.4.6.4 Road Cuts

Road cuts may be needed where the grades (slope) at a steep valley approach or hill can be reduced by excavating into the hill slope. The current design identifies 14 locations where road cuts may be required. Road cuts are expected to be accommodated within the 60 m wide ROW, but local exceptions may be required in accordance with the final design.

The need for road cuts, road cut locations and size will be confirmed during final design and will be influenced by road operational requirements, public safety, geotechnical conditions, and the suitability of the material from the cuts to be used as road embankment. Alternate design approaches (such as switchbacks) will be considered at each of these locations and will involve

modifying design criteria (such as reducing the design and posted speed limits). Through the project-specific engagement process, engagement participants stated that they support the need for road cuts in steep valleys such as at the approaches to existing bridges. Participants in Tulita also favored a road cut along the alignment option further from Bear Rock (Petinıꞗah), because it could potentially replace the need for a quarry near Bear Rock (Petinıꞗah).

Road cuts will be constructed in the summer or winter, after the ROW has been cleared. Road cuts into rock will be blasted and material suitable for road construction will be crushed and stockpiled within the ROW for use. Road cuts in granular material will be excavated. Material removed from road cuts that is unsuitable for road construction may be spread along the ROW or hauled to a quarry/borrow source for disposal, if nearby.

5.4.7 Watercourse Crossings

The Project will cross intermittent and permanent watercourses requiring installation of small (less than 1.5 m diameter) and large (greater than 1.5 m diameter) culverts. No new bridges are required to be constructed as part of the Project, because the Project will use the existing and planned single-lane bridge and bridge-sized culvert structures located over major watercourses along the MVWR, which is operated and maintained by GNWT-INF. As noted in Section 5.4.6.2, some work will be required around existing bridges to tie the new embankment to these existing bridges.

5.4.7.1 Culverts

It is currently estimated that 85 large culverts (greater than or equal to 1.5 m diameter) will be required. Culverts will consist of CSP or structural plate corrugated steel pipe (SPCSP) and may be closed-bottom or open-bottom type. Site-specific culvert design and installation will take into account topography, road geometry, substrate material, fish passage, and fish habitat considerations as based on hydrotechnical and fish and fish habitat studies (Appendix 17A; K'alo-Stantec, 2022c; Tetra Tech, 2021, 2022), and other considerations such as icing (aufeis), as applicable. Final culvert design will specify requirements for excavation, preparation of culvert bedding, and placement of erosion protection (such as rip rap). Culverts will be installed in the summer or winter, in accordance with specifications, or as determined by the contractor. Prior to culvert installation, temporary crossings such as portable bridges may be used if needed to reduce disturbance within the watercourse and in riparian areas. Culvert installation will avoid restricted activity timing windows where applicable, and where possible, as based on the site-specific fish and fish habitat study information and recommendations therein.

Through the project-specific engagement process, engagement participants stated that they have seen other large culverts blocking small fish and some that have collapsed; they urged caution when building these culverts. During project-specific engagement and Traditional Knowledge studies, participants did not identify any proposed new culvert installation locations that are used for boat access. Based on site-specific observations, none of the watercourses where new crossings are to be installed are considered navigable waters under the meaning in the *Canadian Navigable Waters Act*.

The following measures to protect fish and fish habitat will be implemented during installation of culverts and temporary crossings where fish and fish habitat is present, as detailed in the draft Fish and Fish Habitat Protection Plan (see Volume 5):

- Follow Fisheries and Oceans Canada (DFO) measures to protect fish and fish habitat and codes of practice:
 - *Interim code of practice: temporary cofferdams and diversion channels*
 - *Code of practice: Clear span bridges*
 - *Code of practice: Ice bridges and snow fills*
 - *Code of practice: Temporary fords*
- Follow measures in the ESCP
- Respect DFO *Northwest Territories Restricted Activity Timing Windows for the Protection of Fish and Fish Habitat*

Up to 1,500 additional small-diameter culverts (less than 1.5 m diameter) will be installed at smaller and undefined drainages without fish habitat and cross-slopes as identified during design to promote and maintain drainage through the embankment at a frequency of approximately three to five culverts per km. Through the project-specific engagement process, engagement participants were supportive of culverts that would help with drainage and to prevent overflow of the highway.

5.4.7.2 Beaver Dam Removal

The Tulita Renewable Resources Council reports that there are many beaver dams that have caused overflow [of the MVWR] (TRRC, 2022). Construction of the embankment or installation of culverts may require removal of existing beaver dams or lodges to re-establish or maintain natural watercourse flow and to prevent flooding. The identification of beaver dams will be completed prior to construction. Beaver dam removal, if required, will be done in accordance with the DFO *Code of practice: Beaver dam breaching and removal*, a GNWT General Wildlife Permit, the WMMP, and with input from local land and resource managers.

5.4.8 Demobilization

It is anticipated that demobilization of construction equipment, camps, scrap materials, and waste will occur progressively toward the end of construction of each segment of the highway. Equipment and materials not needed for final summer construction activities may be demobilized on the MVWR or on the segment of newly constructed highway, if applicable. Remaining equipment, materials, camps, scrap materials, and waste are likely to be demobilized by barge at the end of the summer season from existing barge landing locations. The demobilization schedule will be determined by the contractor. Some equipment or materials may be retained for maintenance or community use, at the discretion of the GNWT and the construction and maintenance contractor(s).

5.4.9 Closure and Reclamation of Camps, Temporary Quarries, Maintenance Areas, and Mackenzie Valley Winter Road

Once each segment of the new highway is constructed, there will be temporary camps, borrow sources/quarries, access roads, maintenance yards (all considered temporary workspaces), and sections of the MVWR that will no longer be required.

All structures, equipment, and materials will be removed from these temporary workspaces as soon as they are no longer needed. Wastes will be handled and managed as per the Project Waste Management Plan (WMP). These areas will be visited during the summer to confirm that all debris has been collected. Areas suspected to be contaminated by fuel or other contaminants will be assessed and remediated.

Borrow sources and quarries and associated access roads not required for highway maintenance will be closed and reclaimed in accordance with the QDP, input from the landowner (for Sahtu Settlement Lands) and Indigenous Governments, Indigenous Organizations, and other affected parties as appropriate. Objectives of closure and reclamation of temporary workspaces include:

- Leaving the site in a condition that is safe for people and wildlife
- Promoting drainage and preventing project-related erosion and degradation of permafrost
- Promoting natural revegetation

Specific closure activities at temporary workspaces will include:

- Removing all equipment, wastes, and contaminated soils
- Contouring excavations to reduce steep slopes
- Sloping the pit floor of borrow sources/quarries to reduce ponding of water
- Directing surface runoff away from existing waterbodies
- Installing erosion control measures if necessary
- Replacing soil and organic material to promote re-establishment of vegetation

Vehicle access to quarry access roads will be discouraged by placing boulders and ditching the access road or will follow recommendations from the landowner. Access to abandoned sections of MVWR will be discouraged by placing boulders or wood debris and reflective signage and/or markings across the former ROW where it is intersected by the new highway. Restricting vehicle access will prevent rutting and promote revegetation. Snowmobile access is not expected to be affected.

Abandoned sections of the MVWR ROW and access roads will be allowed to revegetate naturally.

5.4.10 Equipment and Fuel Use

The following heavy equipment is anticipated to be required for construction of each project segment:

- Excavators
- Water trucks
- Crushers and screeners
- Bulldozers
- Vacuum trucks
- Rock trucks
- Graders
- Fuel trucks
- Loaders
- Mulchers
- Mobile drills
- Compaction equipment
- Tree harvesters
- Haul trucks

Diesel fuel required for equipment will be stored in approved bulk fuel storage tanks with secondary containment. Fuel will be stored in designated locations such as quarries or maintenance yards. Mobile equipment will be refueled using fuel trucks and trucks with tidy tanks. Personnel will be trained in refueling, fuel handing procedures and spill response, in accordance with the Spill Contingency Plan (SCP).

5.4.11 Water Use

Water will be used for camp operations, winter travel lane construction, compaction, and dust control. Water for road compaction and camp operations will be withdrawn in winter and summer from the Mackenzie River and other authorized sources. Drinking water will be sourced from municipal systems in Wrigley, Tulita, or Norman Wells. Water withdrawal will be in accordance with DFO measures to protect fish and fish habitat, the *DFO Protocol for Winter Water Withdrawal from Ice-covered Waterbodies in the Northwest Territories and Nunavut* (DFO, 2010), *Interim code of practice: end-of-pipe fish protection screens for small water intakes in freshwater*, and *Framework for Assessing the Ecological Flow Requirements to Support Fisheries in Canada* (DFO, 2013). The estimated annual water use for the Project is summarized in Table 5.6.

Table 5.6 Estimated Annual Water Use for the Project During Construction

Water Use	Source	Estimated Daily Volume (all sources) (m ³)	Annual Volume (m ³)	Timing
Potable Water	Municipal Distribution	10	3,000	300 days per year
Camp Operations (non-potable)	Municipal Distribution or Authorized Water Sources	20	6,000	300 days per year
Winter Travel Lane Construction	Mackenzie River and Authorized Sources	>300	10,000	Winter
Compaction and Dust Control	Mackenzie River and Authorized Sources	>300	10,000	Summer

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Water sources to be used for construction will be selected based on available flows and volumes as based on applying the DFO requirements for protecting fish and fish habitat. In winter during Project construction, the GNWT will be concurrently constructing and maintaining the MVWR, which is a separate project. The project contractor and the GNWT may use the same water sources for the Project and MVWR. The GNWT will consider the available water in each source as based on all known potential users when applying for one or more water licences to use water. Generally, lake water sources and large rivers will provide water in winter, whereas smaller river and creek sources are available in summer.

Table 5.7 and Appendix 5A identify potential lake water sources that may be used for construction based on desktop evaluation of available information. A smaller subset of these will continue to be used during operations and maintenance for dust control, when water use needs are much reduced (10 – 50 m³/day). Additional studies of lake depth and volume will be completed prior to construction to support applications for water licence(s). These studies will determine the available under-ice volume that can be taken from each source in accordance with the DFO guidance (DFO, 2010).

All creeks and rivers between Wrigley and Prohibition Creek with existing bridge or bridge-sized culvert crossings, and the Mackenzie River, where accessible, are potential sources for water withdrawal (Table 5.8). Water withdrawals from watercourses will be limited to certain months of the year when flows meet minimum requirements for ecological protection (DFO, 2013), or as otherwise authorized. Table 5.8 presents a summary of available flow from the potential watercourses based on desktop evaluation (K'alo-Stantec, 2022d, 2023). Additional studies of lake and/or river sources may be required to support project authorizations.

During engagement with Indigenous Governments, Indigenous Organizations, and other affected parties, participants identified streams and lakes suitable for water withdrawal. For example, concerns were raised about water withdrawal from Trout Lake at the base of Bear Rock (Petınızah) so it has been removed from consideration as a potential water source for the Project.

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Table 5.7 Potential Lake Water Sources

Potential Source ²	Approximate Access from Alignment (KM station)	Coordinates (all Zone 10)		Potential Available Water Volume ¹	
		Easting	Northing	Available Winter Volume (m ³) ³	Available Summer Volume (m ³) ⁴
WSWrigley	686	479497	7008951	U	U
WR2	702	472036	7016389	4,277	36,496
WR3	719	470063	7032542	U	U
WR4	722	468289	7035078	U	U
WS791	791	440548	7096102	U	U
WR5	799	436935	7102044	0	U
WR6	804	436369	7107258	682	79,647
WR7	810	434895	7112780	U	U
WR8	820	433668	7120640	25,174	at least 25,174
WR9	826	431087	7127153	0	U
WR10	834	425896	7132328	1,316	at least 1,316
WR11	839	423158	7136740	0	U
Mio Lake	858	412714	7155905	98,727	743,243
WR13	876	411367	7166920	0	U
WR16	881	411677	7171746	4,899	5,663
WR18	891	407754.2	7178631	22,937	138,544
WS893	893	405318.4	7178932	U	U
WR19	904	404789	7188854	1,181	3,595
WR22	916	398118	7199490	0	225,436
WR21	921	392634	7199056	0	3,061
WR20	909	389327	7199974	0	U
WS948	948	371930	7210050	U	U
WR28	950	370015	7210416	20,449	20,449

Notes:

¹ See K'alo-Stantec (2023) for methods and limitations

² As referenced in K'alo-Stantec (2023) and Golder (2008)

³ From bathymetric surveys reported in Golder (2008); based on 10% of under-ice water withdrawal (DFO, 2010)

⁴ Based on 10 cm drawdown

U: Unknown

Table 5.8 Estimated Water Availability in Major Streams Intersected by the Project per DFO (2013) Criteria

Watercourse Location	MVH Alignment (KM)	Watershed Area (km ²)	Estimated Monthly Water Availability ¹ (m ³)												Annual Water Availability (m ³)
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hodgson Creek Bridge	695.6	358	0	0	0	253,860	2,561,344	745,800	781,913	700,817	576,570	386,663	193,710	0	6,200,677
Ochre River Bridge	725.7	1,207	0	0	0	813,120	13,287,561	3,524,820	3,443,046	3,780,326	3,758,520	1,439,857	0	0	30,047,250
Whitesand Creek Bridge	733.8	346	0	0	0	179,340	2,346,545	788,370	524,396	490,668	426,300	313,658	0	0	5,069,277
Big Strawberry Creek Culvert	748.5	59	0	0	0	67,140	511,097	98,280	67,146	73,005	63,240	59,458	0	0	939,366
Small Strawberry Creek Culvert	748.6	49	0	0	0	60,570	435,705	79,050	54,157	59,799	51,780	49,941	0	0	791,002
Vermillion Creek South Bridge	752.3	68	0	0	0	72,630	577,592	116,160	79,174	85,064	73,710	67,952	0	0	1,072,282
Bob's Canyon Creek Culvert	755.3	9	0	0	0	23,880	102,765	10,980	7,719	9,827	8,490	10,323	0	0	173,984
Dam Creek Bridge	764.8	110	0	0	0	94,890	874,200	204,630	138,477	142,786	123,840	106,795	0	0	1,685,618
Blackwater Bridge	785.3	10,716	0	0	0	0	57,512,502	59,656,980	31,846,269	15,246,389	13,791,420	10,055,470	0	0	188,109,030
Steep Creek Bridge	816.5	154	0	0	0	114,390	1,168,204	304,050	204,724	205,158	178,020	146,537	0	0	2,321,083
Devil's Canyon Bridge	828.4	21	0	0	0	37,800	209,870	29,130	20,212	23,994	20,760	22,506	0	0	364,272
Saline River Bridge	831.9	317	0	0	0	170,850	2,176,076	711,180	473,680	446,524	387,900	288,858	0	0	4,655,068
Seagrams Creek Bridge	844.3	57	0	0	0	65,850	496,124	94,380	64,511	70,339	60,930	57,567	0	0	909,701
Little Smith Creek Bridge	852.3	439	0	0	0	204,720	2,880,799	1,043,340	691,486	634,105	551,130	392,336	0	0	6,397,916
Big Smith Creek Bridge	872.1	1,076	0	0	0	0	9,012,816	4,527,960	1,438,524	1,730,141	1,973,850	827,545	0	0	19,510,836
Gotcha Creek Bridge	912.7	155	0	0	0	114,810	1,174,745	306,360	206,274	206,615	179,280	147,436	0	0	2,335,520
Twelve Mile Creek Bridge	922.0	42	0	0	0	55,830	384,028	66,510	45,663	51,057	44,220	43,524	0	0	690,832
Four Mile Creek Culvert	931.5	17	0	0	0	33,630	174,933	22,710	15,810	19,096	16,530	18,445	0	0	301,154
Great Bear River Bridge	937.2	158,400	141,955,200	126,524,160	139,276,800	132,710,400	182,666,880	169,257,600	168,739,200	169,810,560	162,000,000	160,704,000	144,892,800	145,972,800	1,844,510,400
Jungle Ridge Creek Bridge	967.8	60	0	0	0	39,960	550,219	168,660	60,419	78,864	88,890	48,701	0	0	1,035,713
Notta Creek Bridge	971.5	65	0	0	0	70,830	555,582	110,160	75,144	81,034	70,200	65,131	0	0	1,028,081
Vermillion Creek North Bridge	973.4	92	0	0	0	85,920	749,456	165,810	112,530	117,800	102,120	90,272	0	0	1,423,908
Prohibition Creek Bridge	984.0	86	0	0	38,812 ²	74,880	740,404	159,180	98,270	104,377	98,220	94,457	0	0	1,408,600

Notes:

Watercourses are sorted from south to north along the proposed Project alignment.

¹ Water availability is 10% of the median total flow for the month. Zero water availability indicates that discharge in that month is less than 30% of mean annual discharge (DFO, 2013).

² See limitations in K'alo-Stantec (2022d)

Sources: K'alo-Stantec (2022d, 2023)

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5.4.12 Wastes

During Project construction, various waste materials will be generated and hazardous materials will be used. The collection, transportation, treatment, and disposal of waste materials, including hazardous wastes generated during construction activities, will be in accordance with the WMP (Volume 5). Details of waste volumes and waste management will be developed by the GNWT and the contractor prior to construction in accordance with regulatory requirements (land use permit[s] and water licence[s]).

The following types of waste will be generated during project construction:

- Camp greywater
- Camp sewage
- Camp solid waste
- Recyclables
- Hazardous waste

Management of greywater and sewage will include the storage of wastewater generated at the construction camps and the periodic transport and disposal of this waste. Sewage will be stored in temporary tanks, removed by vacuum truck, and transported to sewage lagoon facilities in Wrigley, Tulita, or Norman Wells that agree to accept project sewage. Greywater will be transported to sewage lagoon facilities or may be deposited to a greywater sump in accordance with the Northern Land Use Guidelines (GNWT, 2015a), if approved to do so by the Inspector. Construction camps are assumed to have capacity for up to 80 people, depending on the construction season. The wastewater generation associated with the maximum number of people (up to 80 people) in two camps, per segment to be constructed, will be approximately 20 m³ (20,000 litres) per day per camp during peak occupancy.

The management of solid waste from the camps and construction activities may include incineration or the storage of the solid waste and the periodic collection of the wastes in a covered container vehicle. Waste will be hauled for disposal to municipal solid waste disposal facilities at Norman Wells and/or other municipal facilities that agree to accept project waste. Solid waste generated per camp during maximum occupancy (80 people) will be approximately 1 m³ per day. With two camps, approximately 2 m³ of solid waste will be generated per day during peak construction periods. The GNWT will negotiate agreements with the municipalities to receive this waste. If municipal facilities are unable to accept solid waste, containerized waste will be transported by road to an alternate accredited facility approved to accept the specified project wastes.

Certain wastes, such as food-contaminated waste and cardboard, are suitable for incineration. Incineration may be used to divert certain types of wastes from municipal solid waste facilities. Incinerators, if intended to be used by the contractor, will be operated in accordance with applicable guidelines and best practices at the time, including Canadian Council of Ministers of the Environment (CCME) Canada-wide Standards for Dioxins and Furans, CCME Canada-wide

Standards for Mercury, and Environment and Climate Change Canada (ECCC) Technical Document for Batch Waste Incineration (ECCC, 2010).

There are currently no facilities in the Sahtu or Dehcho regions licenced to accept and manage recyclables or hazardous wastes from commercial operations. Recyclable wastes and hazardous wastes will be backhauled for disposal and/or recycling at accredited facilities capable of accepting such wastes within or outside of the NWT.

5.4.13 Access and Site Security

The MVWR will be open to public and commercial traffic and Indigenous land users throughout project construction during the winter. As outlined in Section 5.3.1, a TMP will be applied to identify, control, and report safety risks to project personnel and the public. Examples of safety and security measures to be applied include:

- Access to construction workspaces will be allowed for authorized construction personnel only
- Signage and physical barriers will be used to identify restricted areas to provide separation between workspaces and the MVWR for public safety and security
- Access to quarries/borrow sources during active quarrying and hauling will not be permitted
- Access to the constructed embankment during periods when the MVWR is closed will not be permitted due to safety concerns
- Barriers will be used to restrict vehicle access until construction is completed and the highway is commissioned for use

5.4.14 Construction Employment and Contracting

5.4.14.1 Estimated Workforce and Seasonal Timing

For the purpose of the environmental assessment, it is estimated that the contractor's construction workforce will be 40 to 70 persons per crew, with two crews per segment working on a rotational basis. Up to 10 additional personnel per segment may include the GNWT's Engineers and contractor's specialists that are not present on regular rotation.

The estimated direct construction workforce required to complete each segment of the conceptual project schedule is:

- 160-280 contractor's construction personnel (40-70 persons plus cross-shift at two work camps)
- 8-10 contractor's supervisors (4-5 supervisory personnel per cross-shift)
- 6 contractors' environmental/wildlife monitors (three per cross-shift)

- 24-30 contractor's camp services personnel (for example, cooks, first aid, cleaning, per camp plus cross-shift)
- Contractor's construction administration and management personnel

The Project is assumed to be constructed during approximately 300 days per year, with potential non-construction periods representing times of spring freshet (May-June) and while the MVWR is being constructed annually (November-December).

Additional contracted jobs and business opportunities on the Project will be related to supply and resupply, waste haul, equipment and material supply, and personnel transport.

5.4.14.2 Workforce Arrangements

For the purpose of the environmental assessment, and reflecting the conceptual construction schedule, the following workforce arrangements are assumed:

- Workers will be employed on 12 hour per day, 14 day rotations.
- Work is conducted on a day shift only.
- 50% of the approximately 200-330 person contractor workforce will be from local Sahtu and Dehcho communities and from elsewhere in the NWT; the remainder of the workforce is expected to be from outside of the NWT.
- NWT Bureau of Statistics estimated an available labour supply (for 2019) of 1,237 individuals (444 in the Sahtu Region and 793 in the Dehcho Region) (NWT Bureau of Statistics, 2020). Of those, approximately 863 individuals indicated a willingness to work in rotational shift employment; it is assumed that 100 individuals will be hired from this pool in the Sahtu and Dehcho communities.
- Workers from Norman Wells, Tulita, and Wrigley will have the option to reside in their home community during their rotation, if possible, with shuttles transporting them to the worksite when ground transportation is available. These workers will stay in the construction camp at other times.
- Most positions are likely to be seasonal full-time or on a per-project basis. The number of workers required by occupation or skill would be determined during the detailed design of the Project.

5.4.14.3 Qualifications and Training

Construction of the Project will present business and employment opportunities for general labourers, equipment operators, surveyors, environmental monitors, camp staff (cooks, camp managers, custodians), expeditors, engineering and technical staff, and construction administrators, among others. As noted above, there will be additional employment opportunities associated with the need for supply and resupply, waste haul, equipment and material supply, and personnel transport.

With the intention of maximizing hiring from the Sahtu and Dehcho regions, the GNWT will facilitate job readiness and training as follows:

- The construction schedule will be shared with communities once finalized to encourage local residents to undertake applicable training programs in anticipation of project employment.
- The GNWT and project contractors will both have roles in supporting recruitment and skills training for local workers. The GNWT will work with local academic institutions in the design of short-duration, skill-based courses for northern residents to improve job readiness, expand the available labour pool, and enhance local skill capacity. The availability of training programs would be dependent on the level of interest and expected enrollment of community members.
- Contractors will be required to report on training, including the types of training provided and the number of employees trained.
- The GNWT will share information about Labour Market Programs, which provide support for individuals, employers, organizations, and communities.

5.4.14.4 Procurement Policy

Although specific procurement plans will be determined closer to the time of tender, based on the conceptual construction schedule used for this assessment it is anticipated that:

- Contracts may be awarded for short, medium or long portions of highway segments of 20 km or less, 21 to 99 km, or 100 km or more, respectively.
- Contracts for the construction of one or more smaller portions closest to the communities of Norman Wells, Tulita, and Wrigley may be tendered concurrently with one or more of the longer and more remote sections of the Project.

5.4.15 Roles and Responsibilities of Communities

Confirmation of roles and responsibilities of communities during construction will be developed as applicable. The GNWT intends to negotiate agreements with municipalities with existing potable water, wastewater and solid waste facilities to provide potable water and to receive project wastes.

5.4.16 Summary of Construction Activities and Timing

The assumed schedule of activities in the construction phase used in the assessment is summarized in Table 5.9. As indicated in Section 5.4.1, the assessment assumes that three segments will be constructed in sequence.

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Table 5.9 Summary of Construction Activities and Timing Used for Assessment

Activity per Segment (3 Segments Total)¹	Assumed Timing²
Mobilization of equipment, materials, and fuel by barges or on MVWR	Summer and/or winter, prior to the first year of construction of each segment
Resupply by barges or MVWR	Annually in summer and winter for each construction segment (approximately 3-4 years) with 2 years between of no activity
Establishment and operation of camps and maintenance yards	Annually, year-round for each construction segment (approximately 3-4 years) with 2 years between of no activity
Site preparation of ROW, project winter travel lanes, and maintenance areas	Winter for each construction segment (approximately 3-4 years) with 2 years between of no activity
Borrow source and quarry development and operations, including blasting, crushing, sorting, and stockpiling	Year-round for each construction segment (approximately 3-4 years) with 2 years between of no activity
Material haul	Year-round for each construction segment (approximately 3-4 years) with 2 years between of no activity
Embankment and quarry access road construction, including road cuts	Winter, during first 1-2 years of construction of each segment; blasting/excavation of road cuts may occur in summer or winter
Culvert installation	Summer or winter
Road base placement, compaction, and surfacing	Summer, during last 2 years of construction of each segment
Water withdrawal	Winter and summer as required to support construction activities
Closure and reclamation of MVWR and temporary borrow sources/quarries, camps, and workspaces	Summer, during final year of construction of each segment
Demobilization	Summer and/or winter following the completion of each segment

Notes:

¹ As described in Section 5.4.1

² Summer: April to November; Winter: December to March

5.5 Operations and Maintenance Works and Activities

As a preface to this section, operations and maintenance activities are those activities that are necessary to operating the highway as a highway under the *Motor Vehicles Act*. This includes operating and maintaining each of the segments of the highway until they together become a contiguous highway. Operations and maintenance activities include routine activities within the ROW such as snow clearing, brushing, resurfacing, grading, culvert and bridge maintenance, and dust control. Other physical works and activities outside of the ROW required to support ongoing highway maintenance, such as quarrying (Section 5.5.5), maintenance yards (Section 5.5.6), and water use (Section 5.5.7), are part of the Project.

5.5.1 Responsibilities

The Mackenzie Valley Highway will become a permanent part of the NWT highways system. Once commissioned for use, operations and maintenance activities within the ROW of the Mackenzie Valley Highway will be the responsibility of the GNWT-INF.

5.5.2 Snow Clearing, Grading and Dust Control

The driving surface of the highway and access roads will be maintained and repaired regularly for safety and to mitigate environmental effects. Snow clearing will be conducted following snowfall events. Snow clearing involves pushing snow from travel lanes and shoulders onto the sideslopes where meltwater is diverted into drainage culverts and off the driving surface. The height of snowbanks will be minimized to the extent possible and to a height of less than 1 m.

Resurfacing and grading will be conducted regularly in summer to repair potholes and address washboard. This may require placement of additional granular material. While repairs are being completed, temporary traffic controls will be implemented.

Water will be used to reduce dust in summer. A water truck will be used to spray water on the driving surface, with water obtained from authorized sources. Dust control will be conducted as needed, with daily dust control likely to be needed when conditions are dry and in areas sensitive to dust deposition, such as near communities.

5.5.3 Right-of-Way Vegetation Control

The cleared ROW will require periodic clearing of vegetation (brushing) to maintain sight distances for public safety. Brushing will involve using a track-mounted mower to clear saplings and shrubs. Brushing may be required approximately every three years and will generally be completed in September or October. Brushed material will be chipped or mulched and left on the ROW.

5.5.4 Culvert and Bridge Maintenance

Each completed segment of the Project, including existing bridges and culverts along the MVWR, as well as new culverts constructed as part of the Project, will be integrated into the operations and maintenance of the Project.

Culvert and bridge maintenance is conducted annually on highways throughout the NWT. Culvert maintenance will likely be completed in late winter to clear obstructions such as branches and ice. This can be done by hand or using portable equipment to reduce disturbance to riparian areas. Bridge maintenance is conducted as needed to repair guardrails, decking, and bridge approaches.

5.5.5 Quarrying

Approximately nine of the borrow sources and quarries used for construction will remain open as material sources for maintenance of the highway. Candidate permanent borrow and quarry sources are listed in Table 5.10. These borrow sources and quarries will have permanent access roads and may be operated year-round, or intermittently. Activities to occur at these locations include annual blasting, crushing, sorting, and stockpiling of granular material, primarily during summer. These permanent sources will retain material stockpiles year-round but equipment will be removed annually when not in use, except where the borrow source/quarry is also the location of a permanent maintenance yard (see Section 5.5.3). It is estimated that 30,000 m³ to 50,000 m³ of gravel is needed annually for road maintenance.

Table 5.10 Proposed Permanent Material Sources for Operations and Maintenance

Source ID ¹	Location on Alignment (KM)	Ownership	Material Type	Probable Volume (millions m ³)
10.028	711	Territorial	Rock	3.4
10.014A	734.6	Territorial	Granular	2.5
10.007	753	Territorial	Granular	0.7
9.043	783.5	Territorial	Granular	0.9
9.019	821.6	Territorial	Rock	7.3
9.002	850.4	Private (Sahtu)	Granular	3.1
8.039	865.7	Territorial/ Private (Sahtu)	Rock	7.3
7.109	949.3 or 951.0 (Alignment Option)	Territorial	Rock	4.3
7.083	976.8	Territorial	Rock	1.5

Note:

¹ As reported in K'alo-Stantec (2021)

Alternate permanent material sources may be selected from Table 5.4 or Table 5.5. Though the sources in Table 5.5 are not proposed for development at this time, they are identified as additional sources of material, should the primary sources not be able to be developed. The alternate (additional) sources are not assessed as part of the Project, as doing so would overestimate the project effects. The GNWT may apply to use alternate sources instead of primary sources, applying the same mitigation measures. The need to develop alternate sources may be identified as design and community engagement progresses prior to permitting using factors previously describe in Section 5.4.5.1.

If and when permanent material sources need to be closed, they will be closed and reclaimed in accordance with the QDP and objectives and activities described for closing quarry sources in Section 5.4.9. Progressive reclamation will be ongoing.

5.5.6 Maintenance Yards

Two to three permanent maintenance yards (facilities) will be located at permanent borrow/quarry sources proximal to the alignment to facilitate ongoing maintenance of the highway during the operations and maintenance phase. Their locations have not yet been determined. These permanent maintenance areas will include:

- Maintenance garage and office
- Material stockpiles
- Fuel storage
- Equipment parking area

Permanent maintenance areas will have controlled access to project personnel only.

5.5.7 Summary of Water Use for Operations and Maintenance

During operations and maintenance, water will be used for dust control. Water will be withdrawn in summer from authorized locations. Water withdrawal will be in accordance with DFO measures to protect fish and fish habitat, *Interim code of practice: end-of-pipe fish protection screens for small water intakes in freshwater*, the *DFO Protocol for Winter Water Withdrawal from Ice-covered Waterbodies in the Northwest Territories and Nunavut* (DFO, 2010), and *Framework for Assessing the Ecological Flow Requirements to Support Fisheries in Canada* (DFO, 2013). The estimated water use for operations and maintenance is summarized in Table 5.11.

Table 5.11 Estimated Annual Water Use for the Project During Operations and Maintenance

Water Use	Estimated Daily Volume (all sources) (m ³)	Annual Volume (m ³)	Timing
Compaction and Dust Control	100	10,000	Summer

5.5.8 Maintenance Employment and Contracting

The operations and maintenance of the Mackenzie Valley Highway will be the responsibility of the GNWT-INF. Annual operations and maintenance priorities and budgets are approved as part of the government's annual budget cycle. Annual maintenance costs are estimated at \$9 million per 100 km of highway.

To undertake highway operations and maintenance, the following is an estimate of the workforce requirements, per highway segment supported by a maintenance yard:

- Three to four heavy equipment operators and one supervisor during summer and winter
- Three to four casual labourers during summer

Heavy equipment operators are anticipated to be qualified to operate several types of equipment such as a grader, tandem truck, bottom dump trailer and water truck. Casual labour will be required for duties such as traffic control, litter management, visual inspections and sign maintenance.

5.5.9 Operations

The highway's principal purpose is to facilitate vehicle movements. It will therefore be the highway's presence that will lead to certain potential effects which must be assessed, such as those resulting from public use of the highway. Operations activities that are part of the Project include the highway's presence and the public use of the highway.

5.5.9.1 Traffic Volumes

Anticipated traffic volumes on the Mackenzie Valley Highway once constructed will reflect:

- Local traffic travelling between the communities
- Commercial traffic needed for community operations and resupply
- Traffic associated with operating small businesses, such as tourism
- Industrial traffic to support exploration, development, operations and/or closure and reclamation of natural resource developments, such as oil and gas or forestry

The design of the highway and the assessment of potential effects on the environment as assessed in the DAR anticipates an average traffic volume of 50 vehicles per day, including a mix of vehicles such as pickup trucks and truck trailers up to a weight of 64,000 kilograms (kg). This is consistent with the approximate current average annual daily traffic on the MVWR (GNWT, 2020). The Low Volume Road design allows for average daily traffic of up to 200 vehicles per day.

There are no reasonably foreseeable projects that will increase the number of heavy industrial users, as speculated in the ToR (MVEIRB, 2015). The highway will accommodate potential future industrial users up to 200 vehicles per day average daily traffic, within the load limits of the existing bridges. The need to accommodate industrial users beyond the design capacity of the highway and/or address additional maintenance required will be evaluated if/when these activities are disclosed.

5.5.10 Summary of Operations and Maintenance Works and Activities Timing

The anticipated schedule of works and activities during the operations and maintenance phase is summarized in Table 5.12.

Table 5.12 Summary of Operations and Maintenance Works and Activities Timing

Works or Activity	Timing
Borrow source and quarry operations, including blasting, crushing, sorting, and stockpiling	Summer, annually
Material haul and stockpiling	Summer, annually
Operation of and activities at maintenance yards	Year-round, annually
Water withdrawal for dust control	Summer, annually
Presence and public use of the highway	Year-round, annually
Highway and access road maintenance including repair, grading and dust control	Summer, annually
Highway and access road snow clearing	Winter, annually
Vegetation control	Late summer, every three years
Bridge and culvert maintenance	Winter and summer, as needed

5.6 Closure and Reclamation

The Project will become part of the Northwest Territories Highway system, operated and maintained as capital infrastructure. The Mackenzie Valley Highway will be permanent infrastructure intended to be open in perpetuity, therefore closure and reclamation of the highway is not within the scope of the Project and not a phase of the temporal scope of the assessment (see Section 4.3.3.2). The closure and reclamation of quarries and maintenance areas was described in Section 5.4.9.

5.7 References

5658 NWT Ltd. and GNWT (5658 NWT Ltd. and the Government of the Northwest Territories). 2011. Project Description Report for Construction of the Mackenzie Valley Highway Tulita District, Sahtu Settlement Area.

Dessau, 2012. Mackenzie Valley Highway Extension Pehdzeh Ki Ndeh – Dehcho Region - Project Description Report. Prepared for the Government of the Northwest Territories, Department of Transport.

DFO (Fisheries and Oceans Canada). 2010. DFO Protocol for Winter Water Withdrawal from Ice-covered Waterbodies in the Northwest Territories and Nunavut.

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- DFO. 2013. Framework for Assessing the Ecological Flow Requirements to Support Fisheries in Canada. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2013/017.
- ECCC (Environment and Climate Change Canada). 2010. Technical Document for Batch Waste Incineration.
- GNWT (The Government of the Northwest Territories). 2015a. Northern Land Use Guidelines. Camps and Support Facilities.
- GNWT. 2015b. Northern Land Use Guidelines – Pits and Quarries.
- GNWT. 2020. Northwest Territories Highway Traffic Report. Available at: https://www.inf.gov.nt.ca/sites/inf/files/resources/2020_highway_traffic.pdf. Accessed June, 2023.
- Golder. 2008. Bathymetric Surveys of Potential Water Extraction Sources Summary Report – Final. Mackenzie Valley Winter Road, Water Use Study, Sahtu Region, Northwest Territories.
- K'alo-Stantec (K'alo-Stantec Limited). 2021. Mackenzie Valley Highway Extension Project Prospective Borrow Source Assessment. Prepared for Government of the Northwest Territories Department of Infrastructure. 806 pp.
- K'alo-Stantec. 2022a. Mackenzie Valley Highway Terrain Mapping and IFEA Alignment Analysis. Prepared for Government of the Northwest Territories Department of Infrastructure. 53 pp.
- K'alo-Stantec. 2022b. Mackenzie Valley Highway Project Climate Lens Part II: Climate Resilience Assessment. Prepared for Government of the Northwest Territories Department of Infrastructure. 71 pp.
- K'alo-Stantec. 2022c. Mackenzie Valley Highway Project: Technical Data Report—Fish and Fish Habitat. Prepared for the Department of Infrastructure, the Government of the Northwest Territories, Yellowknife, Northwest Territories.
- K'alo-Stantec. 2022d. Prohibition Creek Access Road: Desktop-based Assessment of Water Availability. Prepared for the Government of the Northwest Territories Department of Infrastructure. 40 pp.
- K'alo-Stantec. 2023. Mackenzie Valley Highway: Desktop-based Assessment of Water Availability. Prepared for Government of the Northwest Territories Department of Infrastructure. 91 pp.
- MVEIRB (Mackenzie Valley Environmental Impact Review Board). 2015. Terms of Reference EA1213-02 Mackenzie Valley Highway Extension Project Wrigley to Norman Wells Government of Northwest Territories. February 13, 2015. PR#66.
- NWRRC (Norman Wells Renewable Resource Council). 2023. Norman Wells Renewable Resources Council Traditional Land and Resource Use Study for Tulita District Mackenzie Highway Project. Prepared by K'alo-Stantec Limited. Prepared for Norman Wells Renewable Resources Council.

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NWT Bureau of Statistics. 2020. Summary of Community Statistics 2020. Available at:
<https://www.statsnwt.ca/community-data/index.html>. Accessed October 2021.

Price. 2009. Predication Manual.

TAC (Transportation Association of Canada). 2017. Geometric Design Guide for Canadian Roads. 3rd ed.

TAC. 2020. Geometric Design Guide for Special Roads.

TetraTech. 2021. Mackenzie Valley Highway Dehcho Segment Hydrotechnical Assessment.

TetraTech. 2022. Mackenzie Valley Highway Sahtu South Segment Hydrotechnical Assessments.

TRRC (Tulita Renewable Resource Council). 2022. Tulita Renewable Resources Council Traditional Land and Resource Use Study for Tulita District Mackenzie Highway Project. Prepared by: K'alo-Stantec Limited. Prepared for Tulita Renewable Resources Council.

6.0 AUTHORIZATIONS, APPROVALS, AND AGREEMENTS

The Terms of Reference (ToR; Mackenzie Valley Environmental Impact Review Board [MVEIRB], 2015 [Public Registry {PR}#66]) require identification of all permits, licences, other regulatory approvals, and land tenure agreements needed for the Mackenzie Valley Highway Project (the Project). The ToR requires the Government of the Northwest Territories (GNWT) to demonstrate how the Project conforms to the Sahtu Land Use Plan (SLUP) and if an exception is required (MVEIRB, 2015 [PR#66]). These requirements are addressed in this chapter.

6.1 Authorizations and Approvals

Applicable statutes and regulations to the Project are summarized in Table 6.1, where they relate to anticipated project activities requiring authorizations or approvals. The associated approval agencies are also summarized in Table 6.1.

The GNWT anticipates that other authorizations or approvals will be required to continue to support detailed design and project planning. This will include geotechnical investigations, which will require a land use permit, engagement with Indigenous Governments, Indigenous Organizations and other affected parties, archaeological assessments, and may require traditional land and resource use (TLRU) studies over and above those completed for the Project. These studies will address some gaps and uncertainties identified in specific valued component (VC) assessments.

Table 6.1 Approvals / Authorizations Applicable to the Project

Legislation	Authority	Activity	Project Phase	Authorization / Action
Quarrying Regulations (Northwest Territories)	GNWT- Department of Environment and Climate Change (ECC)	Quarrying on Territorial Lands	Construction, Operations and Maintenance	Quarry Permit(s)
Sahtu Dene and Metis Comprehensive Land Claim Agreement (SDMCLCA)	Tulita District Land Corporation Ltd.	Quarrying on Sahtu Settlement Lands – Tulita/Norman Wells District	Construction, Operations and Maintenance	Quarry Agreement(s)

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Legislation	Authority	Activity	Project Phase	Authorization / Action
Mackenzie Valley Land Use Regulations (Federal)	Mackenzie Valley Land and Water Board (MVLWB) and/or Sahtu Land and Water Board (SLWB)	Equipment use, earthworks, camp operation, drilling, clearing, fuel storage, use and storage of explosives, levelling, grading, cutting	Construction	Type A Land Use Permit(s)
Mackenzie Valley Land Use Regulations (Federal)	MVLWB and/or SLWB	Equipment use and earthworks outside of the right-of-way (ROW), drilling, use and storage of explosives at quarries	Operations and Maintenance	Type A Land Use Permit(s)
<i>Waters Act</i> and Waters Regulations (Northwest Territories)	MVLWB and/or SLWB	Water use >299 cubic metres (m ³)/day, construction of a structure across a waterbody 5 metres (m) wide or more	Construction	Type A Water Licence(s)
<i>Waters Act</i> and Waters Regulations (Northwest Territories)	MVLWB and/or SLWB	Water use	Operations	Type B Water Licence(s)
<i>Fisheries Act</i> (Federal)	Fisheries and Oceans Canada (DFO)	Works in or near water	Construction, Operations and Maintenance	Letter of Advice/ Authorization
-	Enbridge Pipelines Inc.	Crossing of pipeline ROW	Construction, Operations and Maintenance	Enbridge Pipelines Inc. Third-Party Crossing Agreement
<i>Explosives Use Act</i> and Regulations (Northwest Territories)	Workers' Safety and Compensation Commission	Use and storage of explosives	Construction, Operations and Maintenance	Explosives Use Permit
<i>Area Development Act</i> , Mackenzie Development Area Regulations (Northwest Territories)	GNWT-ECC	Cutting of trees	Construction	Written Authorization from Officer

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Legislation	Authority	Activity	Project Phase	Authorization / Action
<i>Wildlife Act</i> (Northwest Territories)	GNWT-ECC	Project scope and activities per the GNWT-ECC (previously GNWT-ENR) determination August 19, 2021	Construction, Operations and Maintenance	Approval of Tier 2 Wildlife Management and Monitoring Plan
Archaeological Sites Regulations (Northwest Territories)	GNWT Prince of Wales Northern Heritage Centre (PWNHC)	Survey, excavation, alteration, disturbance, or study of archaeological sites	Construction	Class 1 and/or Class 2 Archaeologists Permit(s)
SDMCLCA	Tulita District Land Corporation Ltd.	Permission to Access Sahtu Settlement Lands	Construction	Letter of Approval
Forest Management Regulations (Northwest Territories)	GNWT-ECC	Clearing of timber	Construction	Timber Cutting Permit or Timber Cutting Licence
<i>Public Highways Act</i> (Northwest Territories)	GNWT Department of Infrastructure (INF)	Operation of and access to Mackenzie Valley Winter Road (MVWR) and Mackenzie Valley Highway once constructed	Operations and Maintenance	N/A; The GNWT is the proponent and regulator
<i>Northwest Territories Lands Act¹ and Commissioner's Land Act</i> (Northwest Territories)	GNWT-ECC	Construction of the Project	Construction	Reservation by Notation (Reserve)
<i>Northwest Territories Lands Act, SDMCLCA</i>	GNWT-ECC, Tulita District Land Corporation Ltd.	Establishment of a permanent roadway, quarries, access roads, and ROWs across Territorial ¹ and Sahtu Settlement Lands	Operations and Maintenance	Land Access Agreement(s), Lease(s) and/or Land exchange(s), depending on land ownership

Note:

¹ Territorial Land and the *Northwest Territories Lands Act* are anticipated to be replaced by Public Land and the *Public Lands Act*, respectively, prior to the effective date of authorizations for construction.

6.2 Land Tenure Agreements

The Project will include activities on Territorial Lands and Commissioner's Lands (public) and Sahtu Settlement Lands as identified in the SDMCLCA. Where land tenure or ownership is required for infrastructure on Sahtu Settlement Lands (e.g., quarries, borrow sources, access roads, and new portions of the highway ROW), the GNWT will negotiate the appropriate terms and conditions with the Tulita District Land Corporation Ltd. The existing Mackenzie Valley Winter Road (MVWR) is located on Commissioner's Land, except for several small portions that are located on Sahtu Settlement Lands that are authorized through lease, with provisions for land exchanges that are at various stages of being completed.

The current Project footprint, inclusive of the highway ROW, access roads, and maximum extent of all 15 quarry/borrow sources, conservatively intersects approximately 360 hectares (ha) of Sahtu Settlement Lands. This area does not take into account the existence of the 60 m ROW through these Sahtu Settlement Lands for the MVWR, some of which will be shared by the Project. The final highway alignment (and other components of the Project footprint) to be constructed will be determined subject to design and safety considerations, the outcome of the environmental assessment, and Consultations with the Sahtu Secretariat Inc, per the SDMCLCA.

To prevent future dispositions on those portions of the proposed highway that are on public land, the GNWT-INF will apply for a reservation by notation (reserve) from the GNWT-ECC. A reserve approach is used by the GNWT to preserve and set aside land for a public purpose, as provided for in Section 19(b) of the *Northwest Territories Lands Act* and Section 4 of the *Commissioner's Land Act*. A reserve is not a sale or disposition of land. Once the Project is constructed and formally designated as a public highway under the *Public Highways Act*, the GNWT-INF will apply to have the reserve relinquished.

The Project will also intersect a 30 m wide easement through Territorial Lands for the Norman Wells Pipeline ROW.

6.3 Conformity with Land Use Plan

There is no land use plan in effect in the Dehcho Region. The Project is subject to the SLUP (Sahtú Land Use Planning Board [SLUPB], 2023). The Project is located within six zones of the SLUP:

- General Use Zones
- Petinizah (Bear Rock) Conservation Zone (CZ) (Zone #32)
- Mio Lake CZ (Zone #36)
- Norman Range Special Management Zone (SMZ) (Zone #50)
- K'ąąłọ Tué (Willow Lake Wetlands) Special Management Zone (SMZ) (Zone #62)
- Deh Cho (Mackenzie River) SMZ (Zone #63)

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Lands within the community boundaries of Tulita and Norman Wells are exempt from the Plan. There are 13 general conformity requirements (CRs) that apply across all zones. These are listed in Table 6.2. An additional CR (CR#14) applies to the CZs and SMZs. The values to be protected, respected or taken into account in CZs and SMZs under CR#14 is provided in Table 6.3. Bulk water removal is prohibited in all zone types.

Activity within the Petınızah (Bear Rock) CZ (Zone #32) includes the construction and operations and maintenance of the highway ROW. Activity with the Mio Lake CZ may include water withdrawal, though the use of this sources has not yet been confirmed.

Between Tulita and Norman Wells, the Project will intersect with only the very southernmost portion of the Norman Range SMZ (Zone #50), which includes the entire Level IV Norman Range Ecoregion including Sam McRae Lake, Turton Lake, Chick Lake, Oscar Lake, Kelly Lake, Lennie Lake, and Yamoga Rock. It does not add CRs to the 14 described in Table 6.2. The Project intersects a small portion of the K'ąął Tué (Willow Lake Wetlands) SMZ (Zone #62), which is bounded to its south by the Sahtu Deh (Great Bear River) SMZ (Zone #33). This will not add CRs to those 14 described in Table 6.2.

The Deh Cho (Mackenzie River) SMZ (Zone #63) is defined by a 5 kilometre (km) buffer that applies to the length of the Deh Cho (Mackenzie River) as it runs through the Sahtu Region and will require meeting only the 14 CRs described in Table 6.2.

Table 6.2 summarizes how the Project will meet the CRs. No exceptions to the SLUP will be needed.

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Table 6.2 Sahtu Land Use Plan Conformity Requirements

Conformity Requirement	Status	Supporting Evidence
<p>1. Land Use Zoning</p> <p>1) Land must be used in accordance with the land use zones. Bulk water removal is a prohibited land use in all zone types. The prohibited land uses in CZs are mineral exploration and development, oil and gas exploration and development, quarrying, power development, and commercial forestry.</p> <p>2) Does not apply.</p>	<p>Project activities will not include bulk water removal in these CZs and land use in the CZ (highway) is not a prohibited type and quarrying is not proposed within the CZs.</p>	<p>Chapter 5 project description</p>
<p>2. Community Engagement and TK</p> <p>1) For all applications for land use activities, community organizations and potentially affected community members must be adequately engaged with respect to:</p> <ul style="list-style-type: none"> a) Proposed activities, b) Potential impacts of the proposed activities on specific locations, including heritage resources, and other issues of concern identified in the engagement, c) Traditional knowledge that is relevant to the location, scope, and nature of the proposed activities. <p>2) The proposed activities must be designed and carried out with due regard for community concerns and incorporate relevant traditional knowledge.</p>	<p>Engagement with Indigenous Governments, Indigenous Organizations and other affected parties on the themes of Project scope and activities, potential effects, and mitigation measures took place between 2021 and 2023.</p> <p>Project-specific Traditional Knowledge (TLRU) studies were completed with Norman Wells and Tulita Renewable Resources Councils.</p> <p>The GNWT has engaged with Indigenous Governments, Indigenous Organizations, and other affected parties in Délı̄ne, Colville Lake (K'áhbamítúé), Tulita (Tulít'a), Norman Wells (Tłegóhı̄) and Fort Good Hope (K'asho Got'ine). Engagement is ongoing.</p>	<p>Chapters 2, 3, 8-22</p>

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Conformity Requirement	Status	Supporting Evidence
<p>3. Community Benefits</p> <p>The intent and priority are for residents and communities to benefit from land use activities. Land use activities must contribute to the social, cultural, and economic well-being of residents and communities, as per the guiding principles outlined in S 25.2.4 of the SDMCLCA and S. 35 of the MVRMA and applicants are encouraged to work with relevant community organizations and businesses to maximize the benefits to communities, businesses, and residents from proposed land uses.</p>	<p>Engagement with Indigenous Governments, Indigenous Organizations, and other affected parties in the Sahtu Region is ongoing.</p> <p>A Memorandum of Understanding (MOU) has been signed with the Sahtu Secretariat Incorporated (SSI). SSI Steering Committee and working group meetings occur regularly.</p> <p>Community capacity-building projects including the Christina Creek All Season Access Road (CCASAR), the Prohibition Creek Access Road (PCAR), and the Great Bear River Bridge (GBRB) have either been completed or will be completed in the future and are meant to be capacity-building projects that will provide skills and training development and facilitate community readiness for the Project.</p>	<p>Chapters 1, 2, 9</p>
<p>4. Archaeological Sites and Burial Sites</p> <p>1) Land use activities must not be located within 500 m of known or suspected burial sites, or within 150 m of known or suspected archaeological sites, unless measures are developed in cooperation with the PWNHC, affected communities, or in the case of burial sites, with affected families where possible, to fully mitigate all impacts to the site.</p> <p>2) In areas where there is a high risk of impact to known or suspected archaeological sites, as determined by the PWNHC, an archaeological impact assessment must be conducted prior to commencement of the land use activity.</p>	<p>An Archaeological Impact Assessment (AIA) will be completed prior to construction in areas with high archaeological potential.</p> <p>The required mitigation will be implemented in areas where the Sahtu Land Use Plan applies.</p>	<p>Chapter 22</p>

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Conformity Requirement	Status	Supporting Evidence
<p>5. Watershed Management</p> <p>The land and water boards will ensure that the proposed land use activity:</p> <ul style="list-style-type: none"> a) does not substantially alter quality, quantity, or rate of flow for waters that flow on, through, or adjacent to Sahtu Settlement Lands. b) is subject to mitigation measures to minimize potential impacts on surface and groundwater that flow into CZs, SMZs, PCIs [Proposed Conservation Initiatives] and EPAs [Established Protected Areas]. 	<p>Project effects on water quantity including volume and flow are predicted to be not significant, on the basis that the magnitude of changes will be less than 10%. Project effects on water quality are also predicted to be not significant, on the basis that they are not likely to result in a persistent measurable change in parameters that adversely affect ecological and/or human receptors. Mitigation measures for groundwater and surface water quality, quantity are identified in Table 15.8 and Table 16.5.</p>	<p>Chapters 15, 16, Table 15.8 and Table 16.5</p>
<p>6. Drinking Water</p> <ul style="list-style-type: none"> 1) Any land use activity that would result in the contamination of surface or groundwater within community catchments is prohibited. 2) Where there is reasonable potential for any land use activity to affect a downstream drinking water source: <ul style="list-style-type: none"> a) the affected community must be informed and engaged with respect to potential impacts, the design of mitigation measures and monitoring programs; b) baseline water quality data must be collected from the drinking water source prior to the start of any activity; and c) regular water quality testing of the source watershed must be conducted to monitor potential impacts. 	<p>The Project will occur within the Norman Wells and Tulita Community Drinking Water Catchment Areas (SLUPB, 2022). With the implementation of mitigation measures in Table 16.5 and Erosion and Sedimentation Control Plan (Volume 5), potential effects due to erosion and sedimentation from vegetation clearing and culvert installations are predicted to be negligible and not anticipated to result in adverse or long-term changes to water quality. Water and sediment quality monitoring will be conducted as required to confirm effectiveness of the mitigation measures and to facilitate adaptive management.</p>	<p>Chapter 16, Table 16.5</p>

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Conformity Requirement	Status	Supporting Evidence
<p>7. Fish and Wildlife</p> <p>1) Land use activities must be designed using the most current information for identified species of interest and species at risk as obtained from the GNWT-ECC, Environment and Climate Change Canada’s Canadian Wildlife Service, DFO, Parks Canada Agency, the Sahtú Renewable Resources Board (SRRB) and the local Renewable Resources Council (RRC)s.</p> <p>2) Impacts to wildlife, their habitat and migration patterns, and important community harvesting areas must be prevented or mitigated to the extent possible.</p> <p>a) In particular, all reasonable steps should be taken to follow the horizontal setbacks and minimum flight altitudes identified in Table 4 [of the SLUP] when near habitat sites during sensitive periods described in that table, unless human safety is of concern, and measures are developed with the appropriate organizations and the RRC to mitigate impacts to these species and their habitat.</p> <p>b) In addition, DFO has established in-water construction timing windows for the protection of fish and fish habitat. These are updated from time to time and are available at https://www.dfo-mpo.gc.ca/pnw-ppe/timing-periodes/index-eng.html. During these periods, no in-water work or shoreline work is allowed except under site- or project-specific review and with the implementation of protective measures.</p> <p>c) Barren-ground caribou and woodland caribou are especially important to communities and have been shown to be sensitive to disturbance. Map 4 [of the SLUP] shows the fall-winter core range for barren-ground caribou, annual range for the boreal woodland caribou and Redstone northern mountain woodland caribou herd, and sensitive seasonal ranges for the South Nahanni and Redstone northern mountain woodland caribou herds when additional protective measures are required. All land use activities occurring in these areas are required to address impacts to caribou and their habitat during the following periods:</p> <ul style="list-style-type: none"> • At all times of year when operating within the portions of the annual ranges of the Redstone northern mountain woodland caribou herd and boreal woodland caribou that overlap with the Sahtú Settlement Area (SSA); 	<p>The assessment of potential effects on fish and wildlife applies:</p> <ul style="list-style-type: none"> • Fish and fish habitat studies completed in 2020 and 2021 • TLRU studies completed in 2022 and 2023 with Norman Wells RRC and Tulita RRC • Data and reports from the SRRB harvest study • Data from GNWT-ECC caribou collars and moose surveys • Other publicly available data from government sources <p>Project effects on wildlife and wildlife habitat are assessed in Chapters 10, 19 and 20.</p> <p>Mitigation measures are included in Table 10.5, Table 17.6, Table 19.7, Table 20.7 and the draft Wildlife Management and Monitoring Plan ([WMMP] Volume 5).</p> <p>The Project overlaps with the annual range of boreal caribou. The potential effects of the Project on boreal caribou from changes to mortality, changes to habitat, changes to movement and changes to health are presented in Chapter 10.</p> <p>Project effects on fish and fish habitat are assessed in Chapter 17 and supported by mitigation measures in the draft Fish and Fish Habitat Protection Plan ([FFHPP] Volume 5)</p>	<p>Chapters 10, 17, 19, 20, Table 10.5, Table 17.6, Table 19.7, Table 20.7, draft WMMP, draft FFHPP</p>

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Conformity Requirement	Status	Supporting Evidence
<p>7. Fish and Wildlife (cont'd)</p> <ul style="list-style-type: none"> • Between May 21-October 15 when operating within the portion of the summer and rut range of the South Nahanni northern mountain woodland caribou herd that overlaps with the SSA; and • Between Oct 8-March 31 when operating within the portions of the Bluenose West and Bluenose East fall-winter core ranges that overlap with the SSA 		
<p>8. Species Introduced</p> <p>Land use activities must not result in the intentional introduction of non-native plant and animal species, or of domestic animal species or subspecies, except by special approval by the appropriate authority. All reasonable precautions must be taken to prevent the introduction of non-native species or sub-species.</p>	<p>Mitigations to address the introduction of invasive alien plant species are presented in Table 18.7.</p>	<p>Table 18.7</p>
<p>9. Sensitive Species and Features</p> <p>1) Any land use activity requiring a land use permit or water license must be designed using the most current available information on the location of rare or may-be-at-risk plants, hot and warm springs, mineral licks, karst topography, amphibian sightings, and ice patches and carried out in a manner that minimizes impacts to these features.</p> <p>2) Specifically, land use activities:</p> <ul style="list-style-type: none"> a) must not take place within 1,000 m of any known mineral lick, unless the activity cannot feasibly meet this requirement, and it can be demonstrated that alternative mitigation measures will protect the lick b) that are situated within the boundary of glacial refugia or within 500 m of known hot or warm springs and have the potential to impact rare or maybe-at-risk plants shall require a plant survey. Any rare or maybe-at-risk plants found in the survey shall be monitored for impacts from the activity c) situated within the area of ice patches identified in Map 5 [of the SLUP] <p>3) The location of any hot or warm spring or mineral lick discovered while carrying out an authorized activity must be reported to nwt_pas@gov.nt.ca and any amphibian sightings to nwtsoer@gov.nt.ca.</p>	<p>The assessment identifies and assesses effects of the Project on rare plants, important wildlife areas, and habitat features, where present within the study areas.</p> <p>No hot springs have been identified within the vegetation study area based on available information. If identified, these will be reported.</p> <p>Mineral licks are not documented in the study areas but there is potential for these features to be present. If identified, these will be reported.</p> <p>There is potential for rare plants to be present in the Project Development Area (PDA). A rare plant survey will be conducted in suitable habitats within in the PDA prior to construction.</p>	<p>Chapters 17, 20, 21, Wildlife Management and Monitoring Plan</p>

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Conformity Requirement	Status	Supporting Evidence
<p>10. Permafrost Any land use activity requiring a land use permit or water licence must be designed and carried out in a manner that prevents and/or mitigates adverse environmental impacts resulting from the degradation or aggradation of permafrost.</p>	<p>The Project will apply best practices for the protection of permafrost as described in Table 14.5 and the Permafrost Protection Plan.</p>	<p>Chapter 14</p>
<p>11. Project-specific Monitoring Any land use activity requiring a land use permit or water licence must include site-specific monitoring, that is sufficient to monitor the effectiveness of the activity’s proposed mitigation measures and any impacts to the values in the surrounding area, as defined in the Plan’s Background Report, zone descriptions and in discussions with communities.</p>	<p>Monitoring will be done in accordance with the Wildlife Management and Monitoring Plan, Erosion and Sedimentation Control Plan, Permafrost Protection Plan, and conditions of the land use permit(s) and/or water licence(s).</p>	<p>Chapter 23 and Volume 5</p>
<p>12. Financial Security When required by a land use permit or water licence issued by the Land and Water Board, financial security must be posted and maintained with the responsible federal or territorial Minister. The Land and Water Board will ensure that closure and reclamation plans for land use permits and water licences are in accordance with legislation and regulation.</p>	<p>Not applicable – the GNWT does not need to provide financial security as it is a public government.</p>	<p>N/A</p>
<p>13. Closure and Reclamation All applications for land use must include consideration of closure and reclamation and where appropriate, plans shall be developed in consultation with community organizations.</p>	<p>Closure and reclamation of temporary camps, quarries, maintenance yards and the MVWR and intent to obtain input from landowners, Indigenous Governments, Indigenous Organizations, and other affected parties are described in Section 5.4.9.</p>	<p>Section 5.4.9</p>

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Conformity Requirement	Status	Supporting Evidence
<p>14. Protection of Special Values Any land use activity proposed within a SMZ, CZ ,or PCI must be designed and carried out in a manner that protects, respects, or takes into account the values of the zone as directed in the Plan’s Zone Descriptions.</p>	<p>The GNWT-INF will implement mitigation measures and commitments to protect, respect, and take into account the identified values of wildlife, fish, water, heritage resources, and traditional land and resource use within the CZs and SMZs intersected by the Project.</p>	<p>Throughout</p>

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Table 6.3 Special Values to be Protected

Zone	Special Values to be Protected, Respected, or Taken into Account	Supporting Evidence
Petinizah (Bear Rock) Conservation Zone (CZ) (Zone #32)	Values to be Protected: Petinizah commonly known as Bear Rock, is a large karst formation across from the community of Tulita. The mountain is one of the most sacred sites for the Dene living in and outside of the Sahtu. Archaeological sites are known to exist.	Sections 5.2.3, 11.4.4.2, 22.4
	Values to be Respected: Species and habitat in the zone include: waterfowl and migratory bird habitat including nesting area for raptors, important breeding duck habitat, a Canadian Wildlife Service (CWS) key migratory bird terrestrial habitat site, Important Wildlife Area for moose, furbearer habitat, boreal woodland caribou and bears. The CWS has identified all three Important Bird Areas (IBA) as key migratory bird terrestrial habitat sites in the NWT. These IBAs represent important breeding habitat for globally and continentally significant concentrations of several species. The Lower Mackenzie River Islands IBA, a globally significant site, is a major stopover along the Western Central Flyway, hosting as many as 112,800 waterfowl and most of the Western Central Flyway population of Snow Geese (estimated to be half a million) in spring. Moose, furbearers and fish are harvested.	Sections 10.4, 11.4.2.2, 11.4.3.2, 11.4.4.2, 11.4.5, 12.4, 13.4, 14.4, 15.4, 16.4, 17.4, 18.4, 19.4, 20.4
	Values to Take Into Account: Traditional trails. Within Tulita’s community drinking water source catchment.	Sections 11.4.2.2, 11.4.3.2, 11.4.4.2, 11.4.5, 12.4, 15.4, 16.4
Mio Lake CZ (Zone #36)	Values to be Protected: Archaeological and burial sites	Section 22.4
	Values to be Respected: Wildlife habitat includes: wetlands, waterfowl and migratory bird habitat, important breeding duck habitat, boreal woodland caribou habitat, general moose habitat and moose winter habitat. Moose and fish harvesting take place throughout the zone.	Sections 10.4, 12.4, 13.4, 14.4, 15.4, 16.4, 17.4, 18.4, 19.4, 20.4
	Values to Take Into Account: Traditional trails, cabins, camps, log timber harvest sites	Sections 11.4.2.2, 11.4.3.2, 11.4.4.2, 11.4.5, 18.4
Norman Range Special Management Zone SMZ (Zone #50)	Values to be Protected: Archaeological and burial sites.	Section 22.4
	Values to be Respected: Habitat for: waterfowl and migratory birds, muskox, moose, furbearers, bears and boreal woodland caribou habitat (all year). Important Wildlife Areas for muskox, furbearers and moose, important breeding duck habitat, a CWS key migratory bird terrestrial habitat site and fish bearing lakes (Moon Lake, Sam McRae Lake, Turton Lake, Chick Lake, Oscar Lake, Kelly and Lennie Lake) lie in the zone. The Bluenose West barren-ground caribou herd uses the zone as fall and wintering habitat. Furbearer, moose, fish, barren-ground caribou, bears, berries and plants are harvested. Special Harvesting Areas for birds as per the SDMCLCA exists as do karst features, eskers and wetlands. Yamoga Rock is an important sacred site.	Sections 10.4, 11.4.2.2, 11.4.3.2, 11.4.4.2, 11.4.5, 12.4, 13.4, 14.4, 15.4, 16.4, 17.4, 18.4, 19.4, 20.4

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Zone	Special Values to be Protected, Respected, or Taken into Account	Supporting Evidence
Norman Range Special Management Zone SMZ) (Zone #50) (cont'd)	Values to Take Into Account: Cultural and recreation sites, cabins, tent frames, camps, outpost sites, log timber harvest, traditional trails; within the Fort Good Hope/Colville Lake Group Trapping Area; part of Tulita’s community drinking water source catchment.	Sections 11.4.2.2, 11.4.3.2, 11.4.4.2, 11.4.5, 12.4, 15.4, 16.4, 18.4
K’ąąłq Tué (Willow Lake Wetlands) Special Management Zone (SMZ) (Zone #62)	Values to be Protected: Archaeological and burial sites.	Section 22.4
	Values to be Respected: The wetland is relatively productive habitat and supports large populations of wildlife such as moose, beaver, waterfowl, fish, black bear, lynx, snowshoe hare, muskrat, mink, and marten. Boreal woodland caribou occur throughout. Moose habitat is abundant. The site is general waterfowl and migratory bird habitat as well as a key breeding, nesting and fall staging area for waterfowl populations of international significance. Moose, fish, furbearers, barren-ground caribou and bears are harvested as are berries and plants.	Sections 10.4, 11.4.2.2, 11.4.3.2, 11.4.4.2, 11.4.5, 12.4, 13.4, 14.4, 15.4, 16.4, 17.4, 18.4, 19.4, 20.4
	Values to Take Into Account: Log timber harvest, traditional trails and an outpost camp at the northern end of Willow Lake where cabins are used for recreation and subsistence harvest at various times of the year are found; within Tulita’s community drinking water source catchment.	Sections 11.4.2.2, 11.4.3.2, 11.4.4.2, 11.4.5, 12.4, 15.4, 16.4, 18.4
Deh Cho (Mackenzie River) SMZ (Zone #63)	Values to be Protected: Archaeological and burial sites.	Section 22.4
	Values to be Respected: The water quality and riparian habitat is of primary concern. The Mackenzie River (Deh Cho) and its basin provide important wildlife habitat for a number of species such as moose, migratory birds, waterfowl, boreal woodland caribou, furbearers and fish., important resting stops and feeding areas for migratory birds and waterfowl, important breeding duck sites and riparian areas with high moose density in winter time all exist in the zone. Special Harvesting Areas as per the SDMCLCA for moose, waterfowl and birds, plant and berry picking sites and fish camps are located along the river.	Sections 10.4, 11.4.2.2, 11.4.3.2, 11.4.4.2, 11.4.5, 12.4, 13.4, 14.4, 15.4, 16.4, 17.4, 18.4, 19.4, 20.4
	Values to Take Into Account: Traditional trails, recreation, community gathering places, log timber collection areas, cabins. The portion of the Mackenzie River (Deh Cho) that runs through the K’asho Got’ine District occurs within the Fort Good Hope-Colville Lake Group Trapping Area. Within Fort Good Hope and Tulita’s community drinking water source catchments.	Sections 11.4.2.2, 11.4.3.2, 11.4.4.2, 11.4.5, 12.4, 15.4, 16.4, 18.4

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6.4 References

Government of Canada and Sahtu Secretariat Inc. 1993. Sahtu Dene and Métis Comprehensive Land Claim Agreement.

MVEIRB (Mackenzie Valley Environmental Impact Review Board). 2015. Terms of Reference EA1213-02 Mackenzie Valley Highway Extension Project Wrigley to Norman Wells Government of Northwest Territories. February 13, 2015. PR#66.

SLUPB (Sahtú Land Use Planning Board). 2022. Sahtú Land Use Plan Background Report.

SLUPB. 2023. Sahtu Land Use Plan. Government of Northwest Territories. Fort Good Hope. Ratified but not available as of July 19, 2023; see <https://sahtulanduseplan.org/plan>.

7.0 ASSESSMENT OF ALTERNATIVES

7.1 Introduction

The Terms of Reference (ToR) requires the Government of the Northwest Territories (GNWT) to describe alternate highway routes considered and evaluation of the environmental effects of these alternative routes (Mackenzie Valley Environmental Impact Review Board [MVEIRB], 2015 [Public Registry {PR}#66]). The ToR also requires a description and evaluation of alternative methods for highway design, construction, and operation that are technically and economically feasible, and the environmental effects of these alternative methods (MVEIRB, 2015 [PR#66]).

7.1.1 Identification of Alternatives

This chapter compares alternative routes and alternative methods. A description of alternatives is provided in Sections 7.2 and 7.3.

7.1.1.1 Alternative Routes

In this chapter, two highway routes are compared:

1. Project Route: the preferred alignment routing corridor (as described in Chapter 5 and Appendix 5A mapbook), including the Bear Rock Alignment Option
2. Inland Route Alternative: an alternate route in the Dehcho Region

7.1.1.2 Alternative Methods

Two construction methods are compared:

1. Project construction option: the preferred long highway segments constructed under two to three separate contracts
2. Short segment construction alternative: short highway segments (20 kilometres [km] or less) constructed under separate contracts

The following design, construction, and operations and maintenance methods are not considered further:

- Winter road only (Project does not proceed): The objective of the Mackenzie Valley Highway Project (the Project) is to extend the Mackenzie Highway to provide all-season access to the Sahtu communities of Tulita, Norman Wells, and eventually, following additional later regulatory applications as required, to the Dempster Highway. Not proceeding with the Project to upgrade the winter road to an all-season road will not allow the GNWT to meet its objective of connecting Canada to the Dempster Highway to realize the socio-economic opportunities for Northwest Territories (NWT) residents and all Canadians.
- An “all-at-once” construction alternative: Construction of new highway from Wrigley (Pehdzéh Kì N’deh), hereafter referred to as Wrigley, to Prohibition Creek as one large contract is not considered further, because this will preclude participation by local contractors and will limit long-term employment and training opportunities. This alternative would also have a very high one-time capital cost.

Alternative design methods are not considered as the design is guided by the appropriate road designation of the Transportation Association of Canada and best practices.

7.1.2 Influence of Engagement

Project engagement with Indigenous Governments, Indigenous Organizations, and other affected parties has been ongoing since 2010. The purpose and methods of engagement are described in Chapter 2, and Section 5.2.3, Table 5.2 summarizes how the project design has been influenced by comments or concerns raised during project engagement to date. Engagement outcomes have been considered in the evaluation of alternatives. For example, the Project Route addresses comments to follow the Mackenzie Valley Winter Road (MVWR) alignment as much as possible and to tie into specific existing bridges, such as the Blackwater River Bridge. The Bear Rock Alignment Option was developed to address concern by Indigenous Organizations and other affected parties in Tulita regarding the proximity of the MVWR to Bear Rock (Petinı́zah). In the Dehcho Region, in response to concerns about disturbance to an important moose pasture, the alignment was moved further to the west and the alignment routing corridor was expanded to provide flexibility for alignment routing options and an “optimized alignment” (Dessau, 2012 [PR#13]) was developed to avoid sensitive features identified by the Pehdzéh Kì First Nation.

7.2 Project Route and Alternative Route

The evaluation of routes compares the Project Route to the Inland Route Alternative.

7.2.1 Description of the Project Route

The Project Route is the alignment routing corridor as described in Chapter 5 and Appendix 5A mapbook. Chapter 5 discusses the Project design basis and design objectives around which the Project Route has been defined and assessed. In this evaluation of routes, the Project Route is defined generally as a 1 km wide corridor centered on the preliminary highway alignment, except where a wider (3 km corridor) has been identified to accommodate alignment options in the area of a moose pasture near Mount Gaudet and at five bridge crossing locations where different bridge approach options, such as road switchbacks and roadcuts, are being considered to address steep grades at these locations. These are not evaluated further here because they will be considered during design advancement and the completion of geotechnical investigations and are considered to be an outcome of the progression of design within the identified routing corridor.

The Project Route includes an (8 km) alignment route option in the area of Bear Rock (Petınızah) from kilometre marker (KM) 947 to KM 954 (Bear Rock Alignment Option).

The Project Route was chosen based on earlier studies of alignment routing and the “optimized alignment,” as presented in Dessau (2012 [PR#13]) and 5658 NWT Ltd and GNWT (2011 [PR#16]). This route generally follows the MVWR with local re-routes to avoid wetlands and sensitive terrain. This route ties into nine existing bridges and two existing borrow sources in the Dehcho Region and is also within the 1 km wide alignment routing corridor and therefore considered part of the Project Route as compared to the route alternative.

7.2.2 Description of the Inland Route Alternative

The Inland Route Alternative is an alternate route in the Dehcho Region, generally 5 km east of the Mackenzie River (Deh Cho). An Inland Route Alternative was chosen for evaluation in response to community engagement input received from Pehdzéh Kì First Nation in 2012 (as reported in Dessau, 2012 [PR#13]). This route has not had any formal routing completed but could conceptually be located near the route of the Norman Wells Pipeline. There are no established bridges or quarries along this conceptual route.

7.2.3 Evaluation of Routes

The Project Route is being advanced through the environmental assessment. The Project Route and Inland Route Alternative are compared in the sections that follow.

7.2.3.1 Evaluation Criteria

The two routes are evaluated based generally on the design parameters and objectives as previously introduced in Sections 5.2.1 and 5.2.2 as applicable to route selection. Safety is not considered in the evaluation, as it is assumed that both routes must equally be designed to applicable highway standards for safety. The evaluation criteria have been grouped into technical, economic, and environmental categories, as applicable, using the groupings in Table 7.1. Some criteria are applicable to more than one evaluation category.

Table 7.1 Criteria Used to Evaluate Routes

Criteria	Technical	Economic	Environmental
Use the existing MVWR alignment to the extent possible		✓	✓
Tie alignment to all existing MVWR watercourse crossing structures (bridges and bridge-sized culverts)		✓	✓
Avoid sensitive terrain and wetlands where possible	✓		✓
Situate the highway near to, and prioritize use of, existing and proximal quarries and borrow sources, where possible, to reduce the need for new access roads		✓	✓
Reduce footprint through areas of traditional, cultural, and ecological importance			✓
Avoid known archaeological and heritage resources where practicable			✓
Optimize use of natural topography to reduce material requirements (such as avoiding the need for deep fills)	✓	✓	✓
Reflect engagement input to the extent practicable	✓	✓	✓
Maintain cost-effectiveness in construction, operations, and maintenance		✓	

The routes are compared using the three criteria groupings in Section 7.2.3.2, addressing the criteria identified by check marks in Table 7.1.

7.2.3.2 Comparative Evaluation

7.2.3.2.1 Technical

As it pertains to technical criteria, an Inland Route Alternative may be better in certain ways to the Project Route. The Inland Route Alternative is situated at higher elevation along its length, on the long westward-facing slope of the Franklin Range. As such, the inland route generally has good drainage and avoids many of the lakes and wetlands located closer to the Mackenzie River (Deh Cho), which are present along the Project Route. As this Inland Route Alternative has not had any terrain or engineering analysis completed, it cannot be compared with equivalent detail against the Project Route in terms of relative presence of deep valleys or steep sideslopes which would require deeper material fills. Both route alternatives address engagement input, as comments were received to support both route alternatives.

7.2.3.2.2 Economic

The Project Route will have the advantage of using the MVWR during the winter construction season to mobilize equipment and materials and to use as a travel lane. The Inland Route Alternative will require construction of a winter road each season to support construction, leading to increased construction costs.

The Project Route incorporates nine existing bridges. These bridges were constructed by the GNWT to extend the seasonal operation of the MVWR and have a design life of 75 years. The Inland Route Alternative will not have the benefit of existing bridges and requires construction of four or more new bridge-sized crossings. This negatively affects the GNWT's investment in long-term road infrastructure. The Inland Route Alternative, however, may require fewer new culverts compared to the Project Route because the watercourses to be crossed at the inland route location may be better defined, owing to the upland terrain location. A comparison of cost, however, is not possible without a more detailed route evaluation.

The Project Route traverses through and passes close to several borrow sources, whereas the inland route alternative will provide better access to additional potential rock sources (quarries). Additional potential quarries have not been identified or evaluated.

7.2.3.2.3 Environmental

The Project Route strives to follow the MVWR as much as possible and to use existing borrow sources and disturbances to limit the need for new clearing. The Inland Route Alternative requires clearing of a full new right-of-way (ROW) along its entire length; the road and Norman Wells Pipeline would not be able to be accommodated within the 60 metres (m) highway ROW width. It is possible that the Inland Route Alternative could parallel the existing clearing associated with the ROW of the pipeline in places, but not likely along its entire length because road and pipeline infrastructure apply very different design criteria and therefore would have different horizontal alignment routing. An inland route will avoid some of the wetlands and habitats associated with wetlands used by wildlife species, such as waterbirds and moose. An inland route will encroach further into the annual range of boreal caribou and result in more direct and indirect habitat loss compared to the Project Route, as it will not follow the existing cleared ROW of the MVWR.

A limiting factor for the inland route is the availability of water sources needed for construction and operations and maintenance. Related to this, due to the need to construct new crossings over major watercourses, there will be additional short- to medium-term effects on water resources during construction of these structures. Generally, there may be fewer effects associated with constructing new access roads to quarry sources for the inland route alternative as there are likely to be more suitable material sources available closer to the route than the Project Route.

7.2.3.3 The Preferred Route

The GNWT's preferred route is the Project Route, as it is the only route that makes use of all existing bridges constructed by the GNWT and meets the objective of following the MVWR as closely as possible. The use of existing bridges will limit new effects on aquatic ecosystems and cultural and traditional land use and resources at these larger watercourses, and will maintain consistency with the original construction costs estimates. Following existing cleared ROW to limit new clearing is preferred to clearing new ROW. This is a key mitigation measure for reducing effects of the Project on wildlife, including caribou and moose. The Project Route accommodates alignment options, including the "optimized alignment". An alternative route has been evaluated, and the GNWT concludes that the Project Route is on balance preferred to the Inland Route Alternative.

Though considered part of the Project Route, the Bear Rock Alignment Option provides alternative routing along the Project Route from KM 957 to KM 954. This option has been identified as the preferred option by Indigenous Organizations and other affected parties in Tulita during engagements held in 2022. The option will reduce the potential effects on cultural and traditional land use and sensitive environmental features associated with Bear Rock (Petinı́zah) as described in the Sahtu Land Use Plan (SLUP; Sahtu Land Use Planning Board [SLUPB], 2023). The Bear Rock Alignment Option is approximately 0.4 km longer than the Project Route and could generate over 200,000 cubic metres more material from a road cut than a road cut on the Project Route. A decision to advance the Bear Rock Alignment Option as the preferred option along this portion of the Project Route has not yet been made by the GNWT.

7.3 Alternative Methods of Constructing the Project

Two approaches (methods) to constructing the Project have been evaluated. Ultimately, the contractor selected by the GNWT to construct the Project will be responsible for proposing a detailed construction methodology and schedule that will meet the scope and design requirements as specified in the tender documents.

The comparison of the two construction approaches considers factors that could influence, or be influenced by, the different construction schedules and approaches, such as equipment requirements, camp requirements, workforce, cost, and effects to local infrastructure. The two construction approaches are based on the GNWT's and its engineering consultants' previous experience and working knowledge of infrastructure construction in the Northwest Territories.

7.3.1 Construction Approaches

The Project requires construction of approximately 281 km of new all-season gravel highway embankment, with 102 km in the Dehcho Region and 179 km in the Sahtu Region. In the Sahtu Region it is split into two segments by the Great Bear River Bridge project and associated access roads. The segment from the Dehcho/Sahtu border to Four Mile Creek is approximately 134 km, and the segment from Tulita to Prohibition Creek is approximately 45 km.

Two construction approaches have been chosen for evaluation as they apply to the type of contractors that are anticipated to be able to execute the two contrasting contract lengths:

1. Project construction approach: long highway segments constructed under two to three separate contracts:
 - Segment 1: Wrigley to the Dehcho–Sahtu border (102 km)
 - Segment 2: Tulita south to the Dehcho–Sahtu border (134 km)
 - Segment 3: Tulita north to the Prohibition Creek Access Road (45 km)
2. Short segment construction alternative: short highway segments (20 km or less) constructed under separate contracts

Local contractors, which are smaller and have limited equipment and labour resources, can execute smaller construction segments. The ability to construct longer segments is anticipated to be limited to larger southern contractors who can meet larger financial bonding requirements. The associated size and availability of contractors also speaks to the rate of construction that affects the overall project duration.

7.3.2 Evaluation of Construction Approaches

The evaluation of construction approaches uses criteria relevant to the assessment of effects on the biophysical and socio-economic environment to compare the options. These are presented in the subsections that follow.

7.3.2.1 Evaluation Criteria

The criteria used to compare the construction approaches are provided below:

- Rate of construction progress: refers to the number of kilometres that can be constructed annually based on equipment and workforce availability affecting overall project duration. Shorter project duration is preferred.
- Use of local labour and contractors: refers to the relative ability to contract local (Sahtu and Dehcho) businesses and to employ local workers. Local employment is preferred.
- Granular resources and maintenance: refers to the availability of suitable material sources to construct the option and the relative effort to maintain constructed sections of road during ongoing construction. Less granular material requirement is preferred.
- Construction camp size and location: refers to the size and location of worker camps needed for the option. Smaller construction camps are preferred.
- Construction cost: refers to the relative total cost to construct the option. Lower cost is preferred.
- Environmental and socio-economic effects: refers to a qualitative comparison of effects on the biophysical and socio-economic environment. Reduced environmental effects are preferred.

7.3.2.2 Comparative Evaluation of Options

7.3.2.2.1 Rate of Construction Progress

The rate of progress for the project construction approach could be 30-40 km/year. The longer segments would take three to four years to construct under the project construction approach. The project construction approach could be constructed in as few as three to four years if each longer segment was contracted concurrently; however, it would be more likely that the segments would be constructed sequentially in 10 years, over a timeframe of 15-20 years, as the construction timeframe would be dependent on the GNWT's incremental receipt of project funding and procurement processes.

The rate of construction progress for the short segment construction alternative would be in the order of 5-10 km/year. A 20 km segment contract would take two years to complete. The short segment construction alternative will take longer to construct than the project construction approach. There are several ways that the short segment construction alternative could be contracted (for example, sequential contracts lasting more than 20 years, or multiple concurrent contracts shortening the timeframe).

Small contractors have fewer construction labour and equipment and tend to work at slower rates than larger contractors with larger construction resources on larger contracts. Recent projects within the Northwest Territories reflect this trend. The construction contract for the 97 km Tłı̄chǫ Highway shows a progress rate of approximately 50 km/year for a two-year projected duration. The 120-km-long Inuvik Tuktoyaktuk Highway construction had a progress rate of 40 km/year over three years. These two construction projects were completed using multiple construction headings (the area of active advancement of the embankment) using mobile camps supporting the construction effort for each heading. Smaller road construction contracts such as the Canyon Creek All Season Access Road have a progress rate of approximately 5-10 km/year and use just one heading as the smaller contractors have limited equipment/labour resources. The rate of progress is closely linked to the level of effort associated with the volume of earthworks and gravel haul so these progress rates should be considered as rough guides.

7.3.2.2.2 Use of Local Labour and Contractors

The short segment construction alternative will provide the greatest use of local resources over an extended period of 15 years or more that allows for long term training and jobs and allows smaller contractors to build up their construction resources. This option also allows the local contractor to act as the prime contractor and to access bonds that would be smaller for this type of bid.

The project construction approach will likely use the local contractor and local resources, but it will be over a shorter duration and the local contractor will not have the opportunity to act as a prime contractor.

7.3.2.2.3 Granular Resources and Maintenance

To execute the short segment construction alternative, the shorter segment contract lengths (up to 20 km) and longer construction duration will result in wear and tear on the constructed portions of road. This may require that a separate maintenance contract to be set up to preserve the already constructed portions of the road in areas where there is long gravel haul between material sources. For the project construction approach, the ability to have multiple headings and longer segment contract lengths should reduce the overall maintenance associated with the longer gaps between material (particularly borrow) sources. Completing the Project within a shorter timeframe will also reduce the maintenance requirements associated with use of the already constructed portions of the highway.

7.3.2.2.4 Construction Camp Size and Location

Construction camps will be required once the construction is located more than 20 km away from a community. With the short segment construction alternative, with only one heading, this means a mobile camp in the order of 50 persons should be sufficient for each contract segment. For the project construction approach, it is likely that there would be multiple headings located at separate granular sources to construct the road. These headings would likely be larger and supported by larger 100-person mobile camps.

7.3.2.2.5 Construction Cost

The construction cost for the project construction approach is likely to be less than the short segment alternative. Efficiencies will arise from fewer contracts to manage, greater competition during the bid process, fewer mobilizations and demobilizations, better utilization of gravel sources, and the associated haul requirements. Challenges on this Project include the irregular distances between granular resources. Normally, one uses quarries only for the granular road structure (sub-base and base courses) and borrow sites are used for the embankment because the cost of producing material out of a quarry is usually more than material being extracted from borrow sites. On this Project, there are very long distances between quarries and long distances between borrow sites. This will result in higher costs per kilometre than if there were more material sources available.

7.3.2.2.6 Environmental and Socio-economic Effects

Effects on the biophysical environment and socio-economic environment are evaluated and compared below for the two construction options.

The short segment construction alternative will require a smaller workforce over a longer timeframe, potentially reducing the burden on community infrastructure and services and the need to establish large construction camps. The project construction approach will require a larger construction workforce, but over a shorter timeframe. The difference in socio-economic effects between the two construction options may be noted in positive effects such as long-term training,

employment, and business opportunities, which may last longer for the short segment construction alternative than the project construction approach.

The short segment construction alternative and the project construction approach do not differ in terms of permanent changes to the socio-economic environment once the Project is constructed.

The short segment construction approach will localize biophysical effects during construction to a segment being constructed over a short timeframe (2 years), but the effects on wide-ranging environmental valued components such as wildlife may persist during the construction of multiple construction segments and may overall be longer in duration than for the project construction approach, which will be constructed over a shorter timeframe.

The project construction approach will require more resources over a shorter timeframe, including granular and rock material and water, and will produce more emissions and wastes due to the larger size of the workforce, more and larger equipment potentially to be used compared to the short segment construction alternative; however, the larger contract associated with the project construction approach may lend itself to using more modern equipment with better emission ratings.

The Project construction approach will have effects that occur over a larger geographic area due to the larger segments to be constructed. The magnitude of effects for wildlife, air quality, noise, and aquatic resources may also be greater primarily due to air, noise, and waste emissions, but those that are reversible will return to baseline conditions in a shorter period than for the short segment construction alternative, resulting in overall less duration of effects for the Project as a whole.

The short segment construction alternative and the project construction approach do not differ in terms of permanent changes to the terrestrial environment once the Project is constructed, such as effects associated with a cleared ROW and the presence and use of a highway. The socio-economic benefits associated with creating all-season access (see Chapter 9) may be realized sooner with the project construction approach.

7.3.2.3 The Preferred Construction Approach

Both construction options are feasible for the GNWT. The construction method to be used will depend on availability of funding and the procurement process to be used, and may end up being a combination of the project construction approach and short-segment alternative. For example, the GNWT may procure short construction segments closer to communities and longer construction segments in more remote areas. The GNWT has chosen to advance the project construction approach through the environmental assessment as it has potential to have larger magnitude adverse effects over a larger geographic area for both socio-economic and biophysical components than the short segment construction alternative and will therefore lead to a more conservative assessment of effects.

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7.4 References

5658 NWT Ltd. and GNWT (5658 NWT Ltd. and the Government of the Northwest Territories). 2011. Project Description Report for Construction of the Mackenzie Valley Highway Tulita District, Sahtu Settlement Area. PR#16.

Dessau. 2012. Mackenzie Valley Highway Extension Pehdzeh Ki Ndeh – Dehcho Region - Project Description Report. Prepared for the Government of the Northwest Territories, Department of Transport. PR#13.

MVEIRB (Mackenzie Valley Environmental Impact Review Board). 2015. Terms of Reference EA1213-02 Mackenzie Valley Highway Extension Project Wrigley to Norman Wells Government of Northwest Territories. February 13, 2015. PR#66.

SLUPB (Sahtu Land Use Planning Board). 2023. Sahtu Land Use Plan. Government of Northwest Territories. Fort Good Hope. Ratified but not available as of July 19, 2023; see <https://sahtulanduseplan.org/plan>.