



# **Mackenzie Valley**

## **Environmental Impact Review Board**

***Draft Terms of Reference  
for the  
Environmental Assessment  
of  
Canadian Zinc Corporation's  
Prairie Creek Mine  
EA 0809 - 002***

May 11, 2009

**Mackenzie Valley Review Board**

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## List of Acronyms

BC – British Columbia  
BC EAO – British Columbia Environmental Assessment Office  
Cdn. – Canadian (dollars)  
CO – Carbon monoxide  
EA Study Area – Environmental assessment study area  
GIS – Geographic information systems  
GNWT – Government of the Northwest Territories  
Km – kilometre  
*MVRMA – Mackenzie Valley Resource Management Act*  
NNPR – Nahanni National Park Reserve  
NO<sub>x</sub> – Nitrogen oxide  
NWT – Northwest Territories  
Pm<sup>2.5</sup> – particulate matter less than 2.5 microns in diameter  
Pm<sup>10</sup> – particulate matter less than 10 microns in diameter  
*SARA – Species at Risk Act*  
SO<sub>2</sub> – sulphur dioxide  
TSP – total suspended particulate

# 1. Introduction

## 1.1 Overview

This document outlines the information required for the environmental assessment of the Prairie Creek lead-zinc mine proposed in the Dehcho region of the Northwest Territories by Canadian Zinc Corporation (Canadian Zinc or the developer). It is divided into the following sections:

- Section 1 – Introduction, including the reasons for environmental assessment referral, the legal context, and the *Terms of Reference* development process;
- Section 2 – Description of the scope of the development being proposed and the scope of the assessment, including minimum geographic and temporal boundaries for consideration of impacts of the proposed development on valued components of the biophysical and human environments; and
- Section 3 – The *Terms of Reference* that will direct the production of a *Developer's Assessment Report*.

The *Terms of Reference* will be used by the developer to organize existing material, and conduct additional study and analysis as appropriate, in order to submit a “stand-alone” *Developer's Assessment Report*. That report will then be used to inform all interested parties about the proposed development during the analytical phase of the environmental assessment<sup>1</sup>.

The developer is encouraged to seek clarification from the Review Board in writing if specific requirements in the *Terms of Reference* are unclear.

## 1.2 Referral to Environmental Assessment

Canadian Zinc has applied to develop an underground mine and milling complex approximately 90 kilometres (km) northwest of Nahanni Butte, in the southern Mackenzie Mountains on the eastern side of and adjacent to Prairie Creek, some 43 km north of its confluence with the South Nahanni River. The proposed development includes winter road and highway transportation of concentrate from the lead-zinc mine by truck to the railhead in Fort Nelson, British Columbia.

The following applications to the Mackenzie Valley Land and Water Board in May and June of 2008 triggered a preliminary screening of this proposed development:

- MV2008L2-0002: Type A Water License, Prairie Creek Mine
- MV2008D0014: Type A Land Use Permit, Prairie Creek Mine
- MV2008T0012: Type A Land Use Permit, Liard Transfer Facility
- MV2008T0013: Type A Land Use Permit, Tetcela Transfer Facility

Three *Project Description Reports* and supporting appendices were filed by the developer as part of its application. The Mackenzie Valley Land and Water Board initiated a preliminary screening of the Prairie Creek Mine according to Section 124 of the *Mackenzie Valley Resource*

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<sup>1</sup> The role of the *Developer's Assessment Report* and associated next steps in the environmental assessment are identified in the *Work Plan* issued by the Review Board as a companion document to these *Terms of Reference*.

*Management Act (MVRMA).*

On August 8, 2008, Indian and Northern Affairs Canada notified the Mackenzie Valley Environmental Impact Review Board (Review Board) it had referred the Prairie Creek Mine development proposal to environmental assessment on behalf of the Nahanni Butte Dene Band, pursuant to the *Settlement Agreement* between the Dehcho First Nations and the Government of Canada dated July 8, 2005. The Nahanni Butte Dene Band requested this referral on the basis of “*concern[s] about the potential impacts of the Prairie Creek Mine on the environment and on the traditional rights and interests of [Nahanni Butte Dene Band] and its members*”<sup>2</sup>.

The Review Board notified Canadian Zinc on August 11, 2008, that the development had been referred to environmental assessment.

### **1.3 Legal Context and the Terms of Reference Development Process**

This environmental assessment is subject to the requirements of Part 5 of the *MVRMA*. Section Three of the Review Board’s *Environmental Impact Assessment Guidelines* describes the environmental assessment 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 at [www.reviewboard.ca](http://www.reviewboard.ca) or by contacting Review Board staff.

The Review Board must conduct an environmental assessment of the proposed development that has regard to the protection of the environment from significant adverse impacts, and to the protection of the social, cultural and economic well-being of Mackenzie Valley<sup>3</sup> residents and communities. The Review Board is also required to ensure public concerns are taken into account, and to have regard for the importance of conservation to the well-being and way of life of Aboriginal peoples.

The Review Board has developed these *Terms of Reference* based on an examination of information from the following sources:

- The public record of the preliminary screening;
- All information on the public registry in relation to the Prairie Creek Mine;
- Issues highlighted and information provided during scoping sessions held in Dehcho communities in September and October of 2008 and a technical scoping session held in Yellowknife in October 2008; and
- Review Board experience in the conduct of environmental assessment.

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<sup>2</sup> [NBDB request to INAC for referral to EA](#), dated July 28, 2008, placed on the Review Board website September 22, 2008. The Review Board develops both a paper and website public registry for each environmental assessment, available for viewing at the Review Board’s offices or at [www.reviewboard.ca/registry](http://www.reviewboard.ca/registry). All dates associated with public registry documents in these *Terms of Reference* are the date on which the file was received by the Review Board. Titles are cited as they appear on the website public registry.

<sup>3</sup> Throughout this document, the term “Mackenzie Valley” refers to the area as defined in section 2 of the *MVRMA*.

## 2. Scope Considerations

### 2.1 Scope of Development

Pursuant to section 117(1) of the *MVRMA*, the Review Board is required to determine the scope of development for every environmental assessment it conducts. The scope of development consists of all the physical works (buildings, for example) and activities required for the project to proceed.

Within this document the term “Prairie Creek Mine” means all the physical works and activities required to extract, concentrate, store, and transport lead and zinc concentrates out of the Mackenzie Valley on its way to market. Where this document refers to the “Prairie Creek Mine site”, that means the area covered by Prairie Creek’s mineral claims and mining leases near Prairie Creek.

The Review Board issued a ruling on March 5, 2009, based on a Request for Ruling from the Dehcho First Nations and the Canadian Parks and Wilderness Society in November 2008, that all physical works and activities associated with the winter access road into the mine as well as all physical works and activities associated with the Prairie Creek Mine site itself are included in the scope of development. The ruling with reasons is available on the public registry<sup>4</sup>.

Through the scoping process, the Review Board found that most of the required physical works and activities are adequately described in the three *Project Description Reports* submitted by Canadian Zinc to the Mackenzie Valley Land and Water Board. However, the Review Board notes these *Project Description Reports* do not thoroughly describe the annual construction and use of the winter road which is part of the scope of development, as well as the description of its environmental context. Section 3.2.5 of the *Terms of Reference* requires additional information on this aspect of the development, as part of a summary of all development components and activities and their systemic interactions.

The Review Board has used information provided by the developer to define the scope of development to consist, at minimum, of the following physical works or activities required during the construction, operation and closure phases of the Prairie Creek Mine:

#### **Mining and Materials Storage**

- Use of existing and development of additional underground workings, including construction of an additional portal and decline;
- Extraction and crushing of ore-bearing rock;
- Transport, storage and use of explosives;
- Mine dewatering;
- Construction, transportation to and management of a waste rock pile, including water management systems;
- Construction and management of a solid waste landfill within the waste rock pile;
- Management of dense media separation reject rock, and ore and tailings stockpiles on

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<sup>4</sup>[http://www.reviewboard.ca/upload/project\\_document/1236296722\\_final%20PCM%20ruling%20and%20cover%20letter%20march%205%202009.pdf](http://www.reviewboard.ca/upload/project_document/1236296722_final%20PCM%20ruling%20and%20cover%20letter%20march%205%202009.pdf)

surface, including construction of any associated foundations, buildings, and water treatment and management systems;

- Backfilling of mined out stopes using a tailings paste backfill and engineered bulkheads; and
- Mining equipment operation, including vehicles and materials conveyance systems.

### **Milling**

- Construction and use of a concentrate storage shed, concentrate bagging plant, dense media separation circuit, and paste backfill plant alongside the existing mill facility;
- Partial re-construction and operation of the milling complex;
- Extraction, transportation, consumption, recycling, treatment and discharge to the environment of minewater and process water; and
- Storage, handling, use and disposal of milling process additives and chemicals, both at the mill and on the reagent pad south of the mill.

### **Other On-Site Facilities and Activities**

- Removal of the existing coarse ore stockpile;
- Replacement of existing diesel power generation system and use of new power generation system;
- Re-construction and use of the existing tailings pond as a two-cell water storage pond;
- Construction and use of drainage control structures and process/waste water pipelines from mine to surface, and on surface at the Prairie Creek Mine site;
- Construction of any new roads and use of all roads at the Prairie Creek Mine site;
- Construction and use of a new water treatment plant;
- Additional construction where necessary and use during mine operations of existing on-site water management facilities, including the sewage treatment plant, polishing pond, runoff collection and water discharge system (including all drainage ditches, the catchment pond and all culverts and gates at discharge points), and all flood protection dykes around the property;
- Extraction of groundwater for use as potable water and for any other purposes;
- Re-construction of portions of, and use of, the fuel storage facility on site, including water management and containment facilities and activities,
- Demolition, re-construction where necessary, and use of portions of the existing built support infrastructure at the Prairie Creek Mine site, including the kitchen/diner complex, and some of the accommodation trailers;
- Use of existing on-site buildings and other facilities that are to be retained, including the administration/dry building, maintenance shops, bulk of accommodation trailers, equipment storage facilities in the main yard, and the inert waste storage facility (the boneyard) alongside Harrison Creek;
- Use of vehicles and all other emissions sources at the Prairie Creek Mine site; and
- Replacement of existing waste incinerator with new incinerator and its use.

### **Support/Ancillary Facilities and Activities**

- Initial upgrading (as necessary) and annual construction activities associated with the the winter access road from the mine to the Territorial Highway 7 (Liard Highway), including vehicle traffic, water use and water crossings;
- Truck transport of concentrate from the Prairie Creek Mine site along the winter road and the Liard Highway to the railhead at Fort Nelson;

- Transportation activities by air and road/winter road that support the Prairie Creek Mine's operation, including transportation of goods, fuel, contractors and employees in to and out of the mine, and removal and disposal of wastes or other materials, including operation of the existing airstrip at the Prairie Creek Mine site;
- Construction and use of two transfer facilities, one at km 84 from the mine along the winter access road (Tetcela Transfer Facility), and the other near the Liard Highway east of the Liard River crossing (Liard Transfer Facility), including unloading, storage, and reloading of concentrate, hydrocarbons and other materials; and
- Development and use of borrow sources for aggregate production at the mine site or along the winter access road.

### **Closure and Reclamation**

- Removal of all structures and equipment;
- Reclamation of water storage pond and all other site water management facilities;
- Reclamation of the winter access road and all Prairie Creek Mine site road networks;
- Reclamation of infrastructure foundations, dyking system, piping, and all built structures at the Prairie Creek Mine;
- Reclamation of the Tetcela and Liard Transfer Facilities;
- Reclamation of the waste rock pile, dense media separation reject rock, tailings, and ore stockpiles and any other surface materials storage locations;
- Re-vegetation of areas affected by mining or support activities;
- Backfilling, bulkhead installation and other capping of the underground works; and
- Long-term mine water outflow monitoring/management around the mine site.

The developer is responsible in the *Developer's Assessment Report* (see section 3.2.5) to fully describe all required facilities and activities for the development, including any not listed above. The Review Board may amend the scope of development during the environmental assessment if the proposed development changes.

### **2.2 Scope of Assessment**

The scope of assessment defines which issues will be examined in the environmental assessment. The scope of assessment includes all potential impacts on valued components of the biophysical and the human environment (e.g., wildlife species or heritage resources) 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 reviewed Canadian Zinc's *Project Description Reports* and supporting appendices, examined the public registries of the preliminary screening and ongoing environmental assessment (including historic information), hosted scoping sessions, and reviewed scoping submissions. The Review Board has determined it requires more information on the potential impacts of the Prairie Creek Mine on the human and biophysical environments.

The developer in its response to section 3.2.3 below will be required to define and provide rationales for the specific spatial and temporal boundaries it used to examine the potential impacts on each of the valued components considered in its impact assessment.



### 2.2.1 Geographic Scope

The Review Board provides the following guidance for setting the geographic scope for this environmental assessment. The minimum geographic scope will include:

- 1) Canadian Zinc's mineral and surface leases and mining claims in the Prairie Creek area, and a reasonable impact footprint radius centered on the Prairie Creek Mine site;
- 2) The winter road from the Prairie Creek Mine to the Liard Highway, including the two proposed transfer facilities, and a reasonable impact footprint corridor centered on the winter road, including any watercourses from the point at which they are crossed or otherwise influenced by the winter road downstream to the point where impacts are unlikely to be measurable;
- 3) The Liard Highway from the point where it meets the winter road just north of Lindberg Landing, south to the NWT/BC border, and a reasonable impact footprint corridor centered on the Liard Highway<sup>5</sup>; and
- 4) Prairie Creek downstream of the Prairie Creek Mine to the confluence of the South Nahanni River, and further downstream if there is evidence of likely project-related impacts.

The geographic scope will include all areas that may be affected in some identifiable way by activities related to the Prairie Creek Mine. For example, the geographic extent of evaluation of impacts on water must be governed by the predicted extent of measurable changes to both Prairie Creek and affected groundwater regimes under a range of potential outcome scenarios. Particular emphasis will be given to mapping the distribution of potential impacts on both the current and proposed expanded boundaries of the Nahanni National Park Reserve. The ranges of wildlife using the area, and the areas potentially-affected by transportation activities, particularly along the winter access road and the Liard Highway, are also to be considered. All of these areas together will be considered in the "EA Study Area", to be further defined by the developer in its *Developer's Assessment Report* (see Section 3.2.3).

The geographic scope for assessing impacts to the human environment shall focus on the communities of Nahanni Butte, Fort Liard, Fort Simpson, Wrigley and Lindberg Landing, and include the Dehcho region as a whole. The concerns of aboriginal residents who use the land in the EA Study Area for traditional pursuits must be considered. Together, these groups are described herein as "potentially-affected communities".

### 2.2.2 Temporal Scope

Determining an appropriate temporal boundary (timeline) is made more complex in this case by the fact Prairie Creek Mine infrastructure has been in place for close to 30 years. Information collected in or around 1980, prior to the development of the mine, may provide a picture of natural background conditions for some valued components of the biophysical environment, which will allow assessment of changes over time from previous mine-related activities, if any. Where historic information is available the temporal boundaries will go back

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<sup>5</sup> The British Columbia Environmental Assessment Office (BC EAO) was contacted by the Review Board to discuss whether any transboundary implications were perceived by that organization. None were identified and the BC EAO has declined to get involved in the environmental assessment at this juncture (see [Note to file - discussion with BC EAO](#), March 13, 2009). Therefore, the Review Board has limited the scope of assessment to that portion of the transportation route within its jurisdiction of the Mackenzie Valley (i.e., to the NWT/BC border).

to the time prior to initial construction of the mine so the developer can distinguish between these natural background conditions (for example, water quality in Prairie Creek prior to the early 1980s mine development) and current baseline conditions (see section 3.2.4).

Forward-looking temporal boundaries for this environmental assessment must be set by the developer according to potential long-term impacts on valued components, rather than on a single generic timeline. In all cases, the temporal boundary does not end with the duration of the operating phase of the Prairie Creek Mine. The temporal scope will include all phases of the Prairie Creek Mine lifespan and extend until such time that no potentially significant adverse impacts fully or partially attributable to the Prairie Creek Mine are predicted to occur. Additional instructions on temporal scope and temporal focus include the following:

- 1) Given that the developer has predicted that the Prairie Creek Mine is “expected” to operate for 20 years, this will be the minimum timeline for assessment of the operations phase of the mine lifespan;
- 2) The developer will place special focus on the consideration of times during the development when activities are particularly intense (e.g., during initial construction or during the annual winter road haul season) or when valued components are particularly sensitive to external stimulus (e.g., during wildlife migration periods); and
- 3) The developer will give special attention to the establishment of an appropriate temporal boundary for consideration of impacts of minewater release into the environment which may require long-term monitoring and management after closure.

### ***2.2.3 Other Scope of Assessment Considerations***

The scope of assessment will also include an examination of cumulative effects. Cumulative effects assessment will focus on other past, present and reasonably foreseeable future developments or human activities that combine with the impacts of the Prairie Creek Mine to affect the same valued components. Such cumulative effects will be assessed at a geographic and temporal scale appropriate to the particular valued component under consideration.

Any developments or development components related to historic activities at or in support of the Prairie Creek Mine not specifically required to support the currently proposed Prairie Creek Mine are not defined as part of the scope of development. However, they must be considered for their contribution to the cumulative effects assessment (see Section 3.2.7 for more details).

The level of effort required in considering specific issues is discussed in section 3.1 below under “Issues Prioritization”.

The scope of assessment set out in these *Terms of Reference* may be re-examined at any time by the Review Board if new information emerges.

## 3. Terms of Reference

### 3.1 Considerations

Canadian Zinc is to consider the following when developing the specific material the Review Board requests in Section 3.2.

#### 3.1.1 Incorporation of Historic Information

The public registry for this file includes a wealth of information from previous environmental studies, applications, environmental assessments, and other documents detailing the historic operation and work done by Canadian Zinc over the past two decades. This wealth of historic information provides a strong base for the *Developer's Assessment Report*, especially considering the developer will use many of the existing components on site and the same winter road. Historic information should be summarized and incorporated in the relevant areas of the *Developer's Assessment Report*, provided the developer identifies the source material and any limits on the accuracy of the information or applicability to the current environmental or development context.

#### 3.1.2 Issues Prioritization

The purpose of scoping is not merely to identify issues, but also to prioritize them and if possible, focus required additional work on the most important ones. Canadian Zinc will give consideration to all of the items described in Section 3.2, because every issue identified in this *Terms of Reference* requires a sufficient analysis to demonstrate whether the development is likely to be the cause of – or a contributor to - significant adverse impacts on that aspect of that environmental component. However, one particular issue was identified during scoping as requiring increased attention, because of high impact potential and expressions of public concern. The following **Key Lines of Inquiry** will be a major focus of the environmental assessment and be given special consideration by Canadian Zinc in the *Developer's Assessment Report*:

- **Water quality impacts of the Prairie Creek Mine on the Prairie Creek watershed**, particularly in relation to the quality of minewater and effluent released to the groundwater and surface water regimes in the Prairie Creek watershed, and downstream impacts on water and aquatic ecosystems.

This Key Line of Inquiry is the topic of greatest concern that requires the most attention during the environmental assessment and the most rigorous analysis in the *Developer's Assessment Report*. Designation as a Key Lines of Inquiry is intended to ensure a comprehensive analysis of the issues most likely to cause significant environmental impacts or significant public concern. Data collection and analysis of this Key Line of Inquiry in the *Developer's Assessment Report* 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.

To facilitate close examination of the developer's response to this Key Line of Inquiry, it will be presented in a comprehensive stand-alone section in the *Developer's Assessment Report* which requires only minimal cross-referencing with other parts of the report and appendices.

All other issues that require examination in the *Developer's Assessment Report* are treated as **Subjects of Note**. These issues do not have the same priority or expected level of detail as

Key Lines of Inquiry, but are nonetheless issues that require serious consideration and a substantive analysis.

### ***3.1.3 Incorporation of Traditional Knowledge***

The Review Board values and considers both traditional knowledge and scientific knowledge in its deliberations. Canadian Zinc shall make all reasonable efforts to assist in the collection and consideration of traditional knowledge relevant to the Prairie Creek Mine. Traditional knowledge, where it is applicable, is to be used as a tool to collect information on and evaluate the specific items required in Section 3.2. The developer is advised to refer to the Review Board's *Guidelines for Incorporating Traditional Knowledge into the Environmental Impact Assessment Process*<sup>6</sup> and community-specific traditional knowledge protocols.

### ***3.1.4 Assessing the Impacts of the Environment on the Development***

Potential impacts of the physical environment on the development, such as changes in the permafrost regime, other climate change impacts, seismic events, and extreme precipitation or flood events must be considered in each of the applicable items of Section 3.2. These issues are of particular importance in this development context where they relate to water management and geotechnical stability. Any changes or modifications to the Prairie Creek Mine plan as a result of potential impacts of the environment should be noted in the relevant sections.

### ***3.1.5 Use of Appropriate Media***

The developer is encouraged 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 *Terms of Reference*, the developer should make every effort to simplify their response in the main body of the text and place supporting materials in appendices.

All GIS data must conform to the standards set by the Government of the Northwest Territories (GNWT's) spatial data warehouse<sup>7</sup>.

The *Developer's Assessment Report* will be submitted as a stand alone document. Relevant data and analysis from the *Project Description Reports* and other previous studies should be incorporated where applicable into the *Developer's Assessment Report* and combined with any supplementary material and analyses required herein. Where external sources of information are referenced, a succinct summary of the relevant information from the source report should be provided, and the referenced document placed on the public record for this environmental assessment.

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6 Available at [http://www.reviewboard.ca/upload/ref\\_library/MVEIRB\\_TK\\_Guide.pdf](http://www.reviewboard.ca/upload/ref_library/MVEIRB_TK_Guide.pdf).

7 The GNWT's spatial data warehouse may be accessed at <http://maps.gnwtgeomatics.nt.ca/portal/index.jsp>.

## 3.2 General Information Requirements

*The developer is encouraged to consider the information gaps identified and questions raised by interested parties in their scoping submissions when determining the level of detail required in its Developer's Assessment Report for specific issues covered in these Terms of Reference. All scoping submissions are available on the website public registry for this file.*

### 3.2.1 Summary Materials

The following summary materials are required:

1. English and South Slavey plain language, non-technical summaries of the *Developer's Assessment Report*;
2. An audio (.mpeg) translation of the plain language summary in the South Slavey language;
3. A concordance table that cross references the items in the *Terms of Reference* with relevant sections of the *Developer's Assessment Report*; and
4. A commitments table listing all mitigation measures the developer will employ, organized by theme (e.g., water quality, wildlife) for easy reference.

### 3.2.2 Developer

Provide the following information regarding Canadian Zinc Corporation:

- 1) A summary of the company's corporate history in Canada and the Northwest Territories;
- 2) How the developer will ensure that its contractors and subcontractors honour commitments made by Canadian Zinc;
- 3) Canadian Zinc's environmental performance record during prior exploration and development work in support of the Prairie Creek Mine, including discussion of
  - a) regulatory compliance (e.g., in regards to land use permits and water licenses), with a list of any situations where compliance was breached, the issue and cause, and how and when it was mitigated to the regulator's satisfaction;
  - b) compliance with commitments made during prior environmental assessments; and
  - c) compliance with measures required by the Review Board during prior environmental assessments<sup>8</sup>.

As part of this discussion, the developer will provide a table identifying all commitments made and measures required as a result of previous environmental assessments and identify whether and how they were adhered to, or provide reasons for non-compliance; and

- 4) A description of any corporate policies, programs or plans concerning Canadian Zinc's environmental, sustainable development, community engagement and workplace health and safety commitments.

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<sup>8</sup> Identify the prior assessment by number (e.g., EA01-003).

### 3.2.3 Developer's Assessment Boundaries

*The developer will provide a description and rationale for all of the chosen geographic and temporal boundaries used during its impact assessment. Certain minimum requirements and other instructions to assist in the determination of appropriate boundaries are discussed in Section 2.2 of the Terms of Reference. Separate boundaries may be required for cumulative effects assessment (see Section 3.6).*

The developer will provide the following information:

- 1) A description and rationale for the spatial boundaries of the overall EA Study Area chosen;
- 2) A description and rationale for Canadian Zinc's chosen spatial boundaries for the assessment of potential impacts for each of the valued components considered.
- 3) A description and rationale for the temporal boundaries chosen for the assessment of impacts on each valued component.

### 3.2.4 Description of the Existing Environment

*A detailed description of the existing environment is required, including current status and trends for all valued components. Wherever possible, the developer is responsible for providing a clear picture of what environmental conditions in the EA Study Area were prior to industrial activity (mine construction) occurring. This can then be compared to the current (baseline) conditions to assess both total impact loads (if any) and rates of change over time. For each biophysical valued component where historic information is available the developer will compare natural background (pre-mining) conditions to the current baseline conditions. This will assist in understanding both the existing level of environmental impacts caused by past development activities associated with the Prairie Creek Mine and the likely future impacts associated with full-scale mine operations.*

#### **Biophysical Environment**

Describe baseline conditions for the following:

- 1) The physical location of the proposed development and identification of associated ecozones and ecoregions;
- 2) Ambient air quality and background noise levels (with a description of all human-caused noise sources);
- 3) Climatic conditions, including temperature and precipitation;
- 4) Hydrology and hydrogeology, including surface water, shallow subsurface water and groundwater amounts, direction of flow, likely surfacing points/discharge area (for groundwater and shallow subsurface water) and maps and descriptions of associated watersheds. This should focus in particular on:
  - The Prairie Creek Mine site, including groundwater flow from the mine itself and water flow through the alluvial deposits underlying much of the mine infrastructure and Harrison Creek;
  - The area around the proposed waste rock pile and down Harrison Creek valley;
  - Seasonal and annual variation in groundwater and surface water quantity around the Prairie Creek Mine site, including trends over time;
  - The relative contribution of water from the Prairie Creek Mine site to the volume of Prairie Creek and further downstream, to the volume of the South Nahanni River; and
  - Surface water and groundwater flow regimes associated with the Nahanni North Karst

landform;

- 5) Current and historic data on surface water and groundwater quality for the immediate mine site area;
- 6) Current and historic data on the quality of water coming out of the mine;
- 7) Aquatic organisms (especially fish, including bull trout, Arctic grayling and mountain whitefish) and aquatic habitat in the EA Study Area. Special emphasis is required on Prairie Creek and its tributaries. For these locations, describe the following for key aquatic species:
  - seasonal and life cycle movements;
  - local and regional abundance and distribution;
  - known or suspected sensitive habitat areas for different development stages and times of year;
  - the health of the food chain that supports the species; and
  - any known issues currently affecting fish and other aquatic life forms in the area;
- 8) Wildlife and wildlife habitat and migration corridors. Special emphasis will be placed on Dalls sheep and key harvested species like moose. For each species, information on the following is required (by population if more than one distinct population is present in the EA Study Area):
  - population trends, including abundance, distribution and demographic structures;
  - habitat requirements, including areas of important habitat, attributes of the seasonal habitats that relate to how the species use them (e.g. travel routes, forage) and sensitive time periods;
  - migration routes, patterns and timings including typical patterns and the range of known variation;
  - factors known or suspected to be currently affecting the species in the EA Study Area (e.g. harvesting, disease);
  - known or suspected sensitivities to human activities; and
  - gaps in current knowledge of the species such as the impacts of disturbance on behaviour or abundance.
- 9) “Wildlife at risk” that use habitat in the EA Study Area. The developer will:
  - Identify any species present or potentially present in the project area that are listed under schedule 1 of the federal *Species At Risk Act (SARA)*;
  - Identify any species present or potentially present in the project area assessed by the Committee on the Status of Endangered Wildlife in Canada; and
  - Describe each species in terms of the requirements of Item #8 above.
- 10) Vegetation and plant communities, including identification of any areas where rare plants are known or suspected to be present;
- 11) Terrain, surficial geology, structural geology, mineralogy, bedrock geology (type, depth, composition, permeability), seismic activity records and risk factors, permafrost locations and types within the EA Study Area. In particular:
  - identify the location and extent of the Nahanni North Karst landform and describe its

structure, permeability, stability, and other relevant characteristics of this landform (e.g., location of sinkholes, poljes);

- identify the chemical composition of host rock and ore bodies at the mine site;
- describe and map the ground composition underlying the Prairie Creek mine site, with a focus on susceptibility to water infiltration of different stratigraphic layers;
- identify the location, amounts and type of granular material deposits; and
- describe the ground conditions under and around the winter road, the transfer facilities and the mine site, with emphasis on identifying areas susceptible to erosion, landslides and permafrost instability; and

12) Physical and chemical makeup of soils and water body sediments.

### ***Human Environment***

Describe baseline conditions for the following:

- 13) The location and description of any historic developments related to the Prairie Creek Mine outside the scope of currently proposed development (e.g., the Cat and Grainger Camps, exploration roads and drill sites);
- 14) Any other physical infrastructure present in the EA Study Area, including habitations, roads, buildings, quarries, power lines and industrial works;
- 15) Current and proposed protected areas status of the EA Study Area, with an emphasis on the Prairie Creek Mine's proximity to the current and proposed NNPR boundaries, and a description of how the *Dehcho Interim Land Use Plan* treats the EA Study Area;
- 16) Existing traffic patterns along Territorial Highway 7 (the Liard Highway) from the Northwest Territories border to the winter road turnoff north of Lindberg Landing, as well as identification of any seasonal road use restrictions;
- 17) The availability and average training/skill levels of the local and Dehcho regional labour pool and local and regional business capacity;
- 18) Current socio-economic conditions and relevant trends in the potentially-affected communities and the Dehcho region as a whole, using appropriate indicators of well-being and quality of life;
- 19) A summary of historic and present land use in the study area, including identification of traditional land use groups and the areas they tend to frequent;
- 20) Traditional harvesting activities for - and traditional values about – all relevant animal (including fish) and plant species, including annual average harvesting data by species;
- 21) Known physical heritage resources locations, areas of high potential for unfound physical heritage resources, and cultural values associated with the EA Study Area,; and
- 22) Other economic activities the EA Study Area is currently used for, with emphasis on traditional economic activity, outfitting and Parks-related tourism.

### **3.2.5 Development Description**

*Canadian Zinc will ensure that an adequate description of all its planned facilities and activities is included in the Developer's Assessment Report. In this section, Canadian Zinc is only asked to provide details on the Prairie Creek Mine itself, not to comment on potential impacts from the development.*



*The Review Board recognizes that many of the components of the Prairie Creek Mine are already in place. It is also apparent that the developer plans to alter many of the existing on-site components for the updated mine. These alterations need to be fully described. Where the developer feels it would be helpful to reviewers, the Developer's Assessment Report should describe alternative development components, management systems, or alternative locations for physical works and activities considered for the updated mine should be discussed. Where applicable, the developer will provide reference to research that identifies the successful use of the specific technologies being proposed, and their relevance for this environmental setting.*

The development description shall include the following:

***General Items***

- 1) A Gantt chart of the estimated lifespan of the Prairie Creek Mine broken down into construction, operation, closure and reclamation, and long-term monitoring phases, with a description of major activities by phase;
- 2) The physical footprint of the Prairie Creek Mine site, with locations and descriptions of all structures and all aboveground and underground infrastructure;
- 3) A table of all existing infrastructure components, how they are proposed to be altered and for what purpose, and a description of which existing infrastructure will be removed entirely and how it will be replaced;
- 4) For each existing infrastructure component, a prediction of any changes from its current level of usage during full scale operations (e.g., increased frequency of aircraft flights), as well as comparison of maximum expected usage to the design capacity for the development component;
- 5) A list of all regulatory permits, licenses and other authorizations required to carry out the development; and
- 6) A list of any other required developments that need to be constructed or improved in order for the Prairie Creek Mine to proceed.

***Specific Items***

- 7) All underground facilities, including portals, declines, location of infrastructure, machinery requirements, and water management facilities and methods;
- 8) The types and estimated amounts of explosives to be used, their storage, handling and application, both aboveground and underground;
- 9) The mining, crushing, and ore transportation methods used in the underground works;
- 10) The backfill technology to be used, the paste backfill plant, transport of the paste backfill to the underground works, the planned bulkheads system, and when and how tailings stored on the surface will be transported to and used in the paste backfill system;
- 11) The location and contents of surface storage facilities for mined materials, along with estimates of storage requirements and underground storage capacity limits;
- 12) A description of the milling process;
- 13) Location(s) and proposed activities of aggregate production and storage, with an estimate of the amount of aggregate that will be produced per year over the life of the mine, by location;

- 14) Description of the type, volume, storage (location and method), handling, and disposal of all potentially hazardous materials used on site (provide Material Safety Data Sheets);
- 15) A description of the water collection, management and treatment system and all of its component parts, including control structures, water treatment facilities, water storage facilities, and water transport components;
- 16) The total amount of water in cubic metres estimated to come out of the mine and eventually be released into Harrison Creek, with consideration of changes during the life of the Prairie Creek Mine and seasonal fluctuations (this amount should be presented as a range);
- 17) Sources and estimated amounts of water required for all on-site activities;
- 18) A description of water quality and quantity monitoring proposed for the Prairie Creek Mine site and its surroundings;
- 19) Energy requirements, generation sources, and fuel storage facilities, on-site transport and handling procedures;
- 20) All other infrastructure and activities proposed for the Prairie Creek Mine site not referred to above, including estimates of frequency and type of aircraft landings and takeoffs, and intensity and type of on-site vehicle traffic;
- 21) All existing or proposed access roads required for the Prairie Creek Mine, with particular emphasis on the winter road, including analysis of necessary one-time improvements, initial and annual construction techniques, proposed water crossing types by location, and amount of water and other materials required;
- 22) A description of water quality and quantity management and monitoring along the transportation corridor and at the transfer facilities;
- 23) The route by which concentrate will be transported from the Prairie Creek Mine to Fort Nelson, the expected number of transits<sup>9</sup> per day (and per winter road season) to and from the Prairie Creek Mine by truck type and weight of load, how it will be stored and handled at the two transfer facilities, and estimated duration of the annual haul season;
- 24) The location, construction requirements, and operation activities of the Tetcela Transfer Facility and Liard Transfer Facility;
- 25) The number of full-time job equivalents and person years of work associated with the Prairie Creek Mine, broken down by life cycle phase; and
- 26) Worker transportation and proposed work scheduling.

### **3.2.6 Public Engagement**

*Engagement with any community, Aboriginal group, level of government, or other organization with interests related to areas that might be affected by the Prairie Creek Mine should be considered in this section. Aboriginal groups, different 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 environmental assessment process, and to place any information from those discussions they feel may be relevant to the Review Board's decision on the public record.*

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<sup>9</sup> Transits are defined as single, one-way trips, as opposed to round trips. A round trip is equal to two transits.

The following items are required for consideration of public engagement:

- 1) An engagement log, describing dates, individuals and organizations engaged with, the mode of communication, and discussion topics, including:
  - a. 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 Prairie Creek Mine; and
  - b. All issues that remain unresolved, documenting any further efforts envisioned by the parties to resolve them;
- 2) Description of all methods used to identify, inform and solicit input from potentially-interested parties, and any plans Canadian Zinc has to maintain engagement moving forward;
- 3) Discussion of the implications for environmental monitoring and management of any relevant agreement between the developer and other interested parties, including Parks Canada and any level of government, including aboriginal governments; and
- 4) How Canadian Zinc has engaged, or intends to engage, traditional knowledge holders<sup>10</sup> in order to collect relevant information for the impact assessment, as well as a summary table indicating where and how in which of the subsequent sections (3.3-3.6) traditional knowledge was used in the information collection and analysis.

### **3.3 Impacts on the Biophysical Environment**

#### **3.3.1 Impact Assessment Steps and Significance Determination Factors**

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 environment, the *Developer's Assessment Report* will for each subsection:

- Identify any valued components used and how they were determined;
- For each valued component, identify and provide a rationale for the criteria and indicators used;
- Identify the sources, timelines and methods used for data collection;
- Identify natural background conditions (where historic data is available), and current baseline conditions, and analyze for discernible trends over time in the valued component;
- Identify any potential direct and indirect impacts on the valued components that may occur as a result of the proposed development, identifying all analytical assumptions;
  - Predict the likelihood of each impact occurring, prior to mitigation measures being implemented, identifying and providing a rationale for the confidence held in the prediction;
  - Describe any plans, strategies or commitments to avoid, mitigate or otherwise manage the identified potential adverse impacts, with consideration of best management practices in relation to the valued component or development component in question;
- Assess the significance of any residual adverse impacts estimated to remain after the imposition of mitigation measures; and

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<sup>10</sup> Suggestions for working with communities to obtain traditional knowledge are described in Section Four of the Review Board's *Guidelines for Incorporating Traditional Knowledge in Environmental Impact Assessment*.

- Identify any monitoring and adaptive management plans required to ensure that predictions are accurate and if not, to proactively manage against adverse impacts when they are encountered.

Use of valued component/development component matrices to identify potential interactions, relevant case studies, and qualitative and quantitative discussion of impacts, their causes and outcomes is encouraged to assist in describing likely interactions between the project and the biophysical environment.

When describing impacts and assessing their significance, Canadian Zinc must characterize:

- The nature or type of the impact;
- The direction of the impact (i.e., beneficial vs. adverse);
- The magnitude of the impact, and whether it exceeds a threshold of manageable change;
- The geographic range the impact will occur within, as well as impact loads on any location of heightened sensitivity or high local impact intensity;
- The timing of the impact (including duration, frequency and extent);
- The likelihood of the impact occurring;
- The reversibility of the impact; and
- The confidence level in the prediction, and any factors influencing the level of uncertainty in the predicted outcome (this uncertainty analysis must consider the confidence of the developer in underlying assumptions, models, and data sources).

These criteria shall be used by the developer as a basis for *its opinions* on the significance of impacts on the biophysical environment. The Review Board will make the ultimate determination of significance once considering all the evidence on the public record at the end of the environmental assessment.

### **3.3.2 KEY LINE OF INQUIRY: Mine Site Water Quality**

*During scoping, potential impacts of the Prairie Creek Mine site on local and downstream water quality were identified as a Key Line of Inquiry by all interested parties, including the developer. This Key Line of Inquiry is limited to water issues in the Prairie Creek Mine site area and downstream in the Prairie Creek watershed only. Other water issues related to the transportation facilities are examined in 3.3.4: Off-site Water Quality and Quantity. Some overlap with other sections of the Terms of Reference is inevitable. The developer will consider all potential impacts of water quality on the Prairie Creek watershed to the point where it reaches the proposed expanded boundary of the NNPR in a stand-alone section of the Developer's Assessment Report. That may some include discussion of issues considered in section 3.3.5 (Fish and Aquatic Habitat), for example. Issues related to water quality impacts within the NNPR should be informed by section 3.3.2 but principally examined in section 3.3.3.*

While conducting an impact assessment on water quality from the Prairie Creek Mine site, specific consideration shall be given to the following issues and specific items:

- 1) The historic impact of minewater discharged into Prairie Creek between 1980 and 2006, as well as treated effluent discharged starting in 2006, including:
  - a. Description of the chemical properties of the minewater flowing out of Prairie Creek Mine, and any identified changes in chemical concentrations trends over time;
  - b. Estimated total and annual contaminant loading on Prairie Creek from historic minewater discharge, with emphasis on metals, ammonia, and total solids; and

- c. Identification of any measurable historic impacts of minewater discharge on Prairie Creek's water quality and aquatic ecosystems, an estimate of the geographic distribution of those impacts, and identification of any longer-term implications for valued components that need to be considered when assessing the current mine proposal;
- 2) Identification of all potential sources of contamination from the Prairie Creek Mine site, including risk assessment of the potential for the following to leach metals into the environment or create acid rock drainage:
- a. Underground paste tailings backfill or surface-stored tailings;
  - b. The waste rock pile; and
  - c. Any other materials stored on surface at the Prairie Creek Mine site;
- This discussion will include estimates of how much of the waste rock will likely be placed underground, how this amount will be maximized, and post-closure locations, predicted amounts, and management systems for all surface materials storage systems;
- 3) Prediction of the likely water quality and quantity of final effluent discharged to the environment during all phases of the Prairie Creek Mine life cycle, incorporating:
- a. Predicted changes over time in the amount or quality of minewater outflows;
  - b. All relevant water quality parameters including pH, concentrations of metals, nutrients, total suspended solids, major ions, process chemicals and bacteria; and
  - c. Identification of the confidence levels in the predictions, the assumptions used, and the likely range of variation for the parameters identified;
- 4) Risk assessment of potential impact outcomes of effluent discharge on Harrison and Prairie Creeks, including the likelihood of occurrence and implications of
- a. Changes to pH in downstream watercourses;
  - b. Increasing sediment levels and water turbidity;
  - c. Increasing contaminant concentrations in the sediments, fish and other aquatic organisms of Harrison and Prairie Creeks;
  - d. Discharge of ammonia, including possible changes in nutrients available in the food chain in downstream water bodies; and
  - e. Any other impacts which may alter water quality or aquatic ecosystem integrity downstream of the mine;

This risk assessment should include estimates of dilution effects on effluent once it enters Prairie Creek, with discussion of at what point no discernible impacts to water quality should be measurable downstream, how effluent will likely mix with and disperse in Prairie Creek waters and sediments, and contaminant mobility in water under likely environmental conditions;

- 5) Identification of any potential sources of contaminated groundwater not captured in the minewater management system. This discussion should identify
- a. Where losses to the groundwater system could occur;
  - b. Estimated quantities of contaminated groundwater loss; and
  - c. Potential impacts of contaminated groundwater on the environment and their likely

geographic distribution;

- 6) Discussion of whether there are any site-specific sensitivities in the receiving environment that may require additional precautionary limits on effluent quality above applicable national standards and guidelines for effluent quality and protection of aquatic ecosystems;
- 7) Discussion of the adequacy of the existing and proposed water collection, management and treatment facilities to function during full-scale mining, including:
  - a. The existing sewage treatment system;
  - b. The existing polishing pond and catchment pond;
  - c. The new water treatment plant; and
  - d. The newly configured water storage pond.

This discussion should emphasize the ability of these facilities and the system as a whole to handle expected increased mine water outflows, retention capacity timelines and contingency plans for greater than expected outflows, and impacts of any identified failure mode;

- 8) Risk assessment of how accidents, malfunctions, or impacts of the environment on the development could influence water quantity and quality and the ability of the water management system to function. This discussion should include the likelihood and required circumstances for a failure to occur, and what monitoring and adaptive management systems will be in place to deal with, at minimum, the following scenarios:
  - a. Extreme short-term precipitation events, snowpack buildup or other factors leading to flooding events;
  - b. Geologic instability causing landslides at or near the Prairie Creek Mine or compromise of the waste rock pile;
  - c. Failure of existing water retention structures between Prairie Creek and the mine site or between the water storage pond and the remainder of the mine infrastructure;
  - d. Freezing effects on water transportation systems; and
  - e. How minewater will be dealt with if the water treatment system malfunctions, with a focus on retention capacity timelines for water storage facilities.
- 9) Description of operations-stage and long-term water quality monitoring and management, including:
  - a. Contingency plans in case metals leaching and acid rock drainage occurs;
  - b. Conceptual plans for surface water and ground water monitoring;
  - c. A discussion as to whether and how Canadian Zinc will incorporate Dehcho residents in environmental monitoring, and how it will report monitoring results to potentially-affected communities; and
  - d. A prediction of how long post-closure monitoring will be required, what aspects of the mine and the receiving environment will be monitored, and how monitoring into the extremely long-term will be ensured if required.

### 3.3.3 Ecological Integrity of the Nahanni National Park Reserve

*A variety of parties, including the developer, recognize the need to protect the ecological integrity of the Nahanni National Park Reserve (NNPR) as a priority theme for this environmental assessment. The facts that the mine will be in production for the first time, the likelihood that the NNPR will be expanding in the near future and will likely be closer to – indeed surrounding – the Prairie Creek Mine and the western portion of the winter road, and the NNPR’s status not only as a National Park Reserve but also as a World Heritage Site, make this subject an important one.*

*Ecological integrity is defined in the Canada National Parks Act as*

*“... a condition that is determined to be characteristic of its natural region and likely to persist, including abiotic components and the composition and abundance of native species and biological communities, rates of change and supporting processes”.*

*Final NNPR boundaries have not yet been set. However, the Review Board understands that all three options being considered are identical in their effect on the area around the Prairie Creek Mine site<sup>11</sup>. All three options encircle the minesite completely and move the NNPR boundary from its current 32 km downstream of the mine to seven km. The developer will base its assessment of the Prairie Creek Mine site’s potential impacts on the NNPR on these proposed new boundaries.*

*Responses to other sections of the Terms of Reference shall be used to inform the NNPR-specific analysis required herein. For example, the majority of water quality issues are to be dealt with in 3.3.2, which can then be used to inform the risk assessment inside NNPR boundaries required below. Potential impacts on the wilderness values associated with the NNPR are considered in the section on the human environment (3.4.2 and 3.4.3).*

*Parks Canada has identified several elements of ecological integrity that the Review Board agrees must be considered by the developer in its impact assessment. The developer is encouraged to consider Parks Canada’s scoping submission<sup>12</sup> and structure its impact assessment accordingly.*

The following issues will be considered by the developer in its investigation:

1. Risk assessment for impacts on the ecological integrity of the NNPR from contamination of groundwater or surface water flowing into the NNPR from all possible sources associated with the Prairie Creek Mine. This risk assessment will be informed by the results of the impact assessment on water resources conducted in 3.3.2, focusing on
  - a. Potential impacts associated with the likely water quality at the point where the Prairie Creek enters the NNPR;
  - b. potential impacts on the NNPR and the South Nahanni River stemming from a worst-case scenario; and
  - c. identification of appropriate mitigation and monitoring commitments and contingency plans, as required;
2. Risk assessment for impacts on the ecological integrity of the NNPR from accidents, malfunctions or impacts of the environment on the Prairie Creek Mine, with identification of appropriate avoidance strategies and contingency plans for each as required. The developer will consider the implications for the NNPR of failure modes identified in its responses to 3.3.2 (#8), 3.3.4, 3.3.5 (#5), and 3.3.7;
3. Consideration, incorporating results from 3.3.2, 3.3.4 and 3.3.5, of how any physical

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<sup>11</sup>[http://reviewboard.ca/upload/project\\_document/1242077402\\_Boundary\\_Options\\_of\\_Proposed\\_NNPR\\_Expansion.PDF](http://reviewboard.ca/upload/project_document/1242077402_Boundary_Options_of_Proposed_NNPR_Expansion.PDF)

<sup>12</sup> [Scoping Submission from Parks Canada](#), October 20, 2008.

works or activities associated with the Prairie Creek Mine, including activities along the winter road, could affect any of the following parameters of ecological integrity of aquatic ecosystems in the NNPR, with identification of appropriate mitigation and monitoring commitments for each as required:

- a. Physical and chemical processes that influence aquatic ecosystems;
  - b. Aquatic invertebrates and algal communities in the Prairie Creek watershed;
  - c. Availability of suitable fish habitat within the NNPR;
  - d. Fish population structures, including abundance and size distribution;
  - e. Riparian vegetation structure and function; and
  - f. Introduction of non-native aquatic species.
4. Consideration, incorporating results from 3.3.6 and 3.3.9, of how any physical works or activities associated with the Prairie Creek Mine, including activities along the winter road, could impact on any of the following parameters of ecological integrity of terrestrial ecosystems in the NNPR, with identification of appropriate mitigation and monitoring commitments for each as required:
- a. Introduction of non-native plant species;
  - b. Disturbance of wildlife, increased mortality, contamination of food and water sources, habitat fragmentation or destruction, and other impacts on the individual and population health and distribution of wildlife resident within the NNPR, with special emphasis on “wildlife at risk”, Dalls sheep and moose;
  - c. The Nahanni North Karst, with special emphasis on potential impacts from winter road and Tetcela Transfer Facility operations, including risk assessment of
    - i. Likelihood and implications of collapse or significant erosion of areas of karst over which this infrastructure lies. The developer will estimate the geotechnical stability of the road in light of the known nature and stability of the karst formation and the planned volume, timing and weight of vehicles travelling the winter road, and identify mitigation to eliminate or reduce impacts to the karst and any required monitoring;
    - ii. Potential for and implications of hydrocarbon or other contaminant spills, including estimation of the likelihood of rapid spread of contaminants via surface or groundwater flows associated with the karst landform, and possible implications for water and wildlife. Factors influencing the potential for accidents and spills occurring must be considered; and
    - iii. Impacts on vegetation characteristic of the karst region.
5. A description of whether and how Canadian Zinc and Parks Canada plan to work together to minimize impacts on the ecological integrity of the NNPR, including joint monitoring and management plans, inclusion of other interested parties, reporting of results, and proposed monitoring timelines.

#### **3.3.4 “Off-site” Water Quality and Quantity**

While conducting an impact assessment on water quality along the transportation route, specific consideration shall be given to:



1. Identification of any potential sources and locations of surface or groundwater contamination, with specific discussion of
  - a. Winter road activities, including during annual construction and at water crossings;
  - b. Transfer facilities; and
  - c. Transportation along the Liard Highway.
2. The potential impacts of these facilities and activities on the quality, quantity and ecology of surface waterbodies and groundwater regimes, including
  - a. An assessment of the potential to promote erosion and water sedimentation, impact outcomes for valued components, and contingency plans to deal with sedimentation of watercourses in the event it becomes a concern;
  - b. Risk assessment of contamination via accidents and malfunctions, especially spills of hydrocarbons, concentrate or other potentially hazardous materials near or in water, and discussion of spill avoidance and treatment plans; and
3. Identification of appropriate mitigation and monitoring required.

### **3.3.5 Fish and Aquatic Habitat**

*Potential impacts to aquatic ecosystems, especially fish and their habitat, were identified as issues of concern during the Review Board's scoping exercise. Public concern focused on the Prairie Creek Mine's potential to contribute to the contamination of local fish stocks through water quality changes. Bull trout is considered a species that "may be at risk" in the NWT, and merits special attention. The developer is required to consider potential impacts of all contaminated water originating from Prairie Creek Mine operations on aquatic organisms and their habitat. Focus in this section should be on fish populations outside of the NNPR; consideration of fish species health and population status within the NNPR should be dealt with in section 3.3.3.*

The impact assessment on fish and aquatic habitat shall give consideration to:

1. The identification of any fish-bearing water bodies within the EA Study Area, including Harrison Creek, Prairie Creek, the South Nahanni River and any water bodies the winter road crosses or otherwise impacts on;
2. Estimation of the impacts of Prairie Creek Mine's historic and future operations on the EA Study Area's key aquatic organisms and habitat, including potential impacts of the following:
  - a. Changes to flow or habitat, including alterations to banks and shores of waterbodies near winter road water crossings, and associated changes in habitat availability;
  - b. Reduced oxygen concentration;
  - c. Increased concentrations of metals, nutrients and other contaminations in water and up the aquatic food chain;
  - d. Increased sedimentation in watercourses, especially from the waste rock pile and winter road activities; and
  - e. Alteration of pH.
3. The developer's commitments to mitigate any habitat losses (such as a *No Net Loss Plan*

and habitat creation);

4. Identification of best management practices to minimize impacts on fish in this type of environment, a listing of all commitments to mitigate impacts on fish, fish habitat and other aspects of the aquatic ecosystem, and, where the two differ, a rationale for why certain management practices have not been adopted; and
5. How accidents, malfunctions or impacts of the environment on the development could create additional impacts on fish and aquatic species, and how the developer will minimize the potential for these scenarios to occur and manage them via contingency plans if they do occur.

### **3.3.6 Wildlife and Wildlife Habitat**

*Scoping identified that emphasis needs to be placed on assessing impacts on wildlife along the winter road corridor. The Review Board notes that Section 79 of the federal Species at Risk Act requires that all SARA-listed species be identified and any adverse impacts of a development on them be thoroughly assessed and mitigated, regardless of whether the impacts are deemed “significant”. Cumulative effects on wildlife are examined in section 3.6.*

While conducting an impact assessment on wildlife, consideration shall be given to:

1. The impacts the Prairie Creek Mine is likely to have on wildlife and wildlife habitat, which shall include consideration of the following on a “per valued component” basis, with identification of impact sources:
  - a. Potential impacts to habitat, including degradation and fragmentation, with a focus on important wildlife habitat;
  - b. Potential for increased mortality from all sources (especially from vehicle collisions and increased hunting access along the winter road);
  - c. Potential for increased attraction and habituation of species to mine-related facilities and associated increasing potential for human-wildlife conflicts;
  - d. Potential for increased sensory disturbance from all sources (e.g., noise, odours, activity, vibrations, dust), and a prediction of avoidance and effective habitat loss;
  - e. Potential for disruption of movement and migration patterns; and
  - f. Potential for increased contamination of food and water, including bio-accumulation, from all sources;
2. Estimation of increased impacts on animals frequenting the Prairie Creek Mine site area from increased intensity of activities associated with full-scale mine operations, including a description of increased emissions, dust, noise, attractants, and contaminants;
3. The potential adverse impacts of Prairie Creek Mine operations on any “wildlife at risk” species known or suspected to reside in the EA Study Area, including discussion of management plans and specific mitigation commitments and monitoring proposed for any potentially impacted species;
4. How Prairie Creek Mine planning has considered potential impacts on wildlife and wildlife habitat, best management practices to minimize impacts on wildlife, and what mitigation commitments have been made, with specific consideration of:
  - a. Rules for winter road use by employees and contractors;

- b. Minimizing wildlife access to project components (e.g. by reducing attractants); and
  - c. Spill avoidance techniques and spill response plans for the transportation routes;
5. Provision of a wildlife management plan appropriate for full-scale mining covering all activities occurring at the mine site and along the transportation corridor, including discussion of:
- a. Which other interested parties have been involved in the development of the wildlife management plan;
  - b. The adequacy of all pre-existing wildlife mitigation and management plans and commitments in light of increased activity levels during full-scale operations;
  - c. Efforts to be undertaken to monitor wildlife in the EA Study Area and report the presence of species to the appropriate authorities when necessary;
  - d. Identification of adaptive management measures to avoid, minimize, and mitigate potential impacts to wildlife when detected through wildlife monitoring; and
  - e. How monitoring results and mitigation efforts will be reported to regulators, responsible authorities and potentially-affected communities.

### 3.3.7 Terrain

*Both the development itself and the environment it is situated in have the potential to contribute to terrain instability and failure, considering the mountainous environment in which the Prairie Creek Mine is situated, and the increased level of activity and new facilities planned. The developer will thus be required to consider the implications of terrain stability on its proposed development and vice versa. Scoping noted concerns about seismic activity potential around the mine site and the mountain portion of the winter road, general terrain stability around the mine site, including near the proposed water storage pond, the geotechnical stability of structures such as the proposed “valley fill” waste rock pile and the dyke system between mine site infrastructure and Prairie Creek, and the susceptibility to terrain degradation of the Liard Highway and the mountainous portion of the winter road. Susceptibility of the North Nahanni Karst to collapse is considered in 3.3.3.*

The developer will conduct a risk assessment of landscape instability focusing on the Prairie Creek Mine site in full operation mode, including analysis of different “failure mode” scenarios. Specific consideration shall be given, at minimum, to:

- 1. An examination of the geotechnical stability of the proposed waste rock pile, including
  - a. Soil and hydrological conditions;
  - b. Description of the waste rock pile’s physical and chemical characteristics ; and
  - c. Topography and slope stability of the waste rock pile and its surroundings;
- 2. Potential impacts of Prairie Creek Mine operations on terrain stability and vice versa, including discussion of the implications of:
  - a. Soil erosion, with emphasis on increased sedimentation in watercourses and soil erosion of the winter road’s western, mountainous portion;
  - b. Collapse and closures in either the mountainous or karst portion of the winter road;
  - c. Degradation of the Liard Highway from increased heavy truck traffic;
  - d. Geotechnical instability, especially of the waste rock pile and other engineered

- structures upslope of the main mine infrastructure and berm/dyke structures on site, including the potential contribution to destabilization of seismic activity;
- e. Permafrost failure at the mine site; and
  - f. Landslides at, upslope, or upstream of the mine site from terrain instability, flooding or earthquake;
3. How the geotechnical stability of all engineered structures at the Prairie Creek Mine will be ensured against a range of climate, seismic and precipitation scenarios; and
  4. Identification of plans to mitigate and monitor against impacts on terrain, including:
    - a. Erosion control measures;
    - b. How the geotechnical stability of the waste rock pile and the dyke/berm system will be monitored, and for what extent of time;
    - c. How monitoring results will be reported to regulators and potentially-affected communities; and
    - d. Adaptive management measures and contingency plans that will be adopted if terrain stability is compromised.

### 3.3.8 Air Quality

*The Developer's Assessment Report will evaluate the Prairie Creek Mine's potential impacts on air quality, particularly through industrial emissions and dust. While considering impacts and mitigation on air quality, Canadian Zinc is encouraged to enter dialogue with Environment Canada and the GNWT about appropriate methods for modeling air quality and strategies for minimizing air quality impacts, and should consider the Guideline for Ambient Air Quality Standards in the Northwest Territories and GNWT's Guideline for Dust Suppression.*

While assessing impacts on air quality, consideration shall be given to:

1. A description of air flow and likely levels of particulate matter and other emissions at the Prairie Creek Mine site, with a focus on CO, SO<sub>2</sub>, and NO<sub>x</sub> emissions, and with the relative contributions of main emissions sources identified;
2. The potential impacts of Prairie Creek Mine site operations on air quality through local atmospheric dispersion of emissions and dust, including estimates of:
  - a. Dust from construction activities, roads, mine workings, stockpiles, quarries, and any other facilities and activities, including a discussion of the likely chemical and physical characteristics of the dust; and
  - b. Emissions from vehicles, diesel generators, incineration and other onsite sources.
3. Identification of any human health impacts from particulate matter (total suspended particulate (TSP), PM<sup>2.5</sup> and PM<sup>10</sup>) or hydrocarbon burning on site, and the likelihood of harmful chemical substances being present in that particulate matter and its sources;
4. A comparison of estimated likely emissions to the air quality standards, guidelines and regulations that the developer will apply to the Prairie Creek Mine operation;
5. Specific plans to minimize adverse impacts to local air quality including the provision of an air quality adaptive management plan as part of an overall *Waste Management Plan*, that incorporates:

- a. Incineration management strategies to ensure compliance with national standards for dioxin, furan and mercury emissions; and
- b. A discussion of any proposed programs for monitoring, evaluation and management of air quality impacts, as well as how monitoring results will be reported to responsible government authorities and the public.

### **3.3.9 Vegetation**

*Section 3.3.3 covers vegetation concerns within the boundaries of the NNPR. Section 3.5 addresses re-vegetation issues during closure and reclamation.*

While assessing impacts on vegetation, specific consideration shall be given to:

1. An estimation of the total amount of land clearing required to facilitate new Prairie Creek Mine activities, with estimates of losses of trees, other plants, soil and overburden materials. This should include a description of how the soil materials will be removed and disposed of or stored, and the likely impacts of loss of soil or compaction on long-term re-growth capacity, and should focus on the following areas:
  - a. The waste rock pile;
  - b. Alterations to the routing of - or required additional clearing along the existing - winter road; and
  - c. The Tetcela and Liard Transfer Facilities;
2. Estimation of the potential for the Prairie Creek Mine to impact on rare plants;
3. The potential impacts of Prairie Creek Mine operations on culturally or economically significant harvested plants;
4. The potential impacts of vehicle, mine equipment and power plant emissions on vegetation around the mine site or along the winter road;
5. The potential impacts of dust generation on vegetation, particularly at the mine site;
6. The likelihood that invasive species will be introduced, by what means, and potential impacts; and
7. Best management practices for avoidance of impacts on vegetation, mitigation committed to, and where they differ, the rationale for not adopting best management practices.

### **3.3.10 Biophysical Environmental Monitoring and Management Plans**

*Given the proximity of the mine to a National Park Reserve, World Heritage Site, and Canadian Heritage River, and the potential for long-term monitoring and management requirements of minewater, there was a desire stated during scoping for more information about monitoring and management plans. The term “monitoring” can be applied to several different activities. The developer must clearly distinguish which of the following meanings is meant with each use of the term “monitoring” in the Developer’s Assessment Report:*

1. *compliance inspection (i.e. activities, procedures and programs to confirm the implementation of approved design standards, mitigation, conditions of approval and company commitments);*
2. *environmental monitoring (i.e. monitoring to track conditions or issues during the development lifespan, and subsequent adaptation of project management); or*

3. *follow-up (i.e. any programs to verify the accuracy of impact predictions and determine the effectiveness of mitigation measures).*

Valued component-specific biophysical monitoring and management plans shall be discussed in the relevant sections of the *Developer's Assessment Report*. As well, the developer will provide a summary section with:

1. Reports of all discussions and agreements with communities, federal and territorial governments related to collaborative monitoring and adaptive management of impacts of the project on the environment;
2. A list all of its existing monitoring and management plans, identifying
  - a. where they are being adopted as commitments for the revised Prairie Creek Mine, and
  - b. where they are being altered/strengthened in light of changing circumstances or advances in best practice of environmental management.

If adopting an existing plan, policy or other commitment, the developer will provide a rationale for why that commitment is adequate in light of proposed changes to the development required for full-scale mining;

3. A conceptual *Waste Management Plan*, including commitments for management of solid, liquid, hazardous and airborne wastes, and associated monitoring programs;
4. Plans for communicating results of mitigation, monitoring and adaptive management programs to regulators, responsible government authorities and the public; and
5. A summary table listing all biophysical environmental monitoring and management systems, where they are described in the *Developer's Assessment Report*, the length of time the monitoring is proposed for, and a rationale for each timeline.

### **3.4 Impacts on the Human Environment**

#### **3.4.1 Employment and Business Opportunities**

*The developer will assess the potential impacts of the Prairie Creek Mine on the economy of the Mackenzie Valley, with a focus on the Dehcho region and each potentially-affected community.*

In assessing access to employment and business opportunities, the developer will provide:

##### ***Employment***

1. An estimate of human resource requirements for the development that includes a listing of all direct and contract employment requirements by skills category for each phase of the life of the Prairie Creek Mine. The developer will identify the skill-levels that each position requires, and shall include employment in all aspects of the operation of the mine, including for example transportation and monitoring activities;
2. An assessment of the likely percentage of direct employment for northern and aboriginal residents at the Prairie Creek Mine, in light of the current and likely future (extending for the expected 20 year life of the mine) labour pool context (i.e., likely available numbers of workers in light of total regional economic activity), and identification of any target goals for northern and Aboriginal employment;
3. A description of any barriers to direct or contract employment, advancement and retention for Mackenzie Valley residents, with particular emphasis on Dehcho residents

and Aboriginal people. This description must include employee availability and employability in light of minimum skill requirements and an investigation of current training opportunities for community members. The developer will also discuss:

- a. Current skills gaps in the available labour pool that require additional training programs;
  - b. Hiring and retention policies related to minimum education levels, criminal records and drug and alcohol use; and
  - c. Any identified barriers to maximizing regional and Aboriginal employment.
4. The developer's plans, strategies and commitments for maximizing direct employment and retention of Dehcho residents, northern and Aboriginal persons, including elaboration of its "Hire First" policy for Dehcho communities;
  5. A description of any plans, strategies or other commitments the developer has to support increasing the mine-ready workforce, support career paths in mining, and assist training programs in related support activities. The developer will outline how these strategies will create or contribute to training opportunities for northern and Aboriginal persons in general, and its employees in particular, over the life of the mine. The developer will also identify when any committed-to mitigations will be enacted, keeping in mind the lead time required for job-ready training programs; and
  6. A discussion of whether and how the developer's strategies and commitments for maximizing employment of aboriginal and Northern residents will extend to its contractors.

#### ***Business Opportunities***

7. An estimate of all contractor and subcontractor goods and services that the Prairie Creek Mine will require, by project phase, as well as an estimate of what percentage of required goods and services can feasibly be sourced from local and regional businesses;
8. The developer's policies, plans, and commitments associated with maximizing contracting to aboriginal and Northern-owned and operated businesses, with emphasis on assisting business development initiatives and joint ventures with Dehcho-based businesses;
9. An assessment of any barriers to maximizing the utilization of northern businesses; and
10. The developer's prediction for any training, education or other improvements necessary to maximize local and regional business capacity to benefit from the Prairie Creek Mine.

#### **3.4.2 Distribution of Beneficial and Adverse Socio-economic Impacts**

The developer will provide the following information and analysis:

1. Qualitative and quantitative estimates of all beneficial and adverse economic impacts from the Prairie Creek Mine, including at minimum:
  - a. Capital costs associated with placing the Prairie Creek Mine in operation, broken down by major components (estimates should be in 2009 dollars Cdn. and may be in a +/- 20% range);
  - b. Annual operating costs during the life of the Prairie Creek Mine (estimates should be in 2009 dollars Cdn. and may be in a +/- 20% range);
  - c. Federal, territorial and municipal taxes that the developer may remit by year, as well

- as from linked economic development (a +/- 20% range is acceptable);
- d. Total employment impact on the Dehcho region and Mackenzie Valley, including a prediction of employment multipliers from the development;
  - e. A prediction of any adverse impacts the development may have on public infrastructure maintenance and associated costs (with emphasis on the Liard Highway);
2. Discussion of potential impacts of the Prairie Creek Mine on other economic development activities, with special emphasis on
    - a. Whether and how tourism opportunities may be adversely or beneficially impacted by the presence of the mine and winter road (including consideration of whether the presence of an active mine will reduce the “wilderness values” associated with the NNPR and how that may alter tourism demand); and
    - b. What mitigation the developer will put in place to minimize disturbance to tourists.
  3. Discussion of any plans, strategies or other commitments the developer has to help potentially-affected communities avoid over-exposure to “boom and bust” economic fluctuations, with a focus on
    - a. Potential social and economic effects of mine closure (including unforeseen early closure or project hiatus) on potentially-affected communities and the Dehcho region; and
    - b. Any plans to assist post-closure transition for mine employees;
  4. Discussion of the following:
    - a. Socio-economic impacts potentially resulting from increased disposable income and larger reliance on the wage economy;
    - b. Any impacts on social services provision, infrastructure and costs that may occur as a result of the Prairie Creek Mine (e.g., emergency medical care or family social services); and
    - c. Whether and how the project may create or contribute to impacts on other organizations and businesses servicing the region through mobilization of local skilled labour away from smaller Dehcho communities and associated impacts on maintenance of infrastructure and basic service provision; and
  5. The developer’s policies, strategies, plans, and commitments, alone or in combination with other parties, for the mitigation of any adverse socio-economic impacts.

### **3.4.3 Social Impacts**

While conducting a social impact assessment, the developer will give consideration to:

1. Potential impacts associated with the development on community wellness and population health issues such as:
  - a. Population in- and out-migration;
  - b. Alcohol and drug access and use;
  - c. Sexually-transmitted infections rates;



- d. Crime rates;
  - e. Access to child care;
  - f. Language retention and other key indicators of cultural maintenance; and
  - g. Education completion rates by level.
2. How each identified potential impact may affect individual potentially-affected communities;
  3. The physical, mental, and cultural health of mine workers and mine workers' families, considering potential impacts of long-distance commuting and greater engagement in the wage economy on the population health status of small, primarily aboriginal communities. This discussion should identify any alternative shift rotations considered by the developer, with the rationale for the chosen rotation;
  4. Human resources management plans and programs the developer will offer at the mine site to identify and mitigate potential social problems associated with the Prairie Creek Mine, that will include but not be limited to discussion of
    - a. Increased income and money management;
    - b. Potential stressors associated with long-distance commuting and stress management programs;
    - c. Substance abuse and treatment policies;
    - d. Avoidance of cross-cultural conflicts at the work site; and
    - e. "Home" – community and family - support programs.
  5. Potential impacts on public safety, especially in regards to the use of the winter road and increased truck traffic and road degradation issues along the Liard Highway and in/around Fort Liard, and identification of mitigation to minimize the potential for vehicle accidents;
  6. Potential social impacts on the residents of Lindberg Landing and Fort Liard from Prairie Creek Mine transportation activities;
  7. Potential social impacts caused by a reduction of wilderness values associated with the NNPR; and
  8. Any lessons learned about short and long-term social and economic impacts of previous mine developments in the Mackenzie Valley and the Canadian North, and how the developer has incorporated such lessons into its impact assessment and mitigation commitments for the Prairie Creek Mine.

#### **3.4.4 Cultural Impacts**

*The analysis of heritage resources is inclusive of both sites and objects of cultural significance, and cultural impacts include both tangible and intangible aspects of culture.*

##### ***Physical Heritage Resources***

The developer will report on:

1. Consultation with traditional knowledge holders, archaeologists, anthropologists, and the Prince of Wales Northern Heritage Centre, that the developer conducted during its

cultural impact assessment, indicating how such interactions influenced:

- a. Heritage resource survey locations;
  - b. The identification of locations of known or high potential for heritage resources; or
  - c. Heritage resource management plans;
2. Identification of all known archaeological and heritage resources, sites or areas of cultural significance, and areas of high potential for unfound heritage resources in the EA Study Area; and
  3. All recommended mitigation measures that consultation produced for the protection of local known and high potential areas of physical heritage resources and other sites of cultural significance, and associated developer's commitments or reasons for not adopting recommendations.

### ***Traditional Land Use and Wildlife Harvesting***

*The developer must identify any adverse impacts the Prairie Creek Mine may have on land use and traditional economic harvesting activities. Of specific concern to the potentially-affected communities during scoping was the lack of traditional knowledge and up-to-date wildlife baseline information to assist prediction of impacts on wildlife and wildlife harvesting by regional Aboriginal people. The potential for increased access along the winter road to out-of-region hunters, tourists and mine-related traffic were all cited as potentially impacting on wildlife abundance and harvesting success.*

The developer will:

4. Describe any potential impacts of the Prairie Creek Mine on traditional harvesting activities for Aboriginal residents of the potentially-affected communities including:
  - a. Loss of harvesting success, with a focus on the impacts of increased traffic along the winter road, and associated mortality and disturbance impacts on wildlife; and
  - b. Increased access to non-resident hunters via the winter road increasing wildlife mortality along the eastern portion of the winter road, or increased access to tourists in an expanded NNPR disturbing wildlife;
5. Provide a prediction of the total impact of the Prairie Creek Mine on traditional economic activity in the areas (expressed in dollar terms as well as in terms of reduced or increased harvesting success); and
6. Identify all mitigation commitments by the developer, alone or in combination with other parties, to minimize adverse impacts on traditional land use and resource harvesting, or to compensate for losses that the developer cannot prevent. This should include discussion of:
  - a. How access along the winter road will be monitored and, if feasible, managed;
  - b. NNPR boundaries in relation to the winter road, and what rules in relation to wildlife harvesting will be in place (if boundaries have not been set at the time of the analysis, the management implications of different boundary options will be compared); and
  - c. Plans for any ongoing monitoring, adaptive management and/or harvester compensation.

### 3.4.5 Human Environment Monitoring and Management Plans

1. The developer will provide description of any commitments, plans and strategies to engage with responsible authorities and potentially-affected communities in monitoring impacts on the human environment such as:
  - a. Success of local and regional residents and Aboriginal people in gaining employment at the Prairie Creek Mine, and the success of training initiatives;
  - b. Success of local and regional businesses in providing goods and services to the Prairie Creek Mine, with identification of gaps to maximizing engagement;
  - c. Employee retention and worker and family wellness;
  - d. The contribution of the Prairie Creek Mine to beneficial and adverse social impacts at the regional and local levels across a spectrum of appropriate indicators;
  - e. The use of the winter road; and
  - f. Impacts on wildlife harvesting and practice of traditional culture on the land.
2. The developer will identify relevant existing initiatives monitoring community wellness and investigate how it will engage with, contribute to, and consider results from these programs in its ongoing monitoring and adaptive management programs;
3. How human environment monitoring results will be evaluated and reported to regulators, responsible authorities and potentially-affected communities;
4. What adaptive management systems will be in place to deal with issues identified during monitoring; and
5. A summary table listing all human environment monitoring and management systems and where they are described in the *Developer's Assessment Report*.

### 3.5 Closure and Reclamation

*Canadian Zinc will present on its conceptual Closure and Reclamation Plan for the Prairie Creek Mine in the Developer's Assessment Report. The developer should consider Indian and Northern Affairs Canada's mine closure and reclamation guidelines when developing its reclamation plan for the Prairie Creek Mine.*

*Of particular importance in this case are questions about the long-term interaction of groundwater with the backfilled mine workings, and long-term potential for acid mine drainage or metals leaching from the mine or other on-site structures. Closure and reclamation planning shall emphasize long-term monitoring and management of minewater seeping into groundwater or out of the mine at surface and from the waste rock pile and associated downstream impacts. Emphasis will also be placed on how Canadian Zinc will reclaim the alluvial plain covered by the bulk of mine infrastructure and the waste rock pile in Harrison Creek valley, and on ensuring long-term post-closure monitoring and management plans are in place.*

The developer will provide the following:

1. A description of the policies, regulations and industry standards that Canadian Zinc considered in the development of its *Closure and Reclamation Plan*;
2. A conceptual *Closure and Reclamation Plan*, which will include:
  - a. Identification of the overall reclamation goals and standards the Closure and

- Reclamation Plan is designed to achieve and over what time period;
- b. A list of closure and reclamation components and activities including a rationale for why Canadian Zinc chose a particular option and how it best meets the developer's reclamation goals;
  - c. An outline for the methods and locations for on- and off-site disposal of materials during reclamation;
  - d. A conceptual program and schedule for any progressive reclamation envisioned;
  - e. A conceptual post-closure monitoring plan that includes a reporting strategy and a rationale for an "end-date" for monitoring; and
  - f. A cost-estimate component of reclamation activities, including costs of long-term water quality monitoring;
3. The Closure and Reclamation Plan should include discussion of management and monitoring programs for any materials/locations (including the underground works) that may cause an acid rock drainage or metals leaching impact, that further considers:
- a. Creating a sufficient barrier for the prevention of tailings and waste rock oxidation;
  - b. The likely rate of movement of groundwater through the backfilled underground tailings and waste rock pile, associated uptake of acids, metals or other contaminants into groundwater, and monitoring location requirements and contingency plans for greater than expected rates of contaminant release; and
  - c. Monitoring coverage required to track any other reasonably foreseeable post-closure contamination pathways;
4. A visual depiction of the mine site and transfer facilities areas after closure and reclamation of the mine compared to its present and "during operations" condition, based on the following timelines:
- a. One year after closure;
  - b. Ten years after closure; and
  - c. 25 years after closure;
5. Canadian Zinc's plans for establishing a self-sustaining vegetation community at the mine site after closure, including:
- a. re-vegetation techniques, with a discussion on what species the developer will consider for this activity; and
  - b. an outline for how soon the area will rebound to a natural state of vegetation, if ever;
6. How closure and reclamation activities will ensure long-term suitability of Harrison, Prairie and Funeral Creeks for fish and fish habitat;
7. Closure and reclamation requirements associated with decommissioning of the transfer facilities and winter road, including stabilization and re-vegetation of banks near water crossings; and
8. A record of consultations that Canadian Zinc has had with potentially-affected communities, Aboriginal groups and responsible government agencies for the identification of various closure, reclamation, and long-term monitoring issues, and how the developer has adapted its plans to address the parties' concerns.

### 3.6 Cumulative Effects

*Pursuant to Section 117(2)(a) of the MVRMA, the Review Board considers cumulative effects in its determinations. Cumulative effects are the combined effects on a specific valued component of the development in question and other past, present or reasonably foreseeable future developments and human activities. In addressing cumulative effects, Canadian Zinc is encouraged to refer to Appendix H of the Review Board's Environmental Impact Assessment Guidelines.*

The following items are required for consideration of cumulative effects:

1. Inclusion of the following developments, at minimum, considering how their effects will likely combine with those of the Prairie Creek Mine, on the noted valued components:
  - a. The Cantung Mine on the Flat River, for impacts on water quality in the South Nahanni River watershed;
  - b. The Selwyn Howard's Pass development complex, Cantung and Mactung mines, as well as increased road access in the Yukon and the NWT, for consideration of cumulative impacts on "wildlife at risk" in the southern Mackenzie Mountains, in particular for consideration of increased hunting pressures and habitat fragmentation for woodland caribou (Northern Mountain Population);
  - c. The proposed Mackenzie Gas Project, for how it could influence social and economic impacts in the Dehcho region if both projects proceed at the same time;
  - d. Increased traffic from all potential sources on the Liard Highway, including estimates of past, present and future traffic flows under alternative development scenarios and a determination of its operational capacity to handle increased traffic and loads, and potential impacts on road maintenance and public safety; and
  - e. Increased use of the winter road for activities not associated with the Prairie Creek Mine (e.g., tourism, hunting) and impacts on wildlife, karst features, public safety and traditional harvesters;
2. Consideration of the contribution of other historic developments associated with the Prairie Creek Mine to cumulative effects within the EA Study Area on the specific valued components noted below:
  - a. The Cat and Grainger Camps along the winter access road – for contributions to contamination of water, soil, effects on vegetation, wildlife attractants and disturbance;
  - b. The historic transfer and loading facility between the Liard River and the Liard Highway<sup>13</sup> – for contributions to contamination of water, soil, effects on vegetation, wildlife attractants and disturbance; and
  - c. Roads, drilling pads, clearings or other physical disturbances associated with exploration by Cadillac or Canadian Zinc or its predecessors in the EA Study Area – for contributions to soil erosion and water course sedimentation, habitat fragmentation

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<sup>13</sup> This location is referred to by the developer in its *Liard Transfer Facility Project Description Report*, but the specific location for this historic facility has not yet been identified on the public record. The developer is responsible for identifying the location, status and environmental surroundings for this and all other relevant historic developments associated with the Prairie Creek Mine where appropriate in the *Developer's Assessment Report*.

or other impacts on wildlife, contamination of water and soil, and effects on vegetation.

3. Determination of any other past, present and reasonably foreseeable human activities that may affect the same valued components as the Prairie Creek Mine, including:
  - a. The rationale for including the developments that are chosen for examination on specific valued components, as well as a description of and rationale behind the chosen geographic cumulative effects study area and temporal boundary; and
  - b. A discussion of any developments that were considered, but were not included in the cumulative effects assessment and the rationale behind that decision; and
4. Any plans for the monitoring and evaluation of cumulative effects and the adaptive management of the Prairie Creek Mine's contribution to cumulative effects.