Mackenzie Valley Review Board

Terms of Reference

EA1213-02

Mackenzie Valley Highway Extension Project

Wrigley to Norman Wells

Government of the Northwest Territories

February 13, 2015

Mackenzie Valley Review Board
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1. Introduction

1.1. Overview

This document outlines the information required for the environmental assessment of the Mackenzie Valley Highway extension project. The Department of Transportation (DOT), Government of the Northwest Territories (GNWT) is proposing to construct a 321 km all-weather road from Wrigley to Norman Wells. The developer is the GNWT. The proposed route for the extension of the Mackenzie Valley Highway ("the highway") is shown on Figure 1.

This Terms of Reference (TOR) will direct the developer to organize existing material, and conduct additional studies and analyses as appropriate, in order to submit a Developer's Assessment Report (DAR). That report will then be used to inform all interested parties about the developer's views of the potential impacts of the proposed development during the analytical phase of the environmental assessment (EA).

1.2. Background

The concept of building an all-weather highway through the Mackenzie Valley to connect southern Canada with northern communities originated in the 1960s, although it was not until 1972 that the federal government announced that the Mackenzie Highway would be extended from Fort Simpson to the Dempster Highway. Construction of the highway started in Fort Simpson but was halted in 1977, approximately 18 km south of Wrigley following completion of 210 km.

The GNWT developed its Highway Strategy in 1989 after authority for the Northwest Territories highway system was devolved from the federal government. By 1994, the remaining 18km of the highway to Wrigley was completed. Preliminary engineering, environmental and financial studies to support planning for construction of the remainder of the proposed highway to Inuvik were completed in 1999.

In 2010, the DOT of the GNWT signed Memoranda of Understanding with the Gwich'in Tribal Council; 5658 NWT Ltd representing the Tulita Land Corporation, the Norman Wells Land Corporation, the Fort Norman Metis Land Corporation and the Tulita Dene Band; K'ahsho Got'ine Development Foundation; and the Pehdzeh Ki First Nation to complete Project Description Reports to support further planning for the development of the highway in their respective territories. The Project Description Reports were completed in 2011 and 2012 providing preliminary design and environmental planning information for each territory.

In August 2014, in accordance with the revised priorities of the GNWT, DOT re-scoped the project footprint for the all-weather highway. The re-scoped project refers to the 321 km all-weather highway from Wrigley to Norman Wells rather than the entire 818 km to the Dempster Highway south of Inuvik.

1.3. Referral to environmental assessment

In February 2013, the DOT submitted a land use permit application to the Mackenzie Valley Land and Water Board for clearing of a section of the proposed Mackenzie Valley Highway in the Gwich'in Settlement Area. In addition, the four Project Description Reports described above were submitted by the developer as part of its application. The Mackenzie Valley Land and Water Board 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, the DOT referred its own application, including the entire 818 km Mackenzie Valley Highway to the Mackenzie Valley Review Board (Review Board).

1.4. Legal context and the Terms of Reference development process

This EA is subject to the requirements of Part 5 of the *Mackenzie Valley Resource Management Act* (MVRMA). Section three of the Review Board's *Environmental Impact Assessment Guidelines* describes the EA process in detail. That document, as well as the Review Board's *Rules of Procedure*, other guidelines, reference bulletins and relevant policies applicable to this assessment are available online (www.reviewboard.ca) or by contacting Review Board staff.

In accordance with ss. 115(1) of the MVRMA, the Review Board must conduct an EA of the proposed development with regard for the protection of the environment from significant adverse impacts, and the protection of the social, cultural and economic well-being of Mackenzie Valley residents and communities. Ss. 114(c) of the MVRMA further requires the Review Board to ensure that concerns of Aboriginal people and the general public are taken into account. Accordingly, the Review Board has developed this TOR based on an examination of information from the following sources:

- Information collected from participants at community scoping meetings held by Review Board staff in September 2013 as follows:
    - Wrigley- September 9, 2013
    - Tulita- September 10, 2013
    - Fort Good Hope- September 11, 2013
    - Inuvik- September 17, 2013
    - Norman Wells- September 18, 2013;
- Information submitted by the developer during preliminary screening including the Project Description Reports and the developer's Preliminary Draft TOR;
- The Updated Project Description Report (August 2014) and MVEIRB's issued Terms of Reference (December 2013);
- Information on the Review Board public registry; and,
- Review Board experience in the conduct of EA.

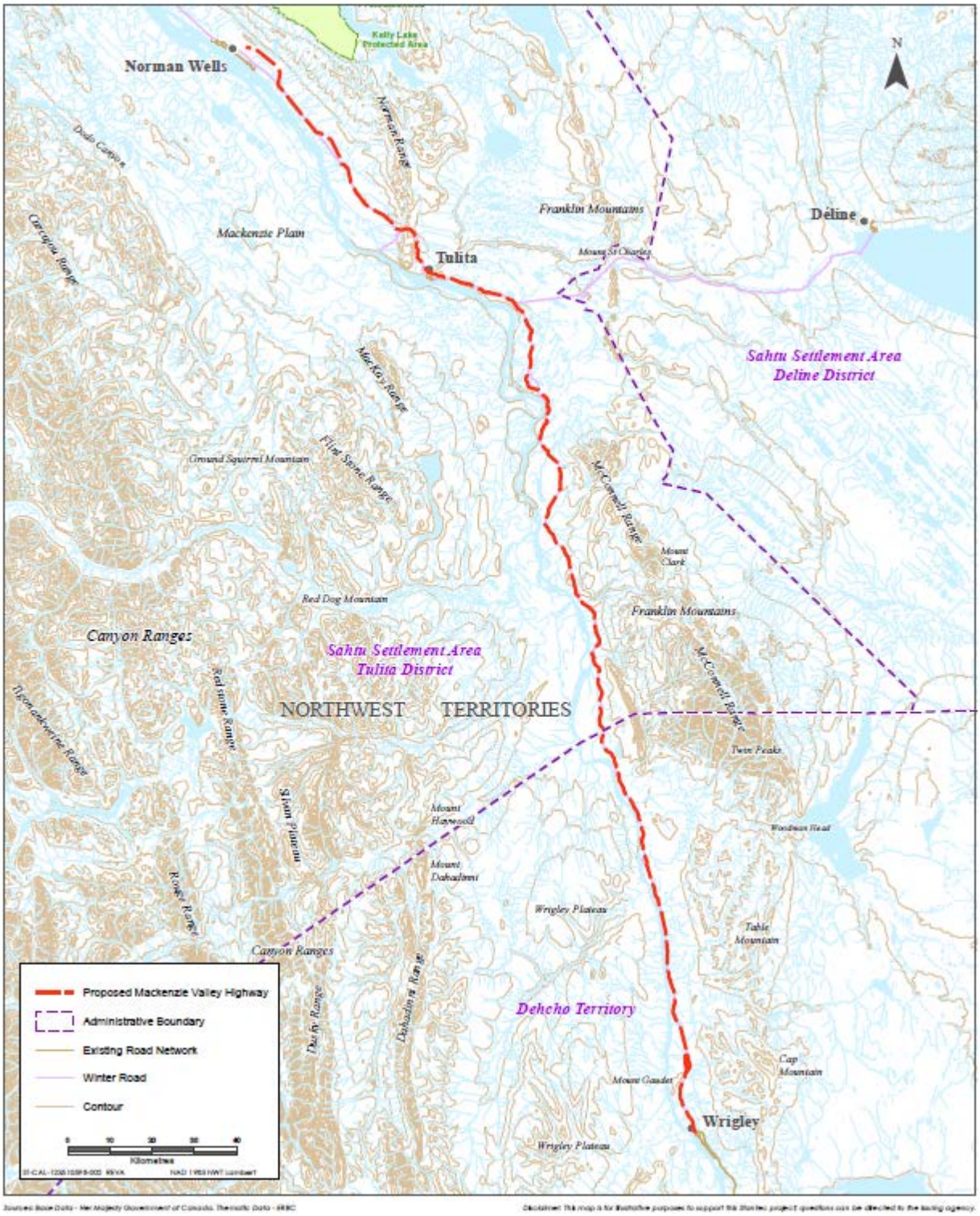

Figure 1 – Mackenzie Valley Highway Extension Project

2. Developer's Assessment Report general requirements

2.1. Presentation of material

The Review Board encourages the developer to present information in user-friendly ways. The use of maps, aerial photos, development component/valued component interaction matrices, full explanation of figures and tables, and an overall commitment to plain language is encouraged. When it is necessary to present complex or lengthy documentation to satisfy the requirements of the TOR, the developer should make every effort to simplify its response in the main body of the text and place supporting materials in appendices. The developer will also produce all electronic documents in Adobe portable document format in files smaller than 40 MB.

The DAR will be submitted as a stand-alone document. Relevant information and analyses from previous project descriptions should be incorporated into the DAR and combined with the supplementary material and analyses required by this TOR. The developer will make all referenced information accessible.

2.2. Incorporation of traditional knowledge

The Review Board considers both traditional knowledge and scientific knowledge in its deliberations. In addition, ss. 115(1)(c) of the MVRMA provides as a guiding principle for the Review Board the importance of conservation to the well-being and way of life of the aboriginal peoples of Canada to whom s. 35 of the *Constitution Act 1982*, applies and who use an area of the Mackenzie Valley. The developer will make all reasonable efforts to assist in the collection and consideration of traditional knowledge relevant to the highway for the Review Board's consideration. Where it is applicable, the developer will make all reasonable efforts to incorporate traditional knowledge from Aboriginal culture holders as a tool to collect information on and evaluate the specific impacts required in this TOR. The developer should refer to the Review Board's *Guidelines for Incorporating Traditional Knowledge into the Environmental Impact Assessment Process*.

2.3. Public engagement

Engagement with communities, Aboriginal groups, governments, or organizations with interests related to areas that might be affected by the highway should be considered in this section. Aboriginal groups, government agencies and other interested parties may have information useful to the conduct of this impact assessment and all reasonable efforts should be made to engage with them. The Review Board encourages the developer to meet with interested groups outside the EA process, and to place any information from those discussions they consider may be relevant to the Review Board's decision on the public record.

The following items are required for consideration of public engagement:

•An engagement log describing dates, individuals and organizations engaged with, the mode of communication, discussion topics and positions taken by participants, including:

- All commitments and agreements made in response to issues raised by the public during these discussions, and how these commitments altered the planning of the proposed highway;
- All issues that remain unresolved, documenting any further efforts envisioned by the parties to resolve them;
- Description of all methods used to identify, inform and solicit input from potentially-interested parties, and any plans the developer has to keep engagement moving forward;
- How the developer has engaged, or intends to engage, traditional knowledge holders in order to collect relevant information for establishing baseline conditions and the effects assessment of potential impacts, as well as a summary table indicating where and how in which of the subsequent sections traditional knowledge was incorporated (see Review Board's *Guidelines for Incorporating Traditional Knowledge in Environmental Impact Assessment*).

2.4. Summary materials

The following summary materials are required:

- Plain language summary in English, South Slavey and North Slavey;
- A concordance table that cross references the items in the TOR with relevant sections of the DAR; and
- A commitments table listing all mitigation measures the developer will undertake, including but not limited to those described in the project application. These should be organized by subject (e.g. water quality, wildlife) for easy reference.

2.5. Land Use Plans

The proposed highway runs through the Sahtu Settlement Area, which has an approved and legally binding Land Use Plan. The developer must clearly demonstrate throughout each section of the DAR how the project conforms to the approved Land Use Plan and/or if an exemption from the Land Use Plan would be required for any specific activities.

3. Scope considerations

3.1. Scope of development

Under ss. 117(1) of the MVRMA, the Review Board determines the scope of development for every EA it conducts. The scope of development consists of all the physical works and activities required for the project to proceed.

Within this document the scope of development includes the construction, operation and reclamation of an all-weather highway from the community of Wrigley to Norman Wells, as well as the restoration of any segments of the existing seasonal public highway deemed to be unsuitable for use as a base of an all-weather road. The development includes the following components:

- Clearing the right of way with intermittent new sections between Wrigley and Norman Wells;
- Construction of a 321 km all-season gravel highway from Wrigley to Norman Wells, much of which follows an existing seasonal public highway;
- Construction of watercourse crossing structures;
- Construction and operation of borrow sources and access to the borrow sources;
- Construction and operation of highway maintenance areas;
- Construction and operation of temporary construction support infrastructure and workspaces including camps, laydown and staging areas, bulk fuel storage areas and airstrips;
- Ongoing operations and maintenance activities; and,
- Reclamation of facilities not required for ongoing highway operations.

The highway is expected to operate for an indeterminate period.

The scope of the project does not include the ongoing operation and planned capital improvements to the existing winter road system between Wrigley and Norman.

In the DAR the developer is required to fully describe all required facilities and activities for the development. The Review Board may amend the scope of development at any time during the EA if the proposed development changes.

The developer shall identify all permits, licences or other regulatory approvals necessary for the different phases of the development. The developer shall also document all land tenure agreements required for the development.

3.2. Scope of assessment

3.2.1. Overview

The scope of assessment defines which issues will be examined in the EA. The scope of assessment includes all potential impacts on valued components of the biophysical and the human environment (for example, wildlife species or community wellness) from the development, by itself and in combination with other past, present and reasonably foreseeable future developments.

To determine the scope of assessment, the Review Board considered the developer's Updated Project Description Report, comments from reviewers on the MVEIRB's Terms of Reference and the results of community scoping sessions held in Wrigley, Tulita, Norman Wells, Fort Good Hope and

Inuvik. The results of the Fort Good Hope and Inuvik sessions were included in this review as residents from other affected communities may have been in attendance.

3.2.2. Issues prioritization – Key lines of inquiry

The developer will consider the following when preparing the specific material the Review Board requests. The developer is encouraged to seek clarification from the Review Board in writing if specific requirements in the TOR are unclear. If the developer finds that a question cannot be answered, the developer must provide a reasonable rationale explaining why the question could not be answered.

The purpose of scoping is not only to identify issues, but also to prioritize them and if possible, focus study on the most important issues. The Review Board has prioritized issues based on information gathered at community scoping meetings.

3.2.3. Key lines of inquiry

The highest priority issues are called "key lines of inquiry". These require increased attention because they are important to communities along the proposed highway route and are of particular interest to the Review Board. The developer is required to give special consideration to the following key lines of inquiry in the DAR:

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

Key lines of inquiry are the topics of greatest concern that require the most attention during the environmental assessment and the most rigorous analyses in the DAR. These are designated as key lines of inquiry to ensure a comprehensive analysis of the issues most likely to cause significant environmental impacts or significant public concern. Data collection and analyses for the key line of inquiry in the DAR should be at a level of detail appropriate for other interested parties to understand the technical material prior to any technical sessions on these topics.

The key lines of inquiry will be presented in comprehensive stand-alone sections in the DAR. This will facilitate close examination of the developer's response to these key lines of inquiry, and will require only minimal cross-referencing with other parts of the report and appendices.

3.2.4. Subjects of note

The developer will consider all other valued components described in Section 7 as subjects of note. Every issue identified in this TOR requires a sufficient analysis to demonstrate whether the development is likely to cause significant adverse impacts. These subjects of note need to be considered by the developer but are of lower priority than the key lines of inquiry.

3.3. Geographic scope

The geographic scope will include all areas that may be affected by activities within the scope of development. For all biophysical or socio-economic valued components (e.g. community wellness, wildlife), the developer will specify the study area boundaries used for the assessment for each component. The geographic scope for each valued component must be appropriate for the characteristics of that component. The developer will provide justification and rationale for all study area boundaries chosen.

3.4. Temporal scope

The highway is intended to operate over the long term. The developer will use temporal boundaries for this EA according to potential long-term impacts on valued components, assuming that the highway is in operation for an indeterminate period of time.

For project specific (that is, non-cumulative) impacts, the temporal scope will include all phases of the highway lifespan including construction, operation, and in some instances reclamation, and extends until no potentially significant adverse impacts are predicted. For cumulative impacts, the temporal scope includes the period of the effects of past, present and reasonably foreseeable future projects that are predicted to combine with the impacts of the highway[1].

The developer will place special focus on the consideration of times during the development when activities are particularly intense (such as during initial construction) or when valued components are particularly sensitive to potential impacts (such as key times for wildlife, fish spawning or wildlife harvesting periods). The developer will also give special attention to appropriate temporal boundaries for considering any impacts that may require long-term monitoring and management such as impacts on communities along the highway route.

The developer is required to define and provide rationales for the specific temporal boundaries it used to examine the potential impacts on each of the valued components considered in its impact assessment.

In light of uncertainties with the timing of construction that could see a long delay from the completion of the EA till highway construction, the developer will provide a management response framework that will address how the accuracy of predictions and applicability of mitigations will be checked before the developer applies for permits.[2]

For example, during the assessment process the developer may make predictions on the abundance and location of caribou and provide mitigations based on the predicted interaction of the project with the caribou. However, should there be a long delay between completion of the assessment and commencement of construction, then the abundance and location of caribou may change. Because of these possible changes, the predictions made during the assessment may no longer be accurate,

[1] See the Review Board's *Environmental Impact Assessment Guidelines (*Appendix H) for further guidance.
[2] See Section 11 of this Terms of Reference for further details about the management response framework.

and the mitigations proposed may no longer be applicable or effective. The developer will explain how this management response framework will be incorporated into the permit applications.

3.5. Consideration of alternatives

The DAR must identify and describe alternative methods for highway construction and operation, scheduling phases, and technical design to carry out the project that are, from the perspective of the developer, technically and economically feasible. The DAR must also describe the environmental effects of each alternative method. In describing the preferred methods, the DAR should identify the relative consideration of environmental effects, and technical and economic feasibility. The criteria and/or constraints used to identify any alternative methods as acceptable or unacceptable, and how these criteria and/or constraints were applied, must be described.

The developer will describe the alternative methods of carrying out the components of the development, including:

- A description of the alternative methods considered, how or why they are not technically and/or economically feasible, and the rationale for rejecting any alternatives that are excluded from further assessment; and,
- The criteria and rationale for selecting the preferred alternative methods.

The developer will identify and describe the alternative routes considered for the development including:

- A description of each alternative considered, how or why they are not environmentally, technically and/or economically feasible, and the rationale for rejecting any alternatives that are excluded from further assessment; and,
- The criteria and rationale for selecting the preferred alternative route, and the environmental, social and technical (including safety) constraints associated with them.

The developer will provide some level of environmental assessment of the alternative routes to substantiate their inclusion as viable alternatives, even if they are not being considered as the developer's preferred route.

The developer will indicate how community engagement and consultation and traditional knowledge have influenced the determinations on route options.

4. Assessment methodology

4.1. Impact assessment steps

In order to facilitate the consideration of the specific questions posed in this section, the developer is required to address the following impact assessment steps. In assessing impacts on the

biophysical and human environment, for each valued component in Section 6, the DAR will identify the highway's potential impacts (direct and indirect) on valued components relative to baseline conditions and trends, describe the methods used to identify these impacts in sufficient detail to allow reviewers to fully understand how these conclusions were reached, describe proposed mitigations to reduce or avoid impacts, and predict residual impacts after mitigation. The developer will provide its views on impact significance.

The developer will describe how the predicted impacts are expected to arise from the proposed development. This will include describing the mechanisms for cause and effect and providing supporting references (including where Traditional Knowledge was used). Where professional judgment has been used in determining impacts, this must be made clear. The developer will also provide a discussion on the uncertainty involved with each prediction. For each predicted impact, the developer will describe:

- the nature or type of the impact;
- the geographical range of the impact;
- the timing of the impact (including duration, frequency and extent);
- the magnitude of the impact (what degree of change is expected);
- the reversibility of the impact; and,
- the likelihood and certainty of the impact.

The assessment process requires that predictions be made regarding the impacts of future construction and operations of a highway on dynamic valued ecosystem components. Mitigations may be proposed based on these predictions. Even for projects with more certain construction schedules, these predictions are inherently difficult. However, the proposed construction method of building segments of the highway, and the high degree of uncertainty associated with timing of each segment, add to the uncertainty of the predictions and the applicability and effectiveness of mitigations. The Review Board requests that the developer describe how it will manage these problems associated with predicting impacts and proposing mitigations.

The Review Board sent a letter to the developer on Oct 29, 2013 regarding this issue. The developer provided a response on November 13, 2013 The Review Board now requires details regarding possible follow-up programs. Please see section 11 of this TOR for details.

4.2. Developer's opinion on significance of impacts

The criteria described above will be used by the developer as a basis for its opinions on the significance of impacts on the biophysical and human environment. The Review Board will make the ultimate determinations of significance after considering all the evidence on the public record later in the EA. For more information on the above criteria, please refer to section 3.11 of the Review Board's *Environmental Impact Assessment Guidelines* available on the Review Board's public registry.

5. Description of the existing environment

The developer shall provide a description of existing conditions in sufficient detail to enable an understanding of how the valued components might be affected (positively or negatively) by the proposed development.

5.1. Biophysical information requirements

The developer will provide a description of all existing regional data used in developing the environmental baseline. Where the developer generated its own data the methodology, accuracy and precision of measurements will be provided. The developer should also describe any analysis conducted to utilize data from outside the study region to characterize the baseline environmental conditions within the study region. This would include a description of any models etc. (including assumptions and accuracy) utilized to characterize baseline conditions where local measurements are not available. The description of the baseline conditions should be sufficient to allow for a thorough assessment of the project effects.

5.1.1. Terrain, geology, soils and permafrost

Describe the existing terrain, geology, soils and permafrost in the project study area(s), including a description, location, and geographic extent of the following features:

- topography and geology, including key terrain features such as rivers, lakes and wetlands and other important processes and features;
- bedrock type and depth;
- unconsolidated surficial materials and terrain types, including thickness of landforms; and,
- soil types, including group, series and type, as applicable.

Describe borrow materials including:

- locations;
- ice content;
- size of borrow areas;
- volumes to be removed;
- quality of materials at each location;
- existence and extent of ice rich permafrost areas that may be excavated; and,
- ownership.

Provide a description of permafrost and ice-rich soils in the area of the highway, including:

- distribution (thickness and lateral extent) on land, water, shoreline and slope crossings, including a discussion of taliks;
- permafrost processes, features and landforms and their stability, including slopes, shorelines and stream banks;

- ground ice conditions, temperature and ground thermal regime;
- active layer thickness, seasonal frost, penetration, thaw sensitivity and frost susceptibility;
- how fires affect ground temperature regimes and permafrost;
- describe thaw slumps in the project area;
- demonstrate an understanding of regional climate warming and documented warming of ground temperatures in the region; and,
- describe how warming ground temperatures and deepening active layers will affect the highway and how mitigation measures will remain effective in various climate warming scenarios.

5.1.2. Climate

Provide a description of the existing or baseline climate conditions and climatic variability and trends, including, but not necessarily limited to:

- the location of recording stations and length of record for any meteorological data presented;
- prevailing climatic conditions, seasonal variations, predominant winds including direction and velocity, temperature and precipitation (snowfall, snow depth, rain, fog, wind);
- spatial and temporal boundaries for the description of climate; and,
- any current climate-related extreme events that may affect the highway, and frequency of occurrence.

In support of the baseline description:

- define the variability/trends within the "current" climate normal period and within the historical period of instrumental record;
- discuss the contribution of traditional knowledge to the understanding of climate conditions and variability; and,
- identify the location of recording stations and length of record for any meteorological data presented.

Changes in climate, in terms of direction, magnitude and climate element affected, can be expected to vary at a regional scale. Accordingly, the description of baseline conditions should be presented in a manner that reflects this variability and facilitates subsequent discussion of how changes in climate could change the highway, or particular highway components.

5.1.3. Water quality and quantity

Provide a description and maps of the existing water resources within or near the boundaries of the study area(s) including:

- waterbodies, watercourses and major drainage areas;

- watercourses that have year-round flow;
- the extent of connectivity to adjacent watercourses including any potential seasonal variation;
- seasonal and perennial springs including ephemeral streams located within or near the boundaries of the study area(s);
- naturally occurring icings; and,
- describe the recharge ability of lakes that will be used for winter road watering or ice mining.

Provide a description of major drainages and watercourses, including the basis for their selection. For each major drainage or major watercourse, as appropriate, provide a description of its hydrological characteristics, including:

- flow regimes, variability and seasonal patterns;
- channel and bed morphology and stability;
- bank stability and areas of erosion;
- sediment load – suspended and bed load;
- active and historical floodplains;
- freeze/thaw timing;
- taliks/permafrost distribution and stability beneath waterbodies; and,
- the role of wetlands (e.g., bogs, fens and peat plateaus).

In the vicinity of communities and along highway routes being considered, describe flood regimes, ice-jamming and scour. In each major drainage, identify locations of existing and planned water use (domestic, municipal, camp, etc.) in relation to the proposed highway routes. For each area of water use that may be affected by the highway, identify quantity of use, existing water quality and variations, existing sources of water quality impairment and their locations in relation to highway routes alternatives, and groundwater resources and hydrogeology where relevant to the highway.

5.1.4. Fish and fish habitat

Provide a description of the existing fish and fish habitat within the highway area, including:

- a description of fish habitat present at each of the planned water crossings, including references (such as photographs and diagrams) at those locations;
- fish species including forage fish (non-harvested) and any other aquatic resources of value present;
- seasonal and life cycle movements and sensitive periods;
- habitat requirements for each life stage;
- local and regional abundance, distribution and use of habitat types, including aquatic and riparian vegetation;

- known sensitive or important areas in terms of habitat type (e.g., spawning, overwintering, refugia, feeding), species and timing of use;
- for species at risk or of concern , also describe specific location, population status, limits and size, sensitivity and limiting factors;
- baseline contaminant concentrations in harvested species, that may change as a result of the highway and as available;
- any known issues with respect to health of harvested species (e.g. parasites, disease, condition);
- species of particular importance to subsistence harvesters;
- species subject to exclusive or preferential rights granted by land claims;
- species of particular importance to the guiding or outfitting industries;
- areas subject to exclusive harvesting rights granted to land claim beneficiaries;
- harvest pressures (subsistence, sport fishing and commercial harvesting) by species, season and geographic area; and,
- listing of existing non-native species.

5.1.5. Wildlife and wildlife habitat

Provide a description of the existing wildlife and wildlife habitat within the study area(s), including:

- wildlife species present;
- distribution and abundance, seasonal movements, habitat requirements (e.g., breeding, calving, feeding) and sensitive time periods;
- for species at risk or of concern, also describe specific location(s), population status and trends, limits and size, critical habitat, sensitivity and any other limiting factors;
- species subject to exclusive or preferential rights granted by land claims;
- species of particular importance to the guiding or outfitting industries;
- habitat types including local and regional distribution and abundance;
- species of importance to subsistence harvesters;
- habitat or sites of special value or sensitivity, including species use and timing;
- areas subject to exclusive harvesting rights granted to land claim beneficiaries;
- migratory patterns, routes and timing in relation to highway route alternatives, construction activities, and operation;
- harvest pressures (subsistence, resident and non-resident harvesting and commercial harvesting) by species, season and geographic area;
- listing and location(s) of existing non-native species;
- current and historic levels of natural and human-caused fragmentation and connectivity;
- baseline contaminant concentrations in harvested species, that may change as a result of the highway; and,
- any known issues with respect to the health of harvested species (e.g. parasites, diseases, condition).

5.1.6. Birds and bird habitat

Provide a description of the existing bird resources with the study area including:

- bird species present;
- abundance and distribution, seasonal movements, habitat requirements (breeding, moulting, staging, feeding) and sensitive periods;
- for species at risk or of concern, also describe specific location(s), population status and trends, limits and size, critical habitat, sensitivity and limiting factors status and trends;
- species subject to exclusive or preferential rights granted by land claims;
- habitat types including local and regional abundance and distribution;
- baseline contaminant concentrations in harvested species, that may change as a result of the highway;
- any known issues with respect to health of harvested species;
- areas subject to exclusive harvesting rights granted to land claim beneficiaries;
- species of particular importance to subsistence harvesters;
- habitat or sites of special value or sensitivity, including species use and timing;
- harvest pressures (subsistence and sport hunting) by species, season and geographic area; and,
- listing and location(s) of existing non-native species.

5.1.7. Vegetation

Provide a description of the existing vegetation within the study area(s), including:

- vegetation and vegetation assemblages;
- any classification system followed, as appropriate;
- identification of species or assemblages that are rare, valued, protected or designated (e.g., vulnerable, threatened, endangered);
- for any species at risk or of concern , also describe specific location, population status, limits and size, sensitivity and limiting factors;
- historic and current human use of vegetation, including subsistence and commercial harvesting, (e.g., berry picking, forestry);
- baseline contaminant concentrations in harvested species or vegetation (e.g. berries) that may change as a result of the highway and as available;
- locations and quantities of merchantable timber;
- listing and location(s) of existing non-native species;
- frequency of forest fires; and,
- post-fire vegetation succession, if applicable.

5.2. Human environment baseline information requirements

5.2.1. Demographics

Provide a description of the social and demographic profile(s) and trends in the study area, including the following:

- population and population trends by community and by region;
- number of persons per household and number of households; and,
- in/out migration by community and region, and factors that could contribute to migration patterns.

5.2.2. Regional and local economies

Provide a description of the local and regional economies and their performance, including:

- gross domestic product (GDP);
- employment rate;
- employment by industry and occupation, including occupations related to traditional activities;
- job vacancy and unfilled positions, labour force growth, participation and balance between wage and non-wage sector activities and earnings growth;
- poverty levels and annual level of social assistance benefits and recipients;
- local consumer prices and cost of living, particularly with respect to food, fuel, utilities, transportation and affordable housing;
- level of local households consuming harvested meat and fish and current harvest activities;
- current and projected land-based enterprises and economic activities, including those related to tourism, outfitting, commercial harvesting, recreation, renewable and non-renewable resources;
- number of licensed businesses with breakdown by Aboriginal ownership; and,
- local and regional economic development goals and objectives as identified in public consultations and regional land use plans.

5.2.3. Education, training and skills

Provide a description of the education, skills and training levels in the communities relevant to the highway, including graduation and achievement rates including high school or higher, and trade certification levels.

Describe adult basic education and literacy programs in the communities along the highway route and identify any other education, training and/or certification programs and institutions available within the region to residents of the highway area that are relevant to the highway.

Describe the timing and duration of education and skills development programs that would be required for highway-related employment.

5.2.4. Infrastructure and institutional capacity

Describe the local and regional infrastructure and institutions, including current levels of use of existing social, institutional, family, health and community services and local, regional and territorial infrastructure, which government organizations provide them, and the capacity of these to meet current, additional and new needs. Particular attention will be given to:

- health facilities and services, including medivac services;
- emergency response and law enforcement services;
- waste disposal and management;
- water and sewage facilities;
- power and fuel services;
- transportation systems (barging, roads, airports);
- telephone/ communication service;
- fire protection;
- housing stock, costs and availability;
- safe houses and shelters;
- child care and elder care services;
- schools and education facilities;
- recreational facilities;
- management of renewable resources;
- supply of aggregate and granular materials; and,
- planned major capital projects or planned major social or institutional changes in the highway area.

5.2.5. Human health and community wellness

Provide a description of the status of human health and community wellness in the study area, including:

- the physical, mental and social health of residents of the areas affected by the highway; and,
- support systems and programs available regionally and locally to address human health and community wellness (e.g., health services, elder care, child care, counseling, alcohol and drug treatment, healing centres)

This description of health status should include indicators of determinants of health, including physical, social, cultural and economic aspects.

5.2.6. Harvesting

Provide a description of current and traditional harvesting, focusing on subsistence and commercial harvesting, including harvesting activities and other traditional uses by Aboriginal peoples within study area.

This will include harvest levels, participation, locations (with specific attention to high use areas and areas of sensitivity, and seasonal access), transmission of culture, and contributions to household economies. Describe any recent and current encroachments and restrictions of harvesting activities (i.e. by competing uses of land and resources or related regulations).

Describe outfitting and trapping activities and related use areas (active and fallow).

5.2.7. Land use

Describe traditional and current land use patterns, designations and special management areas in the study area, including:

- land uses, including but not limited to the following:
    - traditional use areas;
    - special harvesting sites;
    - traditional trails;
    - seasonal and permanent camp areas (i.e., individual work, recreational, commercial);
    - parks and recreation areas;
    - transportation corridors;
    - granular resources; and,
    - industrial zones such as the Norman Wells oil pipeline (line 21).
- land use designations, including but not limited to the following:
    - protected areas;
    - areas of high conservation value/ecological sensitivity;
    - ecologically important areas; and;
    - caribou protection measures.
- valued aesthetic locations and their attributes; and,
- lands and features of special interest or value, and their attributes;

5.2.8. Heritage resources

Describe the existing archaeological, paleontological, and historic resources, collectively referred to here as heritage resources, within the study area. Include:

- archaeological, paleontological and historic sites and resources;
- culturally important sites;
- burial sites; and,

- heritage resource potential.

6. Development description

The developer will fully describe the facilities and activities associated with all phases of the development, including a discussion of the need for the project, alternative methods of carrying out the project and development schedule.

6.1. Project components and activities

The development description for the all-weather highway should address both the initial winter road and the all-weather highway, as applicable, for the following topics:

- all-season gravel highway from Wrigley to Norman Wells;
- design standards;
- land requirements (footprint, location, permanent or temporary, ownership, zoning);
- right of way clearing;
- road construction methods;
- water crossing structures and locations;
- borrow source locations, quality and quantities, activities and methods;
- remporary winter or all-season access roads to borrow areas;
- camps, staging areas, laydown areas, access roads and other support facilities;
- fuel storage and management;
- explosives manufacturing plant, storage, transportation, and use;
- equipment requirements (by phase);
- solid waste management;
- water use;
- wastewater treatment;
- mobilization/demobilization;
- frequency of vehicle and aircraft movement during construction;
- routine maintenance activities;
- expected traffic volumes during operational phase;
- clean-up /restoration of work areas during construction phase;
- reclamation;
- procurement and implementation approach;
- training, employment and business opportunities;
- ongoing operations and maintenance of the all-weather highway;
- land ownership and jurisdiction including any implications to land quantum of settled land claims that the highway crosses;

- what mechanisms will be used to secure tenure of the right of way; and,
- Land requirements including footprint, location, permanent or temporary, ownership, and zoning.

6.2. Development phases and schedule

The development description must also contain an overall and seasonal activity schedule for the development and describe the following aspects of the development in relation to development phases and schedule:

- Identify which government agencies or departments are responsible for the maintenance and operation of the highway.
- Identify the roles and responsibilities of the communities along the route (if any).
- Identify the overall capital cost of the highway.

6.3. Life of the project

The developer will clearly describe the operational life of the highway and how this development fits with the overall goals, objectives and long term planning of the GNWT for territorial highways. In this discussion, the developer will include the following:

- Identify which government agencies or departments are responsible for the long term maintenance and operation of the highway;
- Identify and quantify the anticipated short, medium and long term use/users of the highway; and,
- Discuss how government would respond to and manage the highway, if an increase in the number of heavy industrial users evolves over time (which may, for example, result in increased operation, protective services and maintenance costs).

7. Assessment of environmental impacts and cumulative effects

The developer will be responsible for the identification and assessment of effects of the development on the biophysical and human environment and for the assessment of cumulative effects resulting from the development in combination with past, present and reasonably foreseeable developments and activities. The Review Board acknowledges that much of the proposed development corridor has recently been subject to considerable study of baseline conditions and assessment of potential effects of the proposed Mackenzie Gas Project, also a linear development. The developer is encouraged to utilize information and lessons learned from the assessment of this project in the preparation of its DAR. Further, the developer is encouraged to utilize lessons learned from the existing Norman Wells pipeline.

7.1. Effects assessment

For each valued component described in this section, the following topics will be addressed, consistent with the methodology identified in Section 4 of these TOR.

- **Identification of potential environmental effects**: The potential interactions of the development with the valued component and resulting potential environmental effects to the valued component will be identified. The developer will present quantitative or qualitative parameters to measure potential environmental and cumulative effects on the valued component. The spatial and temporal boundaries for the assessment of effects on the valued component will be presented and justified.
- **Mitigations and residual effects**: The developer will describe all mitigations that will be put into effect during project design, construction or operation to mitigate potential environmental effects. The developer will assess potential effects on the valued component after implementation of mitigations. Residual effects will be clearly identified and characterized based on methodology presented in DAR.
- **Assessment of cumulative effects**: For each residual effect resulting from the development, the developer will conduct an assessment of the potential for cumulative effects resulting from a combination of effects of the development with effects from other past, present and reasonably foreseeable human activities and developments. The way in which a cumulative effect may occur and its potential spatial and temporal scope will be discussed. Residual cumulative effects will be identified. The developer will characterize the significance of residual project and cumulative environmental effects and identify mitigations that may exist for cumulative effects beyond those for project specific effects.

7.2. Key lines of inquiry

This EA will focus on priority issues termed key lines of inquiry. The key lines of inquiry are:

- Local social and economic considerations; and,
- Wildlife harvesting, in particular caribou and moose.

Requirements for the key lines of inquiry are described below. The developer will focus its DAR on these topics.

7.2.1. Local social and economic considerations

The potential direct and indirect social and economic impacts of an all-season highway were raised as concerns in communities along the route. During scoping sessions, community members identified existing social problems that could be worsened, and new issues that could arise as a result of the development. Part of this Key Line of Inquiry deals with the potential effects of the development on community life, including human health and community wellness. It also deals with the capacity of social infrastructure including services to meet potentially increased demands.

Please describe existing conditions and evaluate potential effects from the project on the following, at both the general and community-specific levels, including:

- **Availability of drugs and alcohol** and related social changes at the community, family and individual levels;
- Human **safety** including collisions on the all-weather road, collisions with pedestrians in town, drunk driving, and the capacity for emergency response to accidents in communities and remote areas;
- Predicted changes in **demands for social infrastructure** (including, policing and crime, health services, and social services), and the adequacy of existing social infrastructure to meet those changes (including potential shortfalls); and,
- Capacity of public **physical infrastructure** such as existing roads, water sources, quarries and quarry materials, and waste management facilities.

During scoping, several communities voiced interest in potential economic benefits of the project, and expressed concerns to the Review Board about their readiness and capacity to take full advantage of these opportunities. Please describe and evaluate potential effects of the project on the following, at both the general and community-specific levels, including:

- Direct and indirect **employment opportunities** generated by the development and the potential for uptake of these opportunities locally by Aboriginal peoples;
- **Employment and income opportunities** for every year of construction and operation, with particular reference to wage and salary employment by length of employment, form of employment (full time, part time, seasonal), skills category;
- Measures, plans and commitments for **maximizing local and Aboriginal employment** and businesses;
- Maximizing local and Aboriginal participation in contractor and sub-contractor business opportunities;
- Effects on capacity of local businesses to service other sectors during the construction phase;
- **Cost of living** and consumer prices for different types of goods;
- Proposed **education and training programs** required for highway-related construction and operation employment, including:
    - Local and regional training opportunities;
    - Timing and duration of programs, in relation to the highway development schedule;
    - Skills and experience gained in the highway workforce that could be applied to; other available projects or sectors;
    - The number of people expected to be employable and available;
    - The potential for local development of skills for senior professional positions (e.g. labourer/heavy equipment operator vs. supervisor /manager); and,
    - Proposed programs that would be provided by or sponsored by the developer.

- The development's **contribution to the Gross Domestic Product**, provided separately for direct, indirect and induced economic activities for the regional and (to the extent possible) territorial and national economies; and,
- Highway-related impacts on harvesting and the **traditional economy** (see item 7.2.3 Caribou, moose and harvesting below) and their effects on community income and household economies

7.2.2. Caribou, moose and harvesting

Describe and evaluate the potential impacts of the highway, for the preferred and alternate routes, on caribou and moose, and what this means to harvesting. This section will also include any impacts to harvesting of other species. This will include both construction and operation periods. For moose and caribou[3], this will include an examination of:

- sensitive or important areas or habitat;
- direct and indirect alteration of habitat including highway footprint impact;
- sensory disturbance, and predicted changes in behaviour (including habitat avoidance and effective habitat loss in relation to highway facilities or activities), energetics, health and condition;
- wildlife movement patterns, home ranges, distribution and abundance;
- wildlife mortality due to harvesting and vehicle collisions;
- disruption of sensitive life stages or habitat (e.g., migration, calving, denning, overwintering);
- population cycles;
- predator-prey relationships;
- increased human-wildlife interactions; and,
- contaminant levels in harvested species that could be changed by the highway;

Regarding harvesting, this section will examine:

- changes in access, including increased access to the land and surrounding lakes, as well as increased access to an environmentally and culturally sensitive areas;
- changes in hunting and fishing pressures from people who do not reside in the communities along the route, and how highway-related changes in harvest pressures could impact the resource;
- sensory disturbances of other harvested wildlife species;
- changes in the abundance and distribution of harvested resources, including caribou, moose and other wildlife (e.g. furbearers, waterfowl) that would adversely affect harvesting;
- disturbance of harvest patterns, or loss or alteration of high-value harvest areas including:
    - changes to harvest effort as perceived by harvesters;
    - changes in harvester travel patterns;

[3] For other wildlife species, please see sections 7.3.6 to 7.3.9.

  - changes in harvest levels;
  - changes in harvesters' costs; and,
  - competition among harvesters within and between communities as a result of increased access and loss or alteration to the land resulting from the project.

- changes in the quality of harvested species (including contamination) that would negatively affect their consumption;
- measures to avoid or minimize changes in the abundance, distribution, or quality of harvested species, or mitigate the consequences of such changes;
- mechanisms to control project workforce-related hunting, fishing, or disturbance of wildlife; and,
- mechanisms of resource management agencies and other parties to manage hunting, and fishing by:

  - resident hunters and fishers;
  - non-resident hunters and fishers; and,
  - Aboriginal harvesters.

7.3. Subjects of note

7.3.1. Terrain, soils and permafrost

Describe and evaluate the potential effects of the project on terrain, geology, soils and permafrost including a consideration of:

- slope and soil stability, erosion and subsidence;
- granular resource extraction areas (including quantity and quality of granular resources);
- thaw slumps and compaction of organic peat lands and potential for melt of ice rich ground;
- snow distribution and consequences on ground thermal regime; and,
- drainage beside and beneath the road, channelization and non-channelization flow and permafrost degradation.

With respect to potential impacts of the highway on permafrost, include consideration of:

- permafrost as a design feature in the road bed, failure modes analysis and associated contingency plans;
- thermal conditions, active layer thickness, thaw depth, distribution and stability;
- ice rich soils (thaw settlement, thermokarst) permafrost thaw and related settlement;
- frost heave or frost susceptible soils in thin permafrost as well as seasonally frozen soils;
- thaw or settlement-related impacts on drainage and surface hydrology (see also water quality and quantity);

- shorelines, channels, and taliks; and,
- combined impacts of the highway and fires.

7.3.2. Air quality

Describe existing air quality in the highway area, including airsheds, emission sources, seasonal variations, existing and historic air quality, and visibility (as related to highway safety such as known fog areas).

Describe and evaluate the potential impacts of the highway on air quality including a consideration of:

- dust and carbon emissions from vehicles, equipment and stationary sources;
- emissions by source for each highway phase, including quantity, timing and duration, normal operation conditions and upsets;
- how changes in air quality could have an impact on humans, wildlife and vegetation; and,
- ice fog, dust and visibility.

Relevant territorial, provincial and federal air quality legislation, standards or guidelines should be discussed, including their purpose in relation to the highway phases. The discussion of air quality impacts should also consider guidance and standards from the Canadian Council of Ministers of the Environment.

The developer will provide an assessment of the potential health impacts to humans, wildlife, and vegetation related to highway emissions for all project phases. Dust suppression techniques must also be discussed and evaluated in this assessment.

7.3.3. Noise

Describe existing noise levels along the proposed highway route, including sources, types and boundaries, and any relevant standards, guidelines or objectives. The developer will describe and evaluate the potential impacts of highway-related noise, including a consideration of:

- highway components and activities that could produce noise levels of concern, including source location, timing and duration;
- sensory disturbance to fish, birds and wildlife, including boreal caribou and moose;
- disturbance of harvest and recreational activities, including tourism;
- potential impacts to wildlife harvesting activities; and,
- impacts to communities.

Relevant territorial, provincial and federal noise standards or guidelines should be discussed, including their purpose and use in relation to the project phases.

The developer will provide a comparison of anticipated noise levels along the highway with current industrial, municipal or ambient noise levels.

The developer will provide an assessment of the potential health impacts arising from highway-related changes in noise levels, including potential impacts of sleep disturbance and annoyance. Describe the proximity of the highway to receptors of the human environment, such as residences, cabin, camps and harvesting areas as well as valued components of the biophysical environment.

7.3.4. Water quality and quantity

Describe and evaluate the potential impacts of the highway on water quality and quantity, including a consideration of:

- changes to surface drainage patterns and surface water hydrology including changes caused by highway-related impacts on terrain, soils and permafrost;
- hydrogeological resources;
- drinking water quality for humans and wildlife;
- recreational water quality;
- discharge or seepage of wastewater effluent, contaminants, chemical additives, etc.;
- changes to water quality at water crossings (bridges, culverts and other wetted areas);
- changes to water quality due to thaw slumps and other slope instability at water crossing;
- changes to snow distribution and potential impacts on drainage;
- issues related to borrow extraction including melting of ground ice and potential changes to drainage patterns etc.;
- erosion, sediment deposition, sediment re-suspension;
- dust and dust suppression;
- increased turbidity;
- flow or water levels including potential for glaciation and icings at watercourse crossings;
- water withdrawal and volume of withdrawal (e.g., for ice roads, potable water, dust suppression);
- impacts of the highway on navigation on navigable waterbodies;
- potential effects on the aquatic environment including biota: and,
- water use during gravel extraction.

The developer will provide site specific water quality objectives set out as narrative statements, about the level of protection required for waters potentially affected by the construction and operations of the highway in order to maintain current and future water uses.

7.3.5. Sediment quality

Describe and evaluate the potential effects of the project on sediment quality, including consideration of:

- potential effects related to changes in water quality and quantity;

- potential issues associated with clearing of vegetation;
- potential increases in TSS concentration associated with construction, modification and use of roads and water crossings; and,
- potential effects on the aquatic environment;

7.3.6. Species at risk and species of concern

The purpose of the federal *Species At Risk Act* (SARA) is to prevent wildlife species from being extirpated or becoming extinct; to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity; and, to manage species of special concern to prevent them from being endangered or threatened. S. 79 of SARA requires that the Review Board ensure that during an EA, all SARA-listed species are identified and any adverse impacts of a development on them are thoroughly assessed and mitigated, regardless of whether the impacts are deemed significant.

The developer must consider any change that the highway may cause to a listed wildlife species, its critical habitat or the residences of individuals of that species, as those terms are defined in ss. 2(1) of SARA (see definition of impact on the environment in SARA Appendix 3, Definitions). Accordingly, the developer will take into account the requirements of SARA and provide the information necessary to evaluate the potential impacts of the highway on the species contemplated by this Act including mitigation and monitoring. All direct, indirect and cumulative effects should be considered. Species under consideration should also include those listed on Schedule 1 of SARA, and those designated as at risk by the *Committee on the Status of Endangered Wildlife in Canada* (COSEWIC).

In addition to considering those species identified through engagement and consultation events with communities, and any other species deemed necessary by the developer, the developer will also take into consideration the GNWT's *Species at Risk (NWT) Act* which applies to any wild animal or plant species managed by the GNWT, on both public and private lands, including private lands owned under a land claim agreement.

Discuss the potential impacts of the highway on species of concern and proposed mitigation in relation to applicable legislation, policy, management plans, recovery strategies, action plans or land use planning initiatives. In part, the developer will demonstrate to the Review Board how the Sahtu Land Use Plan and the results of any traditional knowledge and community consultation activities have been used to shape the approach taken to assess impacts to species of special management concern.

7.3.7. Fish and fish habitat

The developer will describe and evaluate potential impacts of the highway on valued components related to fish and fish habitat, including:

- alteration or loss of fish habitat due to development activities during all project phases;

- effects of proposed watercourse crossings and temporary vehicle crossing method;
- standards or guidelines related to watercourse crossings that would be applied;
- relevant policies, management plans or other measures to protect or enhance fish and fish habitat, including timing restrictions, protected areas or regulations;
- disruption of sensitive life stages or habitat (e.g., spawning and incubation, rearing, overwintering) including loss of substrate habitat, known sensitive or important sites;
- effects on riparian areas;
- impacts related to changes in water quality or quantity;
- distribution or abundance;
- sensitive or important areas or habitat;
- contaminant levels in harvested species that could be changed by the highway, if applicable;
- potential effects on fish health;
- blockages to movement;
- blasting (if required);
- dredging or disposal of sediments;
- effects of water withdrawal;
- potential for increased pressure on the resource that could arises from improved access;
- reclamation of in-stream and riparian work areas during construction and also during maintenance operations; and,
- criteria for evaluating the success of mitigation or reclamation measures, and indicate when and how this evaluation would be conducted (see also follow-up and monitoring).

For follow-up and monitoring, the developer will develop a monitoring program for the fish and habitat resources of water bodies along the highway corridor.

7.3.8. Wildlife and wildlife habitat

For wildlife other than those species included in section 7.2.3 (caribou, moose and harvesting), please describe and evaluate the potential impacts of the highway on wildlife or wildlife habitat including a consideration of:

- direct and indirect alteration of habitat including highway footprint impact;
- visual or auditory disturbance, including habitat avoidance and effective habitat loss in relation to highway facilities or activities;
- wildlife mortality due to increased harvesting and vehicle collisions;
- disruption of sensitive life stages or habitat (e.g., migration, calving, denning, overwintering);
- wildlife movement patterns, home ranges, distribution and abundance;
- sensitive or important areas or habitat;
- population cycles;
- predator-prey relationships;
- increased human-wildlife interactions;

- contaminant levels in harvested species that could be changed by the highway; and,
- wildlife health and condition.

Specifically, the developer will discuss the duration and geographic extent (e.g. distance of noise related disturbance) of potential impacts in relation to how wildlife populations and harvest activities could be affected.

7.3.9. Birds and bird habitat

The Mackenzie Valley is a migratory flyway for waterfowl and contains important staging and breeding areas for waterfowl and waterbirds. It includes birds that are rare or otherwise at risk. Describe and evaluate the potential impacts of the proposed highway on valued components related to birds and bird habitat, including a consideration of:

- sensitive or important species, areas or habitat within the study area;
- disruption of sensitive life stages or habitat including, nesting, rearing, staging, moulting, migrating;
- direct and indirect alteration of habitat within the study area;
- visual or auditory disturbance, including habitat avoidance in relation to highway facilities or activities and light disturbance;
- bird distribution, abundance, health and condition;
- contaminant levels in harvested species that could be changed by the highway;
- how highway-related changes in harvest pressures could impact the resource;
- attraction of predators of birds and bird eggs to the project, or the provision of nesting or denning habitat for predators and scavengers; and,
- potential mortality from collisions with temporary or permanent structures, wires or vehicles.

7.3.10. Vegetation

The developer will describe and evaluate the potential impacts of the proposed highway on vegetation including a consideration of:

- alteration or loss of species, or vegetation assemblages that are rare, valued, protected or designated sensitive or important areas or habitat;
- amount of merchantable timber removed during right of way clearing, and the potential for facilitating use of waste timber by communities;
- introduction of non-native and/or invasive species;
- effects of highway emissions including dust;
- how changes in right of way clearing might impact permafrost and the highway itself;
- changes to the soil, hydrological or permafrost regimes related to vegetation changes;

- re-establishment of vegetation and reclamation of borrow sites and other disturbances (particularly identification of vegetation types and seed mixes to be used, and identification of the specific borrow site to be re-vegetated, and those borrow sites that will not be re-vegetated); and,
- vegetation control during operations.

7.3.11. Biodiversity

The developer will describe the changes to the biodiversity of the study area(s) during construction, operations and any post-reclamation and the significance of these changes in a local and regional context. Describe how the highway could result in changes to biodiversity, including a consideration of:

- ecosystem and habitat loss;
- habitat fragmentation / barriers to movement and gene flow;
- ability of habitat or species to recover;
- response to edge effects;
- changes to species distribution and abundance;
- invasive/non-native species (vegetation and wildlife); and,
- changes to special management areas and species of special management concern (see Sahtu Land Use Plan).

7.3.12. Country foods

Many of these biophysical components are, or are linked to, the country foods harvested by local residents. The developer will identify these linkages and related sources of contaminants and other impacts in a separate discussion on the potential contamination of country foods. The discussion will include the identification of which country foods are consumed, or expected to be consumed, which contaminants are of concern and an indication of whether transport pathways of contaminants into country foods will result from the proposed project and associated activities.

7.3.13. Culture and traditional land use

Describe and evaluate the potential effects of the development on culture and traditional land uses (beyond those described in response to the discussion of impacts on harvesting in section 7.2.3 (caribou, moose and harvesting). This will include:

- aboriginal languages;
- traditional lifestyles, values and culture; and,
- cultural and spiritual sites and activities.

Describe activities taken with community members to ensure that all cultural sites along the route have been identified, and the developer's degree of confidence that it has identified all such sites.

7.3.14. Land use

Describe and evaluate the potential impacts of the highway on land use, including a consideration of:

- effects and management of increased access;
- effects to traditional land use, tourism, outfitting, hunting, fishing, recreation and other non-traditional uses;
- effects and changes to industrial land use and changes in access;
- patterns of use and changes in these patterns;
- effects to protected areas, parks, and environmentally and culturally sensitive areas;
- aesthetics; and,
- potential effects to other valued components.

Discuss the conformity of the proposed highway-related land uses with the existing Sahtu Land Use Plan.

7.3.15. Heritage resources

Describe and evaluate the potential impacts of the proposed highway on cultural heritage and special management areas, including a consideration of the following:

- known site locations and areas of high potential for undiscovered sites;
- consultation on site identification and management;
- mitigations and management plans to protect known and undiscovered sites; and,
- effects of increased access on sites.

8. Effects of the environment on the project

The developer will consider the effects of the environment on the highway. The developer will describe how the highway is engineered and designed to integrate into its environmental surroundings and operate safely and reliably over its life. The developer will describe and discuss how physical and biological changes in the environment could have implications for the highway. This should include considerations of the following:

- long-term climate change scenarios (e.g., loss of permafrost, increased evaporation and evapotranspiration, greenhouse gas emissions);
- how likely changes in permafrost will affect the amount the granular material required for care and maintenance of the highway;
- short-term climatic and extreme weather events (e.g., major precipitation, wind, fog, drought);
- landslides and ground movement;
- changes in permafrost regime;
- subsidence;

- seismic activity; and,
- fires.

9. Potential accidents and malfunctions

The developer will describe and evaluate possible accidents or malfunctions, their probable and potential effects on the environment, including impacts on social, economic, and cultural elements of the environment and human health to people in close proximity of accidents or malfunctions, including spills of contaminants for the life of the highway. The developer will describe the process for the implementation of any mitigation measures or contingency plans. The developer must demonstrate a commitment to having an Environmental Protection Plan and Emergency Response Plan that would address potential accidents and malfunctions for the life of the highway. In part, the Emergency Response Plan must include:

- plans for alerting and evacuating employees during an emergency;
- pertinent information in the case of an emergency (people in charge, equipment available, plans and maps to locate works);
- the developer's internal emergency intervention structure and decision-making mechanisms;
- the means of communication with the external emergency preparedness organization;
- the measures considered to protect the people that could be affected; and,
- the means to quickly alert the people that could be affected; in collaboration with the municipal, Aboriginal and other government organizations concerned, advising public authorities of the alert and subsequent information about the situation.

Particular attention should be focused on sensitive elements of the environment that could be affected in the event of an accident or malfunction over the life of the highway, and that could potentially make the consequence worse (e.g., proximity of cabins, heritage sites or environmentally sensitive sites). Where potentially significant impacts could occur as a result of an accident or malfunction, the developer will assess the probability of such an occurrence, taking into account weather or extreme external events that present contributing factors.

The developer will identify and discuss, for each project phase, the potential accidents or malfunctions that may occur as a result of the highway, including a consideration of:

- spills of a hazardous material (on land, ice and in water - freshwater and marine);
- explosion and/or fire;
- transportation, storage, manufacture and use of explosives;
- transportation accidents (air, land, water);
- harvesting;
- social and cultural elements of the environment; and,
- human health.

10. Cumulative Effects Assessment

The cumulative effects of the proposed highway must be assessed. The cumulative effects assessment must demonstrate to the Review Board that any significant cumulative effects are adequately considered and can be successfully mitigated. The analysis of the cumulative effects must enable the Review Board to gain an understanding of the incremental contribution of all projects or activities in the vicinity of the highway, and of the highway alone, to the total cumulative effect on the valued components over the life of the highway. The developer must identify and assess the cumulative biophysical and socio-economic effects of the project in combination with other past, present or reasonably foreseeable projects and activities within the study area(s). While a project-specific assessment of cumulative effects is not responsible for assessing all cumulative impacts from other human activities, it must consider how the project's effects could interact cumulatively with the effects of other human activities, and the contribution of the highway to the overall effect.

The cumulative effects assessment must follow the guidance of the Review Board's *Environmental Impact Assessment Guidelines*, which refers specifically to cumulative effects assessment and includes a description of how to consider reasonably foreseeable future developments. The assessment of cumulative effects of the project must include the following, but may also address other items:

- Identify the valued components, or their indicators, on which the cumulative effects assessment is focused, including the rationale for their selection. These are valued components affected by the highway in combination with other past, present or reasonably foreseeable future developments. Present spatial and temporal boundaries for the cumulative effect assessment for each valued component selected. Emphasize valued components with special environmental sensitivities or where significant risks could be involved.

- Identify the sources of potential cumulative effects. Specify other past, present or reasonably foreseeable future developments that may substantially affect the valued components identified above. These may be in the vicinity of the project footprint, or may affect a mobile resource that moves into its vicinity (like a river or a caribou herd).

- Predict the combined effects of the highway and the other activities identified above.

- Identify how the developer or others will mitigate the identified cumulative impacts.

Key Lines of Inquiry and Subjects of Note contain important cumulative effects components. In addition to providing a detailed assessment in the response to each of these, a stand-alone assessment of the cumulative effects of the proposed development in combination with past, present and reasonably foreseeable future developments is required. As a minimum, this section in the DAR must provide summaries of the analysis and results for any cumulative effects assessment done and presented under any individual Key Lines of Inquiry or Subjects of Note.

The cumulative effects assessment will consider regional plans (including Sahtu Land Use Plan and the Dehcho Draft Land Use Plan), species recovery plans, management plans and objectives and guidelines in an integrated manner in order to understand the aspirations of people and communities in the region. The developer will make reasonable and conservative assumptions about relevant cumulative effects from other activities where there is an absence of data, where these effects could combine with those of the proposed highway. The developer will consider climate trends (per section 8) in the cumulative context as well as the project specific context.

The developer will also provide a discussion of potential future developments that could occur as a result of, or use of, this highway (e.g., Mackenzie Gas project, oil and gas development in the central Mackenzie Valley). Include a discussion of implications for long-term operation, maintenance and management of the highway.

11. Follow-up and monitoring

"Follow-up" means a program for verifying the accuracy of the EA of a project, and determining the effectiveness of any measures taken to mitigate the adverse environmental effects of the project. The developer will:

- Clearly describe the regulatory and non-regulatory monitoring requirements for the life of the project;
- Provide a description of the purpose of each program, responsibilities for data collection, analysis and dissemination, and how results will be used in an adaptive management process;
- Describe how project-specific monitoring will be compatible with the NWT Cumulative Impact Monitoring Program or other regional monitoring and research programs; and,
- Describe how the results of follow-up monitoring and the management response framework would be used and incorporated into land use permit and water licence applications in support of highway construction and operations;

The developer is encouraged to discuss and adopt common data collection and monitoring protocols with local and regional monitoring programs including GNWT-Wildlife and the Sahtu Renewable Resources to facilitate project impact analysis.

Guidance on a management response framework, how to link monitoring results to management decisions, and how management activities are developed adaptively in response to changes in the environment can be found in the Wekeezhi Land and Water Board document *Guidelines for Adaptive Management – a Response Framework for Aquatic Effects Monitoring. Draft. Oct 17, 2010.*

11.1. Environmental and socio-economic effects monitoring

Measuring the effectiveness of mitigation, which includes reclamation of facilities used only for construction, requires that both the baseline and the future effects can be quantified. The

effectiveness of mitigation measures can only be determined by a monitoring approach that is based on testable or answerable questions, and includes adequate sampling and statistical procedures. To the extent possible, the developer should present data in the DAR that may be used for a baseline or benchmark in setting targets, thereby providing the foundation needed in the future to demonstrate the effectiveness of mitigation measures. Where the developer does not present such data for bench marks and targets, the developer will commit to a schedule and a process by which such data will be provided and used in the development of follow-up and monitoring targets. The targets will be used in defining the expected success of mitigation. As not all socio-economic indicators or data are conducive to measurement using targets, the developer should clearly state where qualitative and quantitative goals are used in place of targets.

The developer will prepare a table with effects monitoring requirements. For each effect of concern, this table will include, at a minimum, information on what the indicators and the parameters for the measurement will be and what the target or management goal will be.

11.2. Developer's socio-economic effects management, policies and commitments

Describe any management plans, policies, commitments, and arrangements directed at promoting beneficial or mitigating negative impacts to social, cultural, or economic conditions where they have been presented as a form of mitigation.

Discuss any requirements for contractors and sub-contractors to comply with these policies. Include information on the following:

- Recruitment, training, hiring, pay equity and employment policies, including those policies specifically for Aboriginal and local candidates, and those promoting participation;
- Contracting and procurement policies, including those which promote local sourcing, and participation of local businesses and how this will be accomplished;
- Employment policies, including policies on alcohol and drugs on the job site, harassment policies, firearms policies, work and pay schedules, and any policies related to worker access to harvesting areas;
- Commuting and work rotation of workers and contractors;
- Policies to managing hunting, fishing and gathering on, or from, the work site by non-aboriginal employees and contractors, while respecting the harvest rights of Aboriginal employees and contractors;
- Occupational health and safety and related training, and emergency response plans for workplace accidents;
- Scheduling of construction activities to accommodate needs of Aboriginal harvesters (employees, contractors, and non-employees);
- Scheduling of work activities to accommodate needs of Aboriginal employees and contractors to pursue other traditional activities; and,
- Promoting activities and programs that increase community stability and wellness.

12. Conclusion

The Review Board anticipates that the requirements described in this document will help the Government of the Northwest Territories to produce a Developer's Assessment Report that clearly describes its predictions of impacts from the highway and the likely effectiveness of proposed mitigation and management plans while providing sufficient basis for the Review Board and parties to analyze and evaluate those predictions.