

**Mackenzie Valley  
Review Board**



**Report of Environmental  
Assessment and Reasons for  
Decision**

**Canadian Zinc Corp.  
Prairie Creek All Season Road  
Project  
EA1415-01**

**September 12, 2017**

## Review Board decision

To make its decision in this environmental assessment, the Mackenzie Valley Environmental Impact Review Board (Review Board) has considered all the evidence on the public record and made its decision under Section 128 of the *Mackenzie Valley Resource Management Act*.

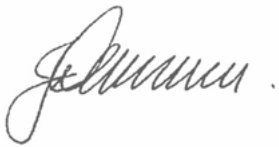
Based on the evidence and submissions on the public record, the Review Board finds that the proposed Prairie Creek All Season Road Project (All Season Road or the Project) is likely to cause significant adverse impacts on the environment. The Review Board has recommended measures to mitigate these impacts so they are no longer significant. Specifically, it requires Canadian Zinc Corp. to:

- create an Independent Technical Review Panel, to ensure that the road is designed to a standard that is highly protective of people and the environment;
- create a *Traffic Control Mitigation and Management Plan*;
- conduct systematic wildlife monitoring and adaptive management incorporating Traditional Knowledge;
- prepare a *Wildlife Management and Monitoring Plan*;
- install stations to collect baseline water flow data, to use when designing water crossings;
- collect detailed baseline information, monitor effects and make an adaptive management framework for the Sundog Creek diversion;
- further engage Aboriginal groups and consider Traditional Knowledge in all applicable aspects of the Project, including monitoring;
- further engage Traditional Knowledge holders about cultural and heritage resources in the Project area, and conduct an Archaeological Impact Assessment incorporating this Traditional Knowledge;
- conduct a rare plant survey and establish a *Rare Plant Management Plan*;
- conduct permafrost investigations to inform road design and appropriate permafrost mitigations and create a *Permafrost Management Plan* with systematic permafrost monitoring and adaptive management; and
- carry out monitoring and reporting, and support independent community monitoring of the Project.

With these and other measures to reduce or avoid identified impacts, the Review Board has concluded that the Project may proceed to the regulatory phase for approvals. By

addressing the significant adverse impacts in these and other ways, the Project will be improved, and meaningful actions will mitigate the significant impacts that would otherwise occur.

The Review Board recommends, under subparagraph 128(1)(b)(ii) of the *Mackenzie Valley Resource Management Act*, that the Project be approved subject to the measures described in this report, which are necessary to prevent significant adverse impacts on the environment.



JoAnne Deneron  
Chairperson  
Mackenzie Valley Environmental Impact Review Board

September 12, 2017

## List of Abbreviations

AIA	Archaeological Impact Assessment
AOA	Archaeological Overview Assessment
CPAWS	Canadian Parks and Wilderness Society
CanZinc	Canadian Zinc Corporation (the developer)
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DAR	Developer's Assessment Report
DAR Addendum	Developer's Assessment Report Addendum
DFN	Dehcho First Nations
DFO	Department of Fisheries and Oceans Canada
EA	Environmental Assessment
ECCC	Environment and Climate Change Canada
ENR	Department of Environment and Natural Resources, GNWT
GNWT	Government of the Northwest Territories
IAB	Indian Affairs Branch
IBA	Impact Benefit Agreement
INAC	Indigenous and Northern Affairs Canada
IR	Information Request
KP, km	Kilometre Post. Along the All Season Road alignment, KP or kilometre (km) zero is the Prairie Creek Mine.
LKFN	Liidlii Kué First Nation
MVRMA	Mackenzie Valley Resource Management Act
MVEIRB	Mackenzie Valley Environmental Impact Review Board
MVLWB	Mackenzie Valley Land and Water Board
NBDB	Nahanni Butte Dene Band
NNPR	Nahanni National Park Reserve
NRCan	Natural Resources Canada
NWT	Northwest Territories
PR#	Public registry number
Project	Prairie Creek All Season Road Project
REA	Report of Environmental Assessment
TAC	Technical Advisory Committee
ToR	<i>Terms of Reference</i> for the EA (PR#42)
SARA	Species at Risk Act
TSS	Total Suspended Solids
TC	Transport Canada
TK	Traditional Knowledge
TK Assessment Addendum	Addendum to the April 2009 Document: Traditional Knowledge Assessment of the Prairie Creek Mine Operation
WMMP	Wildlife Management and Monitoring Program

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## Executive Summary

This report describes the Mackenzie Valley Environmental Impact Review Board's (Review Board) environmental assessment of Canadian Zinc Corp.'s (CanZinc or "the developer") Prairie Creek All Season Road Project (All Season Road or the Project). The Project involves the construction and operation of a 184 km all season access road from the Liard River near the Liard Highway to the Prairie Creek Mine in the Nahanni National Park Reserve (Nahanni Park). The Project is located in the Dehcho region of the Northwest Territories.

### ***Proposed development***

The All Season Road follows the general route of CanZinc's Permitted Winter Road, overlapping it for approximately half of the route. Construction will take three years. Part of the road will be built on the floodplain of Sundog Creek in Nahanni Park; for this part, CanZinc proposes to build a channel to divert the creek. Mine trucks will haul concentrate to the Laird River, which will be crossed by a ferry or ice bridge to reach the Liard Highway, averaging 12 to 18 roundtrips per day, to a maximum of 25 trips per day. Trucks will also haul fuel and equipment, mine supplies and personnel. In addition, the Project will include:

- construction camps and staging areas along the road;
- 80 possible borrow locations, some of which would require blasting; and,
- a check point at the barge landing on the north side of the Liard River (CanZinc cannot restrict access on public land, but can restrict access to its leased barge landing site).

The scope of the development also includes closure and reclamation of the All Season Road at the end of the expected mine life.

Over the course of this environmental assessment, CanZinc has proposed Project modifications. The developer originally proposed building an airstrip on the Ram Plateau in Nahanni Park, but revised its Project during the EA to exclude it. It has also excluded the Tetcela and Liard transfer facilities that were originally proposed as part of the Project.

The Project would cross territorial and federal lands. Approximately 85 km of the Project are in Nahanni Park, a federally protected National Park Reserve. The area crossed by the

route is, and has long been, used for traditional harvesting by Aboriginal groups. Animal and plant species at risk are found along the route.

Nahanni Butte Dene Band is the nearest potentially-affected community to the Project. Its leadership and members voiced their enthusiastic support for the Project, based on expected socio-economic benefits. The Board recognizes the position of Nahanni Butte Dene Band and considered it in its decision making. This Report of Environmental Assessment focusses on the Review Board's assessment of likely significant adverse impacts.

### ***The precautionary approach and adaptive management***

Parties and the Review Board were faced with uncertainty in CanZinc's impact predictions, and expressed a lack of confidence that CanZinc's proposed mitigations would be carried out and be effective. In this EA, when 1) the lack of information caused an unacceptable level of uncertainty, and 2) there was potential for serious environmental harm, the Review Board took a precautionary approach in its decision making.

In the Review Board's opinion, the level of uncertainty regarding predicted impacts is particularly high in this environmental assessment. This is due largely to a general lack of information about the Project, the Project setting, CanZinc's predictions and CanZinc's proposed mitigations. In these respects, CanZinc has not met its burden of proof.

This Project is proposed in an area that is highly valued. The proposed Project includes areas that are:

- in a National Park Reserve (the highest level of protection possible under Canadian law);
- upstream of a UNESCO World Heritage Site;
- culturally and spiritually important and used for traditional harvesting by Aboriginal parties;
- habitat for wildlife and plant species at risk; and,
- in a glacial refugium.

In the Board's view, impacts that might be acceptable in another setting are unacceptable in this setting. An additional duty of care is appropriate when considering the significance of potential impacts in these areas.



The uncertainty described above is part of the reason why the Review Board has emphasized adaptive management throughout this report. By requiring careful monitoring, evaluation (including identifying specific thresholds for action), and increasing levels of mitigation, impacts can be identified and reduced or prevented before they are significant. Adaptive management specifies when to act, and what to do. This is a requirement of several of the measures that follow.

### ***The Review Board's findings***

The Review Board has carefully considered the following issues, and has determined that this proposed all season industrial haul road through a National Park Reserve in species at risk habitat is likely to cause significant adverse impacts on the environment. In light of the uncertainties and lack of confidence noted above, the Board considered its options, including ordering an environmental impact review. Ultimately, the Board decided that by applying a precautionary approach in its analysis of the evidence and imposing measures (many of which build on CanZinc's commitments) significant adverse impacts can be avoided and the Project can proceed to the regulatory phase. The Board has recommended a series of measures and made suggestions intended to mitigate the significant adverse impacts, and improve monitoring and managing the potential impacts.

### **Human safety**

The Project follows a steep and remote mountainous route. Terrain issues such as landslides, avalanches and permafrost thaw have potentially significant impacts on human safety and the environment along the proposed road. CanZinc has not proven to the Review Board that it will mitigate these impacts satisfactorily. CanZinc has only identified a portion of the road alignment, and has not produced detailed site information for approximately 80% of the route, making it difficult to reliably predict impacts.

Accidents could result in significant adverse impacts on people and the environment. Unlike the already Permitted Winter Road, the Project is designed as a single lane haul road, but there will be two-way traffic. It was not designed to a public use standard, but will be used by the public, such as members of Nahanni Butte Dene Band, and possibly others. Additional access will be reduced by controlling the barge crossing and landing site at the Liard River. The Review Board is concerned that this will not prevent other members of the public from accessing the road by going around the barge lease area.

The Review Board finds that the road would pose a significant risk of accidents for all traffic as designed. The location and route is likely to restrict or delay emergency responses. The Review Board concludes that the Project, as proposed, is likely to cause significant adverse impacts on human safety and the environment from accidents. To reduce this risk, the Review Board has prescribed measures for:

- an Independent Technical Review Panel for road design, with Aboriginal and government engagement on panel composition and activities, to ensure that the road is designed to a standard that is highly protective of people and the environment; and
- a Traffic Control Mitigation and Management Plan to manage access control mitigations and all traffic on the road, including mine and non-mine traffic.

The Review Board has made suggestions to help manage avalanche risks.

### **Wildlife and wildlife habitat**

The Project is likely to adversely affect wildlife, including species at risk (such as mountain caribou, boreal caribou, collared pika and rare birds) from:

- direct habitat loss from road construction;
- direct mortality from vehicle collisions;
- sensory disturbance and displacement of wildlife during road operations; and
- wildlife habitat fragmentation.

For a 20 year period, the Project will degrade the ecological integrity of nearby areas of Nahanni Park.

CanZinc cannot reasonably predict impacts on wildlife and wildlife habitat from the Project to identify appropriate mitigations. This is because it lacks baseline data on the presence or absence of key species, the location of critical habitat, and the seasonal use of the road area by wildlife. There is a high level of uncertainty about the effectiveness of the developer's proposed mitigations for impacts on wildlife. Also, there is a high degree of uncertainty over the effectiveness of proposed access control methods, and whether increased hunting will significantly affect wildlife.

To prevent the significant adverse impacts on wildlife and wildlife habitat that are otherwise likely, the Review Board requires CanZinc to link the collection of baseline information with the mitigations, to do systematic wildlife monitoring incorporating Traditional Knowledge, and to use adaptive management to identify when to take action, and what actions to take. Another measure prescribes that the GNWT and Parks Canada require CanZinc to prepare a Wildlife Management and Monitoring Plan under the territorial *Wildlife Act*. A third measure requires CanZinc to identify wildlife crossing areas and post signage for wildlife caution zones.

### **Traditional harvest**

The Review Board finds that traditional Aboriginal harvesting is likely to increase where the Project will increase access. Increased hunting pressure from increased access combined with all other Project effects on wildlife could affect the number of animals available. The Review Board suggests that wildlife management authorities work with communities and harvesters to develop and conduct a monitoring program to track harvest patterns and pressures throughout the life of the Project. This will help wildlife management authorities and communities prescribe or implement adaptive mitigations if necessary.

### **Water quality and quantity**

The Project will include 112 minor stream crossings and 17 major stream crossings. Major stream crossings requiring bridges, numerous crossings requiring culverts, and the Sundog diversion are located in Nahanni Park. The Review Board finds that CanZinc has not provided adequate baseline information on stream flows. Inadequate baseline information may lead to stream and creek crossing designs that are inadequate to prevent flooding, increased erosion, downstream sedimentation, deposition of sediments in the diversion, permafrost thaw, bridge failures, or road washouts. This may result in significant adverse impacts on water quality, and on fish and fish habitat, from impacts such as flooding, erosion, and sedimentation. Impacts from spills resulting from road accidents may cause significant adverse impacts on water quality. CanZinc's proposed monitoring programs are not sufficient to prevent significant adverse impacts; the developer has not shown how its monitoring will be linked to an adaptive management framework to systematically adjust mitigations based on the results of monitoring.

To mitigate these impacts, the Review Board prescribes a measure that requires CanZinc to install hydrometric stations, collect the necessary baseline information, identify appropriate mitigations and use them road crossing design and monitoring. The Board also suggests that water regulators work together when reviewing the Project, and enforce strict conditions about acid rock drainage and metal leaching.

### **Fish and fish habitat**

The proposed diversion of Sundog Creek in Nahanni Park may result in direct habitat loss, smothering of spawning habitat by sediment, effects on invertebrate populations that fish feed on, and stranding of fish when flows change. These risks occur in the setting of a protected area, where it is particularly important to protect fish and fish habitat, as part of ecosystem integrity.

Neither the developer nor the Department of Fisheries and Oceans could provide a single example of a successful creek diversion similar to the one planned for Sundog Creek. CanZinc has not proven to the satisfaction of the Board that it can construct and maintain the Sundog Creek diversion channel in a way that does not result in significant adverse impacts on water quality and quantity or fish and fish habitat. These impacts would also pose risks to traditionally harvested fish.

Considering this, along with uncertainties from a lack of relevant baseline information from CanZinc, the Review Board concludes that there is an unacceptable amount of uncertainty about these impacts in a protected area as a result of the proposed Sundog Creek diversion. There are also several problems with the monitoring CanZinc has proposed to study the effects of the diversion. To mitigate this, the Review Board requires CanZinc to make a plan for mitigating impacts through protective design, collection of baseline data, and monitoring to ensure effectiveness and inform adaptive management if unexpected problems arise.

### **Culture and heritage**

The Review Board finds that the Project is likely to cause significant adverse impacts on culture and heritage resources. Aboriginal groups have traditionally used and continue to use the Project area, and have outstanding concerns. CanZinc did not provide the Review Board with Traditional Knowledge from all Aboriginal groups that use the Project area. Although the developer has made certain commitments to mitigate cultural impacts, the

Review Board is not confident that they are sufficient. Traditional Knowledge from all potentially-affected Aboriginal groups is necessary to ensure culture and heritage resources are protected, to support other measures in this Report of EA, and to support and inform project design, mitigations, monitoring, and adaptive management.

The Review Board requires CanZinc to engage with Traditional Knowledge holders from Nahanni Butte Dene Band, Liidlii Kué First Nation, and Dehcho First Nations about ways to avoid impacts from the Project, including impacts on heritage resources. The Board also requires CanZinc to conduct an Archaeological Impact Assessment that is informed by this Traditional Knowledge.

### **Vegetation**

The road passes through a glacial refugium (an area that was not under glaciers during the last ice age), which is likely home to rare plants that may not exist elsewhere. CanZinc lacks sufficient baseline information to predict the Project's impacts on vegetation and to appropriately mitigate those impacts. There is also uncertainty about the potential impacts on vegetation from the introduction of invasive species.

To prevent significant adverse impacts on vegetation, the Board requires CanZinc to conduct an early season rare plant survey following the guidance of Parks Canada. This will form the basis for a Rare Plant Management Plan, including mitigation and adaptive management to prevent impacts on vegetation in Nahanni. The Board also requires invasive species management to prevent the introduction of invasive seeds and prevent or reduce the spread of invasive species.

### **Permafrost**

The Review Board finds that permafrost degradation from Project activities is likely to cause significant adverse impacts on the surrounding environment. These include impacts on water, vegetation, the success of Project reclamation efforts, the ecological integrity of Nahanni near the road, and road infrastructure itself (leading to increased risk of accidents and malfunctions, and additional impacts on the environment). CanZinc did not provide enough information on specific areas susceptible to permafrost degradation. This creates uncertainty and an inability to develop appropriate mitigations.

Parties and the Review Board agree that permafrost monitoring and adaptive management is needed to mitigate likely significant adverse impacts related to permafrost degradation. The Review Board has built on CanZinc's commitments to set out measures that require CanZinc to 1) further investigate permafrost to inform road design and appropriate permafrost mitigations, and 2) create a Permafrost Management Plan that includes systematic permafrost monitoring and adaptive management.

### **Closure and Reclamation**

The Review Board finds that CanZinc's significance predictions for many Project impacts will depend on whether or not the developer can reverse those impacts. More information should be collected about pre-disturbance conditions to use after closure to better understand whether impacts have been effectively reversed by reclamation activities. Some impacts, such as permafrost thaw, are likely irreversible. The magnitude of these effects needs to be considered in closure and reclamation planning prior to construction. Planning should account for parties' perspectives on future use of the Project area.

The Review Board is confident that the regulatory process will adequately address the closure and reclamation of the Project. It has made suggestions about CanZinc's Closure and Reclamation Plan. In combination with requirements of measures prescribed in other sections of this report (such as the Permafrost Management Plan and the Independent Technical Review Panel), the Review Board is satisfied that the Project will be adequately reclaimed after closure.

### **Monitoring, reporting and adaptive management**

Adaptive management is a critical part of the Board's overall mitigation strategy described in the measures in this Report of EA. For the measures to be fully effective, monitoring and reporting are needed to:

- verify that the measures are being carried out and evaluate their effectiveness;
- confirm that significant adverse impacts are not occurring;
- test EA predictions; and
- inform adaptive management.

Additional community-based monitoring by Aboriginal groups is a form of Project oversight that could be a valuable part of monitoring.

The Review Board has required adaptive management frameworks as part of several measures in this Report of EA and has, in Appendix B, set out essential components of these frameworks. The Board has also suggested that CanZinc use adaptive management principles in other applicable management plans and monitoring programs.

The Board has prescribed measures that require CanZinc to:

- ensure that its monitoring programs are good enough to reliably support the adaptive management frameworks and to monitor the effectiveness of all measures in this REA;
- support independent monitoring of the Project by Aboriginal groups; and
- annually report on how measures are being carried out and on the effectiveness of CanZinc's efforts to minimize impacts.

Another measure requires regulators to report on actions they take to implement measures.

## **Conclusion**

Considering the uncertainties that remain due to inadequate baseline information, insufficient Project design and unclear commitments, CanZinc has failed to meet the burden of proof necessary to convince the Review Board of the effectiveness of the developer's planned mitigations. In light of the sensitive setting where the Project is proposed, the Review Board has taken a precautionary approach in its deliberations.

Based on the evidence, the Review Board finds that the Project is likely to have significant adverse impacts on the environment, and has prescribed measures that will mitigate these impacts. These measures will also address any public concern related to these impacts.

Some of these measures include requirements to:

- create an Independent Technical Review Panel, to ensure that the road is designed to a standard that is highly protective of people and the environment;
- create a *Traffic Control Mitigation and Management Plan*;
- conduct systematic wildlife monitoring and adaptive management using Traditional Knowledge;
- prepare a *Wildlife Management and Monitoring Plan*;

- collect baseline water flow data, to use for water crossing design;
- collect detailed baseline information, monitor effects and make an adaptive management framework for the Sundog Creek diversion;
- further engage Traditional Knowledge holders about cultural and heritage resources in the Project area, and conduct an Archaeological Impact Assessment incorporating this Traditional Knowledge;
- conduct a rare plant survey to form the basis of a *Rare Plant Management Plan*;
- conduct permafrost investigations to inform road design and appropriate permafrost mitigations;
- create a *Permafrost Management Plan* with systematic permafrost monitoring and adaptive management; and
- support independent community monitoring of the Project.

With these and other measures to reduce or avoid identified impacts, the Review Board has concluded that the Project may proceed to the regulatory phase for approvals. By addressing the significant adverse impacts in these and other ways, the Project will be improved, and meaningful actions will mitigate the significant impacts that would otherwise occur.



## 1. Introduction

This is the Mackenzie Valley Environmental Impact Review Board's (Review Board) *Report of Environmental Assessment and Reasons for Decision* (Report of EA or REA) for the proposed Prairie Creek All Season Road Project, including<sup>1</sup> all supporting infrastructure. The Review Board conducted the environmental assessment (EA) in accordance with Part 5 of the *Mackenzie Valley Resource Management Act* (MVRMA or the Act).

The developer of the Prairie Creek All Season Road Project (All Season Road or the Project) is Canadian Zinc Corporation (CanZinc or the developer). The Project is located in the Dehcho region, in the southwestern part of the Northwest Territories (See Figure 1-1).



**Figure 1-1: Prairie Creek All Season Road location**  
(PR#513 p4)

<sup>1</sup> Note: all instances "include" in this report should be understood to mean "including, but not limited to".

The Project consists of a 184 km all season access road from the Liard Highway to the Prairie Creek mine in the Nahanni National Park Reserve and is proposed to be constructed over 3 years (PR#224 p8). CanZinc proposes to modify the alignment of its Permitted Winter Road<sup>2</sup> in order to construct the All Season Road. Haul trucks will transport ore from the Prairie Creek mine along the All Season Road and continue along the Liard Highway to Fort Nelson, BC.

## 1.1 Outline of the Report

This Report of EA includes seventeen chapters and five appendices:

**Chapter 1 - Introduction** discusses the regulatory history and how the Project came to be referred to EA, including differences between the Permitted Winter Road alignment and the proposed All Season Road alignment. This chapter also provides a current Project description and describes the environmental setting within which the Project is proposed.

**Chapter 2 – Scope of the environmental assessment** describes the scope of the environmental assessment, including the scope of development, scope of assessment, and other statutory considerations. The scope of development includes changes to the Project that occurred during the EA.

**Chapter 3 – Environmental assessment process** describes the Review Board’s process for the EA, including MVRMA process requirements. It also provides information about the parties to the assessment.

**Chapter 4 – The Precautionary Approach and Adaptive Management** describes the precautionary approach to dealing with uncertainty that the Board applied in its decision-making and that informed the Board’s conclusions and recommended measures.

**Chapters 5 to 16** focus on the environmental impacts of the Project including:

- a summary of the evidence from parties and the developer;
- the Review Board’s analysis and conclusions; and

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<sup>2</sup> In 2013, after the EA0809-02 was completed, CanZinc applied for and received new land use permits and water licences (PR#129 p3) from the MVLWB (MV2012F0007, MV2012L1-0005) and Parks Canada (Parks2012-L001, Parks2012-W001) for a winter access road to the Prairie Creek Mine. This winter road will be referred to as the “Permitted Winter Road” throughout the remainder of this document.

- any recommended mitigation measures (and suggestions) to prevent significant adverse impacts on the environment, as required by Section 128 of the MVRMA.

Within each of these chapters, Section x.1 provides a summary of the evidence from parties and the developer. Section x.2 presents the Review Board's analysis and conclusions, and Section x.3 sets out the Review Board's mitigation measures to prevent significant adverse impacts.

**Chapter 17** presents the Review Board's final conclusion.

**Appendix A – Measures** lists the Review Board's recommended measures and suggestions to avoid or reduce impacts from the Project.

**Appendix B – Adaptive management framework** provides an adaptive management framework to be followed by the developer, where adaptive management is explicitly required in the measures in this report.

**Appendix C – Developer commitments** provides a list of the developer's commitments made for the Project, including commitments made in response to information requests, the DAR Adequacy Review, technical sessions, and public hearings.

**Appendix D – Party recommendations** lists parties' final recommendations.

**Appendix E – Public registry index** contains the public registry index.<sup>3</sup>

## 1.2 Regulatory history of the Prairie Creek Mine and access road

CanZinc's Prairie Creek property has been the subject of several EAs since mineral exploration began at the site in 1974. This section outlines the development and regulatory history of the Prairie Creek mine, up to and including the developer's proposal to construct the All Season Road (which is the subject of the current environmental assessment) and associated infrastructure.

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<sup>3</sup> This report references documents on the Review Board's public registry with the initials "PR" followed by the registry number of the document and specific page numbers where appropriate. Appendix E provides a listing of the documents on the public registry by number.

### 1.2.1 Early developments

Cadillac Explorations Limited (Cadillac) initiated exploration activities at the Prairie Creek property in 1974. In 1980, Cadillac proposed to develop an underground mine at the Prairie Creek site, including the construction and operation of a 160 km winter road from the Liard Highway to the mine. The winter road became the subject of an environmental evaluation<sup>4</sup> and was subsequently permitted in 1980 by the Department of Indian Affairs and Northern Development (now Indigenous and Northern Affairs Canada or INAC)<sup>5</sup>. The land use permit for the road (LUP N80F249<sup>6</sup>) was issued in 1980 and renewed annually for use during the winter season in 1981 and 1982. Cadillac went bankrupt before it began operating the mine (PR#44 p2).

San Andreas Resources Corporation (CanZinc's corporate predecessor) acquired the assets of the Prairie Creek Mine in 1991, and the current surface lease between CanZinc and the Government of Canada was signed in 2003 (PR#44 p2). The lease incorporates a release granted in 1987 to Cadillac<sup>7</sup> "and its successors and assigns" from obligations associated with the restoration of the Prairie Creek mine site<sup>8</sup>.

### 1.2.2 EA0809-002 and the Permitted Winter Road

In 2007, CanZinc was granted a land use permit by the Mackenzie Valley Land and Water Board (LUP MV2003F0028<sup>9</sup>) for use of the winter road to support site clean-up and exploration activities. The following year, CanZinc proposed to develop and expand the mine and mill and construct the winter access road for the purposes of mining; this project was referred to the Review Board for an environmental assessment (EA0809-002)<sup>10</sup>.

During EA0809-002, the Review Board assessed all physical works and activities associated with the mine, including the construction and use of a winter access road (Permitted Winter Road) for the purposes of mining (e.g., mine construction, concentrate

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<sup>4</sup> This took place before modern environmental assessment requirements were made law by the Federal Government.

<sup>5</sup> See [Preliminary Environmental Evaluation for Winter Access Road](#)

<sup>6</sup> See [LUP N80F249](#)

<sup>7</sup> The release specifically pertained to Cadillac Explorations Ltd, Procan Exploration Company Limited, Procan Exploration Company, Nelson Bunker Hunt, William Herbert Hunt, and Lamar Hunt. Procan sold the assets to San Andreas Resources which took the benefit of the release.

<sup>8</sup> See [CanZinc letter to the Mackenzie Valley Land and Water Board](#)

<sup>9</sup> See LUP [MV2003F0028](#) and the supporting [application](#)

<sup>10</sup> See [Report of Environmental Assessment](#) for EA0809-002

hauling, etc.)<sup>11</sup> (PR#44 p2). In 2013, after the EA was completed, CanZinc applied for and received new land use permits and water licences for the winter access road from the MVLWB (MV2012F0007, MV2012L1-0005) and Parks Canada (Parks2012-L001, Parks2012-W001) that are still in effect.

### **1.2.3 The All Season Road and EA1415-01**

In 2014, CanZinc submitted Land Use Permit and Water License applications (MV2014F0013 and MV2014L8-0006) to the Mackenzie Valley Land and Water Board for a proposed All Season Road from the Liard Highway to the Prairie Creek mine. The Mackenzie Valley Land and Water Board subsequently referred the All Season Road to environmental assessment (PR#1) on May 22, 2014.

On May 23, 2014, the Review Board notified the developer and parties that it had initiated an environmental assessment of the All Season Road (PR#3; PR#4)<sup>12</sup>.

#### ***All Season Road and relationship with the Permitted Winter Road***

The proposed 184 km All Season Road follows the general alignment of the Permitted Winter Road, while reflecting the terrain, site characteristics, and road specifications suitable and preferred for an all season road (PR#56 p4)<sup>13</sup>.

Approximately half of the All Season Road alignment overlaps with the alignment of the Permitted Winter Road (PR#224). The sections that do not overlap the Permitted Winter Road alignment are at the following locations along the proposed All Season Road alignment: km<sup>14</sup> 24-29; km 33-43; km 48-59; km 80-101; km 103-124; and, km 134-163 (PR#224). These re-alignments include additional and modified stream crossing locations<sup>15</sup>.

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<sup>11</sup> For more information on the scope of development for EA0809-002 see the Board's [Ruling on Scope of Development](#).

<sup>12</sup> This Report of EA represents the conclusion<sup>12</sup> of the Review Board's EA process and includes the Board's recommendation to the Minister in accordance with Section 128 of the MVRMA.

<sup>13</sup> The final alignment is found in PR#370 pdf pp129-131.

<sup>14</sup> In CanZinc's submissions and in this Report of EA, KP means "kilometre post", with numbers starting from zero at the mine and increasing along the All Season Road alignment toward the Liard Highway. In this report, "km" has been used instead of "KP" outside of direct quotes from parties or the developer.

<sup>15</sup> Updated stream crossing locations are provided in PR#350, Appendix B.

The developer intends to build a winter road along the proposed All Season Road alignment in order to support construction activities (e.g., setting up work camps, developing borrow sites, and installing watercourse crossings) (PR#524 p28-29); the winter road will also be used for transporting equipment and materials for mine construction (PR#224). While CanZinc is not proposing separate winter road and All Season Road alignments, there are two notable exceptions<sup>16</sup> where, during construction activities, the developer will be operating on both the Permitted Winter Road alignment and the All Season Road alignment (PR#524 p28-29). Aside from these sections (and perhaps other small deviations), only the alignment of the All Season Road will be used, not the alignment of the Permitted Winter Road<sup>17</sup>.

### **1.3 Development description**

The following sections describe the Project components and activities as proposed by CanZinc<sup>18</sup> for the All Season Road.

#### **1.3.1 Road construction**

CanZinc proposes to construct the All Season Road from east to west, beginning at the intersection of the Liard Highway (km 184) and ending at the mine (km 0) (PR#224).<sup>19</sup> Road construction would occur over a period of three years. Prior to construction activities, CanZinc will conduct field investigations and prepare site plans (including detailed road design) and award construction contracts (PR#101 p46-50). The updated road construction schedule is presented in Table 1-1 below (PR#513 p13-14).

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<sup>16</sup> CanZinc proposes to use the Permitted Winter Road along upper Sundog (km 24-29) and Fishtrap creeks (km 90-95) in order to construct adjacent sections of the All Season Road. In these instances, the developer will be carrying out activities permitted under the Permitted Winter Road and permitted under authorization(s) for the All Season Road (if approved).

<sup>17</sup> As noted in Section 2.2.2 under cumulative effects, the Review Board has not assessed the combined effects of disturbance from separate winter road and All Season Road alignments.

<sup>18</sup> The project description provided here reflects the Project components and activities proposed by the developer in its Developer's Assessment Report (DAR) and DAR Addendum, and updated based on new information provided by CanZinc during the environmental assessment, including developer commitments.

<sup>19</sup> While the road from the mine (km 0) to km 37.4 is permitted for all season use, the scope of development for this environmental assessment includes any upgrades needed along this section, including realignments and new watercourse crossings (for more information see Section 2.1).

**Table 1-1: Updated road construction schedule<sup>20</sup>**

Season	Road Activity
<b>Year 1</b>	
Winter	-Subgrade KP 170 to Liard River -Liard River Ice Bridge, Barge Ramps -Subgrade Liard R to Grainger Gap -Surfacing KP 170 to Liard River -Winter Road to Mine (Mine construction <sup>21</sup> )
Fall	-Surfacing Liard River to Grainger Gap
<b>Year 2</b>	
Winter	-Liard River Ice Bridge -Winter Road to Mine (equipment in) -Subgrade Grainger Gap to KP 102 and KP 95-59 -Install major crossings to KP 87
Summer	-Surfacing Grainger Gap to KP 102 -Subgrade KP 28 to Mine, KP 102-95 -Install KP 23.3 and 25.4 crossings
Fall	-Surfacing KP 102-86 -Sundog Creek Realignment <sup>22</sup> -Mill Commissioning
<b>Year 3</b>	
Winter	-Liard River Ice Bridge -Winter Road to Mine -Subgrade KP 59-39 -Install remaining major crossings
Summer	-Surfacing KP 86-39

<sup>20</sup> PR#513 p13-14. Along the All Season Road alignment, KP or kilometre (km) zero is the Prairie Creek Mine.

<sup>21</sup> CanZinc expects that there will be approximately 100 loads needed over a 2-3 week period to support mine construction activities; they expect fewer loads to be needed the following winter for transporting equipment to the mine (PR#240 p80-81).

<sup>22</sup> In this Report of EA, the term “diversion” is used to refer to the Sundog Creek diversion and realignment is used to refer to changes to the alignment of the road itself.



Road construction activities would involve a total fleet of approximately 35-40 pieces of heavy equipment and vehicles, and 10 light trucks. On a daily basis however, it is likely that a lower intensity of construction would be adopted, and the entire fleet would not be in operation. Moreover, most of the vehicles would remain localized at the sites of construction (e.g., locations where road sub-grade or running surface material is being placed, where borrow is being acquired, and where bridges are being built). Travel between these locations, and between the mine and camps, will be mostly by small support trucks (PR#55 p143).

### **1.3.2 Sundog Creek diversion<sup>23</sup>**

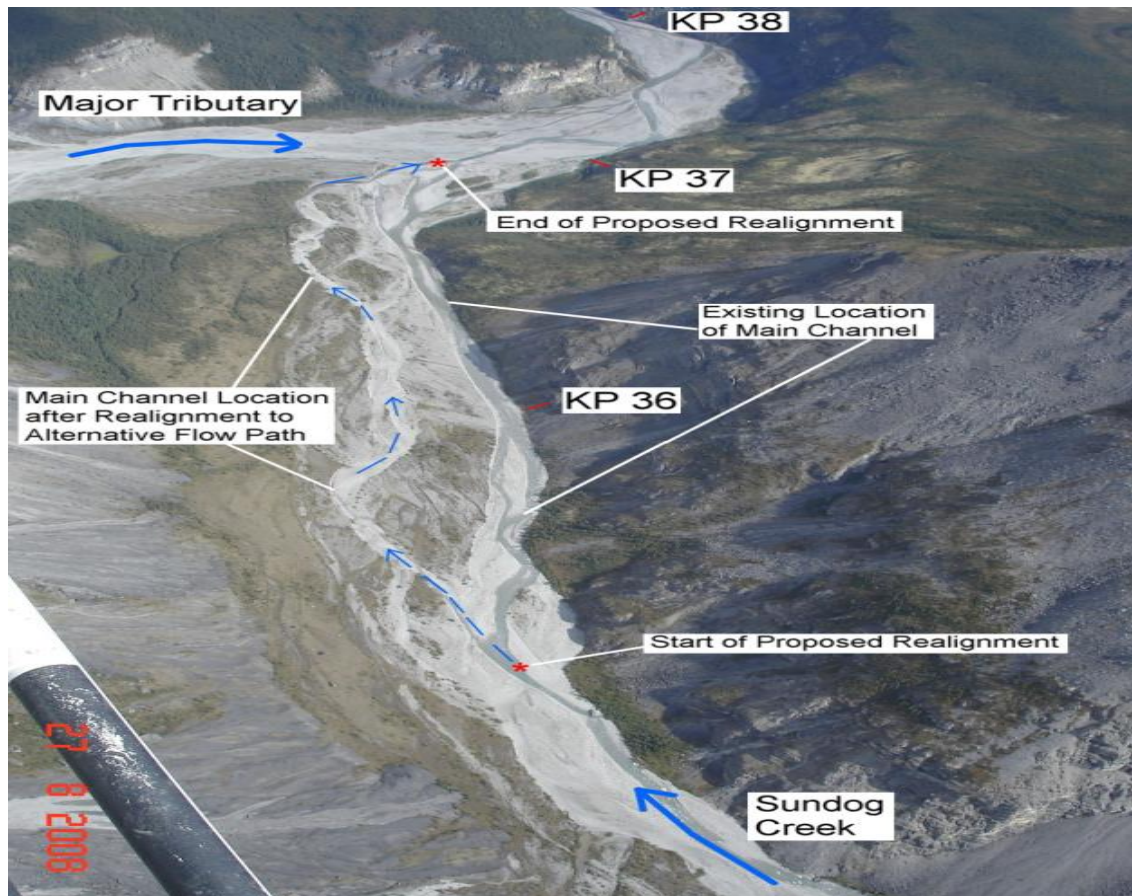
The Permitted Winter Road traverses the lower Sundog Creek floodplain from approximately km 24 to km 41. In order to avoid multiple creek crossings and contact with active creek channels in the summer, the proposed All Season Road will be constructed along the south edge of the floodplain. However, given the proximity of the creek channel in certain locations along this southern edge, the channel will be diverted between km 35.5 and km 37, approximately (Figure 1-2) (PR#238). The All Season Road will be armored to prevent erosion at the beginning of the diversion (km 35.1), as will the southern bank of the channel where necessary to divert flows to the north, away from the road (PR#55 p148; PR#100 p62).

Work on the channel diversion is expected to take about one month and would be completed in the late summer or fall when typically significant stretches of the creek are dry in order to limit impacts on water and fish (PR#100 p41). Moreover, the proposed diversion would be maintained for the life of the road and, thereafter, the creek would either continue in the same channel, or cut a new one, as it does naturally at present.

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<sup>23</sup> Despite developer and parties' use of the terms "diversion" and "realignment" interchangeably when referring to the Sundog Creek channel diversion, for the purposes of this report, the Board will use the term "diversion" exclusively in order to avoid confusion with the road realignments from the existing Permitted Winter Road.





**Figure 1-2: Proposed diversion of Sundog Creek**  
(PR#238)

### 1.3.3 Transportation and concentrate hauling

Along the proposed All Season Road corridor, concentrate will be hauled in bulk bags (with secondary containment)<sup>24</sup> by truck from the mine to the Liard transfer point (km 157)<sup>25</sup>, where the trailers will be transferred to other trucks before continuing along the remainder of the All Season Road and on to Fort Nelson, BC (PR#55 p137; PR#375, p1). The Liard River crossing will place seasonal constraints on the operation of the access

<sup>24</sup> CanZinc intends to use a containerized form of bulk concentrate transport, either in addition to or instead of bags to account for some smelters that do not accept bagged concentrates (PR#55 p137).

<sup>25</sup> This transfer point is proposed to be located on the South side of the Liard river crossing. Alternatively, CanZinc may use a laydown area on the north side of the Liard River crossing for the transfer location (PR#375 p2). The Liard transfer point would also be used as a refueling location (using portable tankers) (PR#375 p1).

road; a barge<sup>26</sup> will be operational during the summer haul period from June 15 to November 4, and a winter ice bridge will be in place during the winter haul period from January 1 to March 31. This crossing will, however, only offer full 60-tonne capacity from mid-January on (PR#224 p23; PR#56 p5). In addition, the NWT restricts legal loads to 75% and/or 5,000 kg on the Liard Highway during spring break up from late April to July (PR#56 p5).

Daily truckloads of concentrate from the mine would travel the All Season Road to the Liard transfer point, and subsequently to Fort Nelson (267 km of highway travel) (See Figure 1-3) (PR#55 p133). Travel time from the mine to the Liard transfer point and back at a conservative average speed of 30 km/hour would be approximately 10.5 hours (PR#375 p2), assuming breaks and tractor assist which may be required to ascend the Silent Hills in winter, and a bottle-neck at the barge crossing of the Liard River in summer. Travel from the Liard transfer point to Fort Nelson at 60 km/hour would take approximately 9 hours for a return trip (PR#375 p2).



**Figure 1-3: Proposed haulage route including the All Season Road (PR#55 p133)**

<sup>26</sup> This barge would be private, and not for public use (PR#55 p146). The frequency of crossings will likely be approximately one per hour, with a sailing time of about 5-10 minutes (PR#55 p273).

CanZinc proposes that other supplies such as fuel and mine supplies will be delivered on concentrate truck back-hauls and that there may be a small number of additional hauls of unique loads of camp supplies and mine explosives. The mine will require approximately 8 million liters of diesel fuel per year; with fuel brought in on concentrate truck back-hauls, this equates to approximately 2,700 L/trip. The trucks will likely have dedicated tanks installed behind the cab or on the trailers for the fuel haul, with a maximum capacity of 10,000 L (PR#55 p145). The developer has estimated the number of concentrate truck trips to be between 12 and 18 trucks/round trip/day on the all season road, up to a maximum of 25 trucks/round trip/day (PR#264).

The existing mine airstrip<sup>27</sup> may be used to support All Season Road construction activities, mainly for crew changes and providing spare parts (for equipment, building supplies, etc.) (PR#55 p144). At the time of the DAR Addendum, the developer estimated that 29 flights would be needed annually to support All Season Road construction, with a higher frequency of flights in the winter months (PR#100 p37).

#### **1.3.4 Camps and staging**

CanZinc will establish camps and staging areas along the road corridor during construction. Camps will be either for long-term use (i.e. during construction and operations) or temporary facilities to support construction of the road and bridges. Long-term camps will be located at km 120.4 (Grainger Camp), km 87.3 (Tetcela Camp), and km 39.5 (Cat Camp) (PR#350, Appendix B). Temporary camps will be located at km 23.1 (Drum Camp), km 64.6, km 101.8 (Wolverine Camp), km 147.5, and km 156 (Liard Camp)<sup>28</sup> (PR#350, Appendix B; PR#101 p47). After completion of the road, the developer will decommission the temporary camps and reclaim their footprint to the applicable standard.

A typical camp (either for temporary or long-term use) would accommodate up to 50 people and occupy up to three hectares (PR#186 p43). Peak road construction activities could see a labor force of approximately 80, and with different road construction activities occurring at different locations, there may be one main camp and two smaller camps in operation at any one time, with locations changing as work progresses (PR#100 p74). A list

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<sup>27</sup> According to the DAR, flights to this airstrip are likely to be few since it would only be used in winter (PR#55 p144)

<sup>28</sup> Alternately, this camp will be located at a borrow pit site at km 154.4, 154.9 or 155.6, or at the Liard North Side Landing site at km 156.2 (PR#350, Appendix B).

of all potential camps is provided in CanZinc's Summary Scope of Development table (PR#350, Appendix B).

For construction staging (and later road operations), the developer expects to build staging and laydown areas on each side of the Liard River. Material and equipment will also need to be staged on both sides of the river during periods when there is no means of travel across (ice, barge). A list of all potential laydown areas is provided in CanZinc's Summary Scope of Development table (PR#350, Appendix B). The total size of these laydown areas will be subject to the construction schedule and requirements of the successful contractor (PR#56 p43). Major stream crossings will also require construction staging areas (50m x 50m) on either side of the river (PR#56 p48)<sup>29</sup>. A site plan for the North Shore (Liard River) staging area is in Appendix E of the DAR (PR#63).

### **1.3.5 Borrow Sources and blasting**

CanZinc is considering 80 potential borrow source locations (PR#350, Appendix B). Of these, there are 44 preferred locations. All preferred and alternative borrow sources are listed in PR#350, Appendix B. Some of these borrow sources may require blasting and/or crushing activities (PR#186, Appendix A, p2). Blasting will also be required at km 23.4 and 27.3 for bridge approaches, at km 28 to 29 for a road re-alignment, and at km 37 for the road-bed off the floodplain (PR#186, Appendix A, p2).

In all cases where blasting is required, blasts will be infrequent and of short-duration (seconds), extending over a period of two to four weeks at each borrow site, and a shorter period at the other sites. Crushing operations will be continuous but of short-duration, extending to approximately one month at each borrow site. Blasting and crushing operations may occur throughout the year, and activities at one borrow source will conclude before beginning at another. For human safety, blasting activities will occur during daylight hours (PR#186, Appendix A, p3).

### **1.3.6 Access control**

Due to the fact that the All Season Road is to be located on public land, CanZinc will have no legal authority to restrict access to the road. Despite this, after clarification from the GNWT, CanZinc will have the right to restrict access on its leased parcel for the barge landing on

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<sup>29</sup> For details on major stream crossings, see Table 10 in DAR Appendix 1 (PR#56 p49-55)

the north side of Liard River crossing (PR#525 p236). Moreover, CanZinc confirmed that it will exercise its right to control access to this and its leased parcel for the barge landing on the south side of the Liard river crossing<sup>30</sup>, likely by employing NBDB (PR#524 p67). In addition, the developer proposes to install a check point around km 140 to record road users and discourage non-mine related use of the road (PR#101 PDF p148).

### 1.3.7 Closure and reclamation

The approach to road closure will not include removal of the sub-grade and gravel surface, but will include grading and slope flattening where appropriate, and scarifying of the surface to promote invasion of natural vegetation (PR#55 p286). Crossing structures and culverts will be removed, and disturbed areas near watercourses will be either temporarily stabilized until vegetation has established, or permanently stabilized where needed.

CanZinc is committed to undertaking closure and reclamation to avoid landslides, uncontrolled soil erosion and sediment transport. The developer will meet these objectives by: stabilizing the road bed (or road prism) and cleared width; restoring or maintaining surface drainage patterns, and; ensuring that subsurface drainage is consistent with natural drainage patterns, and that silt and sediment transport is minimized (PR#55 p286).

Heavy equipment use for the reclamation of borrow pits is likely to be similar to that for road construction, with perhaps fewer vehicles because borrow is not being dug, hauled and placed (PR#55 p144). Moreover, to prevent the introduction of invasive plant species, the developer anticipates re-vegetation of borrow sources and other disturbances associated with the development of the All Season Road to occur primarily through encroachment of native species from surrounding vegetation communities (i.e. natural revegetation) (PR#55 p267).

For additional information on closure and reclamation activities, see chapter 14 of the DAR (PR#55 p286-288), the Road Closure and Reclamation Plan, and the Borrow Pit Management and Reclamation Plan in Appendix C of the DAR Addendum Appendix A (PR#101). For a brief summary of the reclamation approach by Project component, see Table 16 in Appendix 1 of the DAR (PR#56 p80).

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<sup>30</sup> The south side of the Liard river crossing will be on Indian Affairs Branch (IAB) Lands, at a location where the road can be gated and access can be controlled by the Nahanni Butte Dene Band (NBDB) (PR#375).



## 1.4 Environmental setting of the Prairie Creek All Season Road Project

### 1.4.1 Physical environment

The currently Permitted Winter Road and approximate location of the proposed All Season Road<sup>31</sup>, including major realignments, is shown in Figure 1-1. Located in the southwestern part of the Northwest Territories, the access road begins at the Nahanni Butte access road and passes through the Mackenzie Mountains and the Nahanni National Park Reserve (NNPR) its way to the Prairie Creek mine site. Approximately half of the 184 km access road passes through Nahanni National Park Reserve (Figure 1-1).

Information provided by the developer about the physical environment in which the Project is located is summarized below.

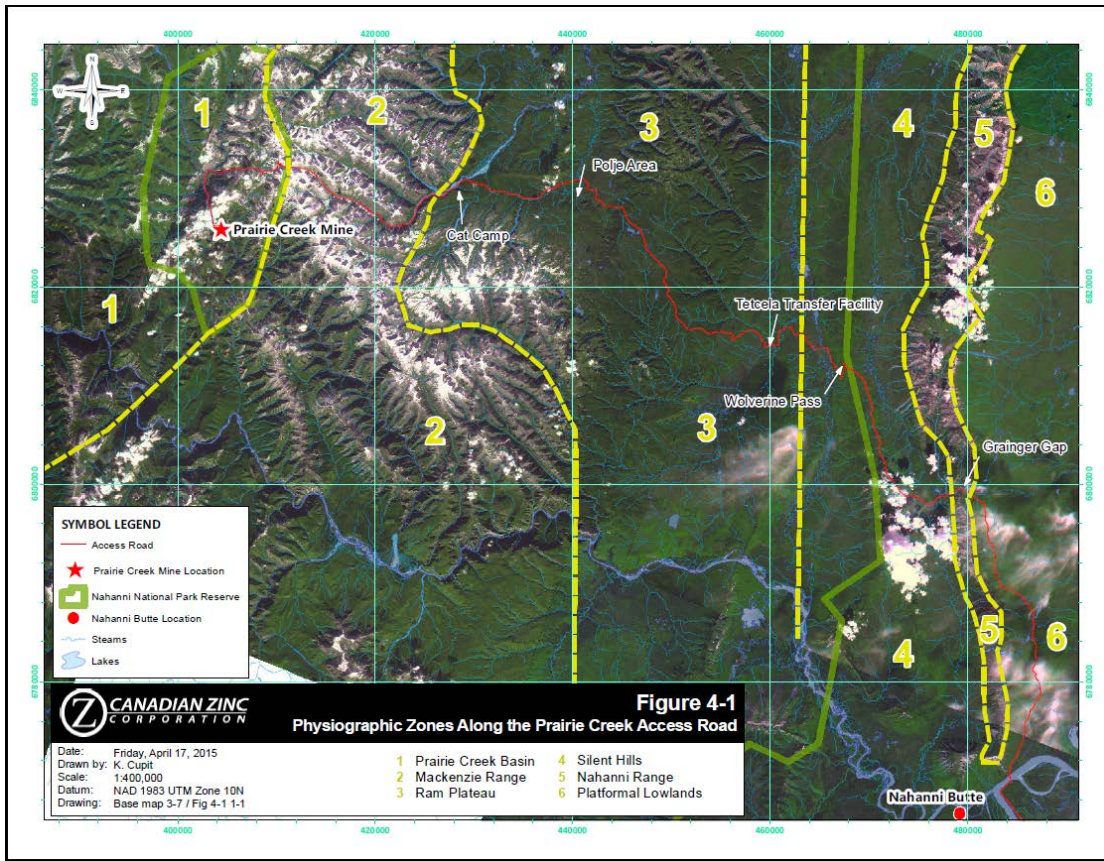
#### *Terrain and physiography*

The proposed route of the All Season Road passes through a variety of natural regions including valleys, Sub-Alpine Shrub and Alpine Tundra (max elevation of 1530 m AMSL), Riparian Alluvial habitat, open-forest parkland, muskeg, and mixed forest (PR#55 p58). The road alignment crosses terrain that includes discontinuous permafrost and karst, with the potential occurrence of thermokarst, sinkholes, debris flows and thaw slumps, as well as rock fall, rock slides, and snow avalanches in mountainous terrain (PR#55 p10). The route is entirely underlain by sedimentary rock sequences generally consisting of various combinations of limestone, dolostone, siltstone, shale and mudstone (PR#55 p59).

The entire study area is located primarily within the Taiga Cordillera and Taiga Plains Ecozones of the Northwest Territories and is characterized by several significant topographic features (e.g., Mackenzie Mountains, the Nahanni Ranges and the Liard floodplain) (Figure 1-4). Wildfires occasionally occur in the region and have influenced forested ecosystems throughout much of the landscape (PR#55 p114).

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<sup>31</sup> The alignment of the All Season Road differs from that of the Permitted Winter Road. See Section 1.2.3 for details.



**Figure 1-4: Physiographic zones along the Prairie Creek Access Road (PR#55 p60)**

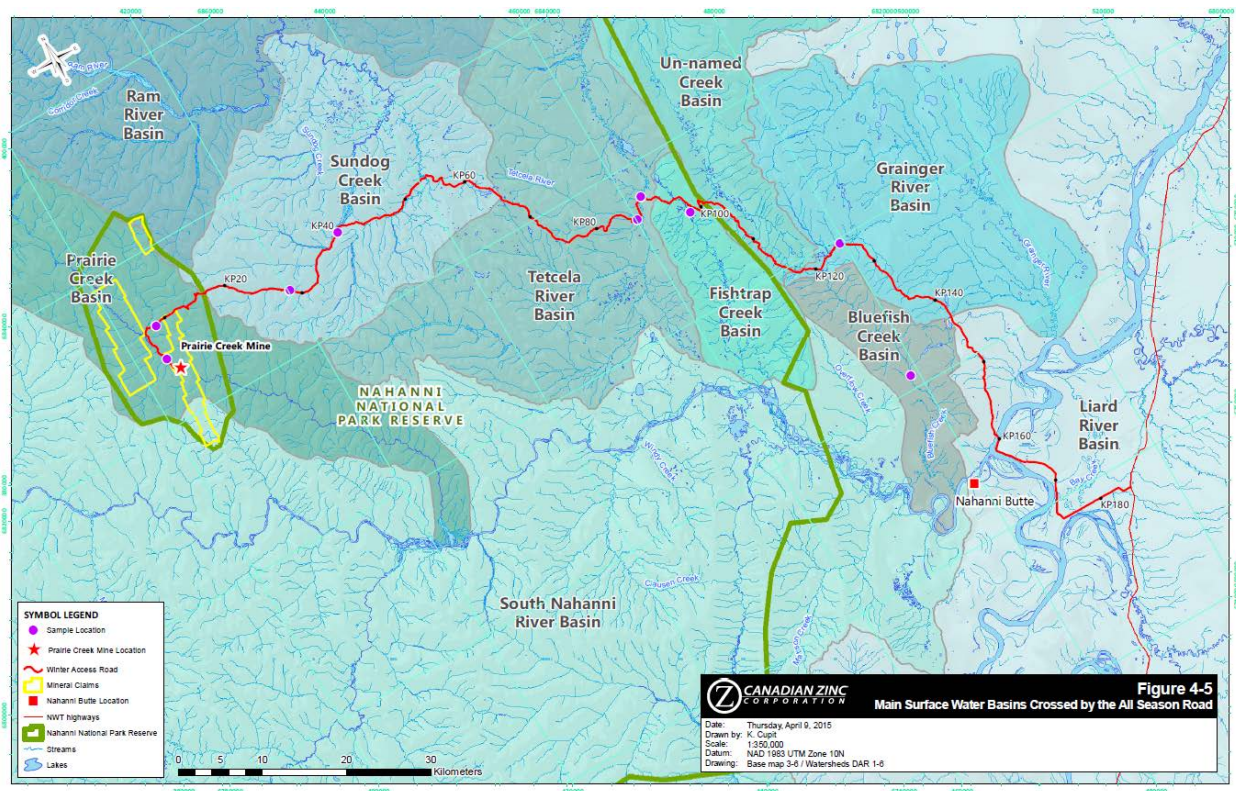
Rainfall for the study area has been estimated to be approximately 300 mm/year, and total precipitation of 508 mm/year. However, it is clear that rainfall totals for the year vary largely in response to the number and intensity of summer rainfall events. The mine site experienced two flood events in recent times, in June 2006 and August 2007. Both were in response to intense rainfall. Temperatures at the mine site from 1980 to 2012 have remained generally consistent, averaging -5C annually (PR#55 p67).

Karst features are present in the Ram Plateau and Polje geographic areas that are within the Project study area. Many karst features have been identified and documented, including (but not limited to) poljes, dolines, suffosion terraces, caves, labyrinth karst, and tower karst (PR#55 p64).



## Surface water

The main surface water basins crossed by the All Season Road alignment are, from west to east, Prairie Creek, Sundog Creek, Tetcela River, Fishtrap Creek, an unnamed creek, Grainger River, and the Liard River (PR#55 p72) (Figure 1-6).



**Figure 1-5: Main surface water basins in the Project area  
(PR#55 p73)**

Flow rates in the various larger streams crossed by the access road are assumed by the developer to mirror the pattern of Prairie Creek, for which there is a good record. Higher monthly flows occur over the period May-September, with the peak flow month usually being June coincident with the freshet. The annual low flow month is usually March when flows are approximately 50 times less than in June. However, these data do not account for peak flows observed in the area, which may occur during intense summer rainfall events. Freeze-up usually begins in mid-October, and spring thaw in mid-April (PR#55 p79).

## Fish and wildlife

Wildlife species at risk that are potentially present along the All Season Road corridor and were of particular interest for the effects assessment in the DAR include boreal woodland



caribou, northern mountain woodland caribou, wood bison and grizzly bear (PR#55 p86). Additional species with “secure” and “sensitive”<sup>32</sup> populations in the NWT that have known distributions along or near the All Season Road include Dall’s sheep, moose and furbearers (including grey wolf, beaver, marten and wolverine) (PR#55 p103).

By the end of the 2001 fieldwork, it was known that both bull trout and mountain whitefish spawn in Prairie Creek upstream of the mine site, most likely in Funeral Creek. Arctic grayling are known to inhabit lower Prairie Creek and many other creeks in the study area, and Slimy sculpin inhabits the main stem creek and some tributaries above and below the mine. In addition, Fisheries and Oceans Canada reported spawning bull trout in Funeral Creek in 2005, which are thought to be resident species that over-winter in the area (PR#55 p98). Other species known to inhabit water bodies in the study area include northern pike, lake chub, burbot, and longnose sucker.

There are 13 stream crossings for the All Season Road where the presence of fish has been confirmed (PR#264). During the cultural technical session in Nahanni Butte, Bluefish Lake was identified by community members as important for grayling and a creek west of Grainger Gap was noted as important habitat for fish (PR#275 pp6-7).

The presence of many waterfowl species, including Trumpeter Swan, is likely along the All Season Road alignment; the Project area contains habitat for breeding and/or staging for short periods during annual migration (PR#55 p111). In addition to waterfowl, raptors are expected to occur and nest near the entire All Season Road alignment, and documented occurrences include golden eagle, bald eagle, peregrine falcon, American kestrel, red-tailed hawk, northern harrier, and gyrfalcon (PR#55 p113).

### **Vegetation**

The entire study area is located primarily within the Taiga Cordillera and Taiga Plains Ecozones of the Northwest Territories and is characterized by several significant topographic features (e.g., Mackenzie Mountains, the Nahanni Ranges and the Liard floodplain) resulting in an array of growing conditions, and consequently, numerous vegetation species assemblages (Ecosystem Classification Group 2007) (PR#55 p114).

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<sup>32</sup> “Secure” and “sensitive” are status rankings of species in Canada. For more information, see [General Status of Species in Canada](#)

Initial database research by CanZinc indicated historical occurrences of the following species within a 50 km radius of the study area: 16 vascular plants species, one lichen species and 13 bryophyte species currently ranked as 'may be at risk'; one vascular plant species ranked as 'sensitive', and; one vascular plant species ranked as undetermined'<sup>33</sup> (PR#55 p115). Results of the ENR virtual herbarium search indicate that no occurrences of vegetation species at risk have been historically recorded within five kilometers of the study area (PR#55 p117).

### ***Nahanni National Park Reserve***

Approximately half of the proposed alignment of the All Season Road is located within the Nahanni National Park Reserve of Canada (NNPR). Within the NNPR, the pre-2009 park expansion boundary occupies a smaller area and is a UNESCO World Heritage site. The NNPR is known for its globally-significant karst terrain, as well as the South Nahanni River, a Canadian Heritage River, located within the park. According to Tetra Tech EBA, about 85 km of the proposed All Season Road is located in the NNPR (PR#129). The Project does not cross through the UNESCO World Heritage site.

### ***Traditional harvesting and cultural resources***

According to the developer, most residents of the Dehcho, the area in which the Project is located, are involved in traditional activities. Due to relatively low employment rates and the high cost of living, it is likely that traditional activities like hunting, fishing and traditional arts and crafts are important for both the local economy and the preservation of tradition and culture (PR#55 p131). Traditional harvesting in the Project area has historically included hunting and harvesting of Dall's sheep, moose and caribou (east of Grainger Gap), and trapping of furbearers (including wolf, fox, marten, beaver, lynx, mink, muskrat, and wolverine). Traditional harvesting of fish seems to have been focused at the mouth of Fishtrap Creek, likely on Bluefish Creek, and on the main stems of the Tetcela and Grainger Rivers proximal to the road alignment; this is in addition to lakes and stream mouths accessible from the South Nahanni River (including Prairie Creek). Fishing has also been noted in Gap Lake and Bluefish Lake (PR#55 p101).

Due to its seasonal importance for hunting, fishing, and trapping purposes, the mouth of Prairie Creek has been used over time for both seasonal and year-round camps; at least one

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<sup>33</sup> Rankings by the NWT General Status Ranking Program.

burial site is located in this area. Berries and medicinal plants are harvested in the Project area, though this activity is now mostly focused close to the village of Nahanni Butte and surrounding mountains (PR#55 p122-125).

Previous archaeological database searches in the vicinity of the mine as well as the entire All Season Road corridor from the Prairie Creek Mine to the Liard River revealed no archaeological sites. Archeological work was undertaken by CanZinc for the current EA in key areas along the proposed alignment, primarily at the Second Gap area in the Nahanni Range, but also at Wolverine Pass in the Silent Hills, and at the Tetcela River crossings. No heritage resources were found. During an engagement meeting in January 2015, elders advised that there were no known burial or culturally-important sites proximal to the access road, and that the closest ones were several hundred metres upstream from the proposed Liard River crossing (PR#55 p127).

#### **1.4.2 Human environment**

The developer provided the following information about the human environment to the Review Board in the Developer's Assessment Report (DAR) and its supporting documents.

##### ***Regional and local economies***

The communities studied (Fort Simpson, Fort Liard, Wrigley, and Nahanni Butte<sup>34</sup>) can be considered small and relatively isolated. Fort Simpson is the only community within the Dehcho region with a population that exceeds 1,000 (Table 5-6 in PR#55 p130). Similar to the territory as a whole, the population is dominated by young people below the age of 25. Aboriginal<sup>35</sup> people make up the majority in all of the communities studied. Fort Simpson has the largest number of non-Indigenous people in both relative and absolute terms (PR#55 p131).

The DAR noted an overall weak economy and workforce participation generally below the territorial average in the study area communities; average incomes are similarly low. Employment rates (2009) vary between communities, with Fort Simpson the highest (65%) and Nahanni Butte the lowest (44%). When coupled with the cost of living (relative

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<sup>34</sup> Population and employment statistics include Trout Lake and not Wrigley.

<sup>35</sup> The Review Board recognizes that some parties use the word Indigenous. In this Report of EA, the Review Board uses the word Aboriginal, because it is used throughout Part 5 of the MVRMA and links to the *Constitution Act, 1982*.

to Edmonton and Yellowknife), low incomes suggest higher rates of poverty among the population and in particular amongst the Indigenous population (PR#55 p131).

While business services are limited, First Nation development corporations in the communities studied are considered capable of expanding to take on new roles or brokering joint venture arrangements with larger firms. Fort Simpson offers the largest array of business services in the area. The community is home to several transportation companies servicing industry, tourism and general transportation needs, and a number of accommodation services, including hotels/motels and bed and breakfasts. Other businesses provide expediting services, construction, contracting and general retail services such as grocery outlets, fuel, taxi service, etc. (PR#55 p131). Liidlii Kué First Nation's (LKFN) Nogha Enterprises is involved in a wider array of construction activities, general contracting, and services, and has the capacity to expand to meet new demands from industry, either independently or through the formation of a joint venture. Nahanni Butte and Trout Lake have formed development corporations, however their ability to expand to meet the business needs of industry is largely untested (PR#55 p131).

### ***Education and training***

The communities studied lag behind the rest of the NWT in terms of educational attainment; in 2011, 49.2 percent of the Dehcho region's population aged 15 years and older had a high school diploma compared to 68.9 percent for the territory as a whole. There is a marked difference in the education levels of Indigenous and non-Indigenous residents within the communities. The Indigenous population from within these communities also underperforms in comparison to the territory's Indigenous population; in 2006, for the Northwest Territories as a whole, 45 percent of Indigenous residents have a high school diploma or its equivalent, compared to 34 percent in the communities studied. Similar to other regions in the NWT, the smaller communities studied do not have a high school (PR#55 p120).

In terms of employment and skills, there is a clear division between Indigenous and non-Indigenous people in the communities studied; the average Indigenous employment rate is less than 50 percent, whereas the non-Indigenous employment rate exceeds 80 percent (PR#55 p120).

### ***Employment and benefits to the community***

CanZinc ratified Impact Benefit Agreements (IBA's) with the Nahanni Butte Dene Band and Liidlii Kué First Nation at the time of the mine and winter road development proposals. The developer also signed a Socio-economic Agreement (SEA) with the GNWT. These

agreements give priority to local community members, northern workers and contractors for employment and contracts at the mine and for road construction. The SEA also has provisions for human resource development, and supporting territorial health and wellness programs. The IBA's and SEA are pertinent to, and will be retained for the All Season Road (PR#55 p269).

### **Tourism**

Current tourist activity in the study area is dominated by visitation to the Nahanni National Park Reserve (NNPR), followed by river guiding and canoe tripping on the South Nahanni River (PR#55 p226). From 1984-2014, between 724 and 1391 people visited the NNPR annually. Since the expansion of the park in 2009, annual visitation rates to the NNPR have averaged of 947 visitors (PR#100 p69). The NNPR had 20 staff positions prior to expansion of the park in 2009, and there are currently 31 positions (PR#55 p226).

#### **1.4.3 Regulatory context**

The Review Board notes that the Project setting is jurisdictionally complex, given its location in the Nahanni National Park Reserve and on territorial lands, as well as Indian Affairs Branch Lands (administered by INAC). For the EA of the All Season Road, the Review Board applied a consistent methodology and decision-making framework to the entire Project. This framework includes consideration of the values placed on the environment, components of the environment, and different geographic locations, based on the evidentiary record for this EA. The Review Board's analysis and conclusions related to likely significant adverse impacts on the environment from the Project are set out in Chapters 5-16 of this REA.

Where the Review Board has recommended mitigation measures as conditions of Project approval, the Board has considered the regulatory and jurisdictional context within which the measures will need to be implemented. For example, measure 6-2 requires CanZinc to develop a Wildlife Management and Monitoring Plan (WMMP) for portions of the Project within the NNPR and on territorial lands, in accordance with legislation applicable to both regulators. Although the enabling legislation and legislative requirements may differ by area, the Review Board suggests that the regulatory authorities work together to ensure a consistent WMMP over the entire Project area. In this and other measures, the Review Board encourages consistency in implementation and where possible, content, while respecting the independent authority of the regulators to set their own requirements to implement the recommended measures in this REA.

## 2. Scope of the environmental assessment

This chapter describes the scope of development and scope of assessment set by the Review Board for the environmental assessment (EA) and explains how the Board satisfied other statutory obligations in relation to the scope of assessment.

To determine the scope of development and scope of assessment, the Review Board considered CanZinc's original Project Description Report (PR#2) and the evidence on the public record up to the end of scoping phase, including: comments received at the community scoping sessions in Nahanni Butte, Fort Liard and Fort Simpson held in June 2014 and at the technical scoping session held in Yellowknife in July 2014. The Review Board then set out the scope of development described in Section 2.1. Then, considering the scope of development, the relevant information on the public record, and the Review Board's statutory obligations under the MVRMA, the Review Board set the scope of assessment.

The *Terms of Reference* for the EA (PR#42) describes the scope of development and scope of assessment for the Prairie Creek All Season Road Project (All Season Road or the Project). The Review Board also issued *Reasons for decision on the scope of the environmental assessment* (PR#44).

### 2.1 Scope of development

Under subsection 117(1) of the MVRMA, the Review Board determines the scope of development for every environmental assessment it conducts. As described in the *Terms of Reference*, the scope of development consists of all physical works and activities required for the Project to proceed. The final scope of development described in this Report of EA includes all relevant Project changes made during the EA, and in the Review Board's opinion, accurately reflects the Project as currently proposed. In general, this includes the construction, operation, maintenance, closure and reclamation of the All Season Road and supporting infrastructure. Specific components of the final scope of development for the Project include:

- construction of an all season road from km 37.4 to the Liard Highway, along the alignment described in Section 1.2.3 and shown in PR#224;
- upgrades to the existing access road from the mine (km 0) to km 37.4, including re-alignments between km 24 and 37.4;

- construction and use of a winter road along the same alignment of the All Season Road, to support construction of the All Season Road and the Prairie Creek Mine<sup>1</sup>;
- construction of watercourse crossing structures along the All Season Road;
- construction and operation of borrow sources (including access to them) along the All Season Road;
- construction and operation of construction support infrastructure and workspaces, including camps, laydown and staging areas, and bulk fuel storage;
- diversion of the Sundog Creek between km 35.5 and 37;
- construction and operation of a barge crossing at the Liard River;
- use of the mine airstrip to support Project activities;
- All Season Road operations (including concentrate hauling<sup>2</sup> and transportation of fuel, equipment, personnel, and consumables) supporting the construction, operation, closure and reclamation of the Prairie Creek Mine; and,
- the closure and reclamation of the All Season Road at the end of the expected mine life.

In accordance with Section 157.1 of the MVRMA, and as described in its *Reasons for Decision on the Scope of the Environmental Assessment*, the Review Board decided that the scope of the development excludes Project components and activities currently permitted or authorized prior to June 22, 1984, namely the all season use of the access road from the mine to km 37.4<sup>3</sup>. This section of the road (km 0-37.4) is already constructed and is considered to be of all season quality. However, any changes to this section of the road beyond what is currently constructed (e.g., upgrades, realignments, water crossings, etc.) are included in the scope of development for the All Season Road (PR#44 p3).

Additionally, because the previously-assessed winter road in EA0809-002 concerned only the winter construction and use of an access road and associated components and activities, the scope of development for EA1415-01 includes components and activities above and beyond those needed for the Permitted Winter Road to support all season use (including the realigned locations, All Season Road construction and operation, additional

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<sup>1</sup> Except specific locations where use of the Permitted Winter Road alignment has been identified (see Section 1.2.3)

<sup>2</sup> Concentrate hauling will take place during the winter and summer haul periods described in Section 1.3.3.

<sup>3</sup> Following the 1980 Environmental Evaluation (see Section 1.2), permit N80F249 allowed all season use of the access road from the mine to km 37.4. Moreover, in EA0809-002 the road was considered to be an all season gravel bed from the mine to km 16.8 and natural gravel and snow from km 16.8 to 39.5. Given the purported all season quality and permitted all season use up to km 37.4, the construction of an All Season Road is not included in the scope of development for the Project.



borrow sources, Sundog Creek diversion, all season water crossings, etc.). For more information on the Board's consideration of previous assessment activities, see Section 2.2.2.

### 2.1.1 Project changes during the EA

During the EA, the developer made several changes to the Project. These changes resulted in the final scope of development, which is set out in Section 2.1, above. These changes included:

- removal of an airstrip to be constructed on the Ram Plateau (PR#113);
- removal of the Tetcela Transfer Facility (TTF) (PR#230 p100);
- removal of the Liard Transfer Facility (LTF) (PR#375 p1); and,
- road re-alignment from km103-124 (Wolverine Pass to Grainger Gap) (PR#230 p128-29).

In the DAR, CanZinc proposed building an airstrip within the Nahanni National Park Reserve (NNPR) adjacent to the road to support road construction and maintenance activities, and to act as an alternative to the mine airstrip in bad weather (PR#55 p9). Due to uncertainty regarding the legality of building an airstrip within the NNPR, the Review Board did not include the airstrip in the scope of development for the current EA pending a determination by Parks Canada under the *Canada National Parks Act*. In a letter to the Review Board dated April 8, 2015, Parks Canada stated that it “does not have legislative authority to authorize CanZinc by lease, licence of occupation or easement to construct an airstrip within Nahanni National Park Reserve” (PR#54). Based on this information, and subsequent correspondence with the developer and Parks Canada, the Review Board issued a Note to File on January 8, 2016, indicating that it would not assess an airstrip within the NNPR (PR#113).

During the technical session held in Yellowknife, CanZinc clarified that the originally proposed Tetcela Transfer Facility (TTF) would no longer be needed since the developer would not be taking a phased approach to road construction (i.e. first constructing an all season road from the mine to the TTF, and later completing the All Season Road) (PR#230 p100). The originally conceived TTF was to be used for storing concentrate at a midway point on the road in order to take advantage of the short winter road season (PR#56 p7). Similarly, in a November 2016 letter, CanZinc advised the Review Board that the Liard Transfer Facility (LTF) would no longer be required for concentrate storage, and that trucks would instead transfer trailers at a site near the Liard River before continuing to Fort Nelson, BC (See Section 1.3.3) (PR#375 p1).



In its presentation at the technical session in Yellowknife, CanZinc described a major re-alignment to the proposed All Season Road from km 102 to km 124 (Silent Hills to Grainger Gap) (PR#224 p18). During the technical session, CanZinc clarified that the so-called wolverine re-alignment is the preferred option as it allows the Project to avoid crossing a fish-bearing watercourse that would otherwise require blasting (PR#230 p128-29).

These Project changes were initiated by the developer. During the EA, the Review Board ensured that parties and the developer had a fair and reasonable opportunity to discuss issues related to these Project changes. The final scope of development for this EA is set out in Section 2.1, above, and includes these Project changes.

### **2.1.2 GNWT's recommended changes to the scope of development**

As per subsection 117(1) of the MVRMA, the Review Board must determine the scope of development in order to conduct an environmental assessment. The Review Board makes this determination after considering input from parties to the EA. In its closing arguments, the Government of the Northwest Territories (GNWT) recommended several additions to the scope of development, including a number of developer's commitments (PR#551 p8).

In some past EAs, the Review Board has found the treatment of developer's commitments to be a challenge. Some commitments may be subject to a regulatory authorization, some may be an important part of mitigating significant adverse impacts that should inform EA measures, and others may be of relatively minor importance to the substantive issues examined in the EA. For commitments that relate to findings of significant adverse impacts, the Review Board's approach generally has been to set out measures that incorporate and/or build on those commitments, as part of the Review Board's overall mitigation strategy.

Considering the Review Board's legal framework under the MVRMA for setting the scope of development, carrying out an assessment, making determinations of significance, and imposing mitigation measures, the Board finds that GNWT's recommended approach is unworkable for the following reasons.

First, the GNWT's recommended approach is not consistent with the procedural sequence described by the MVRMA. Subsections 117(1) and (2) of the MVRMA require the Review Board to proceed through several specific tasks when undertaking an EA of a development

proposal, the first of which is a determination of the scope of development. As discussed in the Review Board's EIA Guidelines "[i]n order to conduct the environmental assessment, the Review Board must understand what is being proposed"<sup>4</sup>. If the Review Board has not first determined the scope of development, it would not be possible to carry out the other subsection 117(2) tasks, including: assessment of a project's impacts and their significance; consideration of comments from the public; and imposition of mitigation measures. Further, the Review Board could not, after undertaking the EA process, reasonably or logically make a determination of whether a development is likely to have a significant impact on the environment, if the scope of development that was the subject of the EA process is subsequently changed just before the final decision-making stage.

Second, acceptance of GNWT's recommended approach at this point in the proceeding would raise concerns of procedural fairness. As described in the EIA guidelines, "[t]he common law duty of procedural fairness applies to all decision-making by and proceedings of the Review Board"<sup>5</sup>. The scoping of a development is a preliminary procedural step. After the scope of development is set during scoping, the Review Board may take fair and reasonable steps to accommodate new information that comes to light during the assessment; for example, the Project changes described in the section above. However, serious concerns about procedural fairness would arise if the scope of the development was changed late in the EA process, especially just before or during the decision phase.

Finally, the developer's commitments concern a variety of topics that do not all relate to the Review Board's findings of significance. The Review Board's practice is to recommend measures where there are likely significant impacts, consistent with the decision-making framework set out in the MVRMA. Where commitments include mitigations that are clearly linked to the prevention of a significant adverse impact on the environment, the Review Board has incorporated and/or built on the commitment within its recommended measures. Beyond this, the Board encourages regulators to consider and require implementation of all relevant developer commitments through regulatory authorizations (e.g., licence and permit conditions) within their respective jurisdictions.

The procedural framework for EAs ensures that the Review Board can reach a fully informed decision on how, and if, a proposed project should proceed. When considering this process as a whole and in sequence, it is clear that making changes to the scope of

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<sup>4</sup> Review Board EIA Guidelines, *supra* 2, p. 27

<sup>5</sup> EIA Guidelines, *supra* 2, p. 53.

development after a hearing and during Review Board deliberations is inconsistent with the intent of the MVRMA and the Review Board's EIA Guidelines, and that such a change would raise both fairness issues and create procedural difficulties for the parties and the Review Board.

## 2.2 Scope of assessment

The scope of assessment defines which issues will be examined in the environmental assessment. The scope of assessment for EA1415-01 includes all potential impacts from the Project on valued components of the biophysical and human environment.

The key lines of inquiry<sup>6</sup>, subjects of note<sup>7</sup>, and other important scope of assessment considerations for this EA were identified in the *Terms of Reference* and are described below.

### 2.2.1 Key Lines of Inquiry and Subjects of Note

The Review Board identified the following key lines of inquiry and subjects of note to investigate in the EA:

#### ***Key Lines of Inquiry***

- Impacts on traditional harvesting and traditionally harvested species
- Effects of potential accidents and malfunctions
- Impacts on Nahanni National Park Reserve

#### ***Subjects of note***

- Terrain, soils, permafrost, and karst topography
- Granular materials
- Air quality
- Noise

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<sup>6</sup> Key lines of inquiry are areas of concern that have been identified as requiring the most attention during the environmental assessment. Key lines of inquiry may involve impacts on multiple valued components.

<sup>7</sup> Subjects of note are issues of significant concern, but do not require the same level of attention as the key lines of inquiry.

- Water quality and quantity
- Species at risk
- Fish and aquatic habitat
- Wildlife and wildlife habitat
- Vegetation
- Cultural and heritage resources
- Employment and benefits to the community
- Impacts on existing transportation infrastructure

The subsequent chapters of this report discuss the predictions and analysis of significant impacts and their likelihood in relation to the key lines of inquiry and subjects of note. Not all key lines of inquiry and subjects of note are discussed individually (for example, “Impacts on Nahanni National Park Reserve” are incorporated into all chapters and discussed throughout the report, rather than in a separate, stand-alone chapter). The Report of EA focuses on the topics of most discussion during the EA and the Review Boards’ conclusions and findings of significance, including recommended measures and suggestions.

Treatment of the “effects of potential accidents and malfunctions” key line of inquiry is explained below under “Accidents and malfunctions”.

### **2.2.2 Other scope of assessment and statutory considerations**

In addition to key lines of inquiry and subjects of note, there are several other important scope of assessment considerations, including statutory requirements.

#### ***Well-being and way of life of Aboriginal peoples***

In accordance with Section 115 of the *Mackenzie Valley Resource Management Act*, the EA process shall have regard to: the protection of the environment and social, cultural and economic well-being of residents and communities in the Mackenzie Valley; and, “the importance of conservation to the well-being and way of life of [A]boriginal peoples of Canada to whom Section 35 of the *Constitution Act, 1982* applies and who use an area of the Mackenzie Valley.”

As described throughout this Report of EA, the Project area is important to and used by Aboriginal people. Throughout the EA process and its deliberations, the Review Board has therefore given due consideration not only to impacts on the environment, but to impacts on Aboriginal rights (such as harvesting), well-being, and way of life. For example, Chapter

7 focuses on traditional harvesting, which was a key line of inquiry in this EA and has linkages to wildlife (Chapter 6), and access (Chapter 5). The importance and traditional use of the area is also discussed in Chapter 10 (Culture and Heritage) and, briefly, in Chapter 4 (The precautionary approach and adaptive management).

### ***Traditional Knowledge***

The Review Board pays special attention to how Traditional Knowledge was incorporated into Project design, the establishment of comprehensive baseline information and the assessment of Project impacts. In accordance with the requirements of Section 115.1 of the Act, the Review Board considered all Traditional Knowledge that parties shared during the EA, including the TK Addendum Report prepared for the Nahanni Butte Dene Band by Crosscurrents Associates Ltd during EA0809-002 in 2009 (PR#18). Consideration of available Traditional Knowledge informed the Review Board's decisions and is required in several measures.

### ***Decisions on significance***

Section 128 of the Act requires that the Review Board decide, based on all of the evidence on the public record, whether the proposed development is likely to have a significant adverse impact on the environment or be a cause of significant public concern. The *Terms of Reference* (PR#42) outlined how the developer was to predict and rate the overall significance of potential impacts in the DAR, and the Review Board asked parties to provide their own views of the predicted impacts and their significance. Parties provided this information through information requests, technical reports, and closing arguments. After considering all of the evidence on the public record, the Review Board made its final determination on the significance of impacts, as described in this Report of EA.

### ***Consideration of previous assessment activities***

In accordance with subsection 115(2) of the MVRMA, the Review Board must consider previous environmental assessments conducted under Part 5, namely EA0809-002. Because EA0809-002 only assessed winter use<sup>8</sup> of the entire access road, the scope of

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<sup>8</sup> EA0809-002 assessed a winter road from the mine and stated that use beyond "the winter road operating season could have significant adverse impacts".

assessment for EA1415-01 includes consideration of all potential impacts that may result from construction and use of the All Season Road, including from the mine to km 37.4.

### **Cumulative impacts**

In accordance with subsection 117(2)<sup>9</sup> of the Act, the Review Board must consider any potential impacts related to cumulative impacts. Cumulative impacts are the combined effects of the development in combination with other past, present, or reasonably foreseeable future developments and human activities. CanZinc analyzed potential cumulative impacts on the relevant valued components in the DAR and DAR Addendum. The Review Board's own analysis and conclusions of cumulative impacts is described in Chapter 13.

The Review Board has not assessed the combined impacts that may occur if CanZinc's Permitted Winter Road and the proposed All Season Road were to both be constructed and used. With the exception of the two sections (upper Sundog and Fishtrap creeks) of the Permitted Winter Road that CanZinc proposes to construct to support All Season Road construction (see Section 1.3.2), the Review Board understands that CanZinc intends to construct a winter road along the All Season Road alignment, not the Permitted Winter Road Alignment.

### **Accidents and malfunctions**

In accordance with subsection 117(2)<sup>10</sup> of the Act, the Review Board must consider any potential impacts related to accidents and malfunctions. The *Terms of Reference* required the developer to assess the impacts of potential accidents and malfunctions as a key line of inquiry (PR#42 p35).<sup>11</sup> Specifically, the *Terms of Reference* required the developer to:

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<sup>9</sup> 117(2) Every environmental assessment and environmental impact review of a proposal for a development shall include a consideration of (a) the impact of the development on the environment, including the impact of malfunctions or accidents that may occur in connection with the development and any cumulative impact that is likely to result from the development in combination with other developments [...]

<sup>10</sup> 117(2) Every environmental assessment and environmental impact review of a proposal for a development shall include a consideration of (a) the impact of the development on the environment, including the impact of malfunctions or accidents that may occur in connection with the development and any cumulative impact that is likely to result from the development in combination with other developments [...]

<sup>11</sup> And also to evaluate potential accidents and malfunctions, by project phase, from: explosions; the transportation, storage, manufacture and use of explosives; and fires

- conduct a risk assessment using best practices for the Project including components, systems, hazards, and failure modes;
- describe the likelihood and severity of each risk identified;
- describe all contingency plans for accidents, malfunctions, or unforeseen impacts of the environment on the development and of the development on the environment; and,
- describe all emergency response plans that will be in place.

CanZinc provided a risk assessment of accidents and malfunctions in the DAR and a revised risk assessment in the DAR Addendum. In its *Reasons for Decision on the Adequacy of the DAR* (PR#112), the Review Board concluded that the developer's risk assessment methodology and approach was not adequate, and therefore retained a third party risk assessor to complete an independent risk assessment for the Project (PR#324).

In this Report of EA, discussion related to accidents and malfunctions focuses on potential impacts on the environment (including people). Consideration of impacts on the whole environment (including people and their well-being) is a fundamental part of the Review Board's mandate under the MVRMA. With regard to human safety (i.e., prevention of injury or death from traffic accidents), the Board notes that:

- Traffic accidents and associated impacts on people are a standard and necessary consideration for the design and operation of any road.
- Throughout the EA, the developer and parties acknowledged and discussed the importance of human safety in relation to design and operation of the road.
- The likelihood of non-mine traffic (i.e., people not employed by CanZinc) using the road became more apparent over the course of the EA, as CanZinc's intentions and feasible options for controlling or limiting access along the road were discussed.

The developer, parties, and the Review Board also recognized that, in order to maximize safety and minimize accidents on a road proposed to be built in the complex terrain of the Project area, road design and operation is an especially critical part of the Project.

The Review Board's analysis and conclusions related to impacts on people from accidents and malfunctions are presented in Chapter 5: Human Safety. Other impacts on valued components of the environment from accidents and malfunctions (e.g., impacts on water from spills caused by accidents) are discussed in the chapters dedicated to each valued component (e.g., Chapter 6: Wildlife, Chapter 8: Water).



### ***Effects of the environment on the Project***

The *Terms of Reference* required CanZinc to describe the potential effects of the physical environment on the development, including changes in the permafrost regime, climate change impacts, extreme weather and seismic events, subsidence and fires (PR#42 p34). The *Terms of Reference* also required an evaluation of the risks posed by these effects of the environment, and a description of any contingency and emergency response plans that will be in place.

In the DAR (PR#55) and DAR Appendix 2 (PR#129), the developer discussed these potential effects, as well as potential Project design or management changes to address them. The developer provided additional information related to effects from fires and climate change in the DAR Addendum (PR#100) and DAR Addendum Appendices A and E (PR#101; PR#102). The Review Board considered effects of the environment and the developer's predictions, in its analysis and conclusions; effects of the environment on the Project are discussed in the context of impacts on valued components that may be subsequently affected in the relevant sections of this report.

### ***Consideration of alternatives***

The Review Board's *Terms of Reference* required the developer to describe Project alternatives that could achieve the same objective as the proposed Project (i.e. reliable access to the Prairie Creek Mine). CanZinc conducted an alternatives analysis for three alternatives in the DAR that included technical feasibility, cost-benefit analysis, socio-economic impacts, and environmental impacts. CanZinc ranked the alternatives and explained why certain alternatives were rejected and why the proposed Project was selected. Upon request in the adequacy review, CanZinc submitted an analysis of two additional alternatives (including continuing with a winter road only) in the DAR Addendum (PR#100). The Review Board accepts the developer's conclusions regarding alternatives and its selection of the proposed Project as the preferred alternative.

### ***Temporal Scope***

Temporal scope refers to the temporal boundaries that the developer used to examine potential impacts of the Project on valued components. The *Terms of Reference* (PR#42) directed the developer to consider times during which Project activities are most intense, times when valued components are particularly sensitive to impacts (i.e. during migration or calving seasons) and the duration of impacts in its determination of temporal scope. For cumulative impacts, the temporal scope includes the period of the impacts of past, present



and reasonably foreseeable future projects that are predicted to combine with the impacts of the Project.

The specific temporal boundaries proposed by the developer for impact predictions can be found in the DAR and other relevant assessment materials. The Review Board considered the temporal scope of Project impacts in its analysis and conclusions.

### **Geographic scope**

Geographic scope refers to the spatial boundaries that the developer used to examine potential impacts of the Project on valued components. The *Terms of Reference* (PR#42) provided minimum geographic scopes of assessment for valued components, but also directed the developer to consider and rationalize actual geographic scopes that were appropriate for the characteristics of each valued component.

The specific geographic boundaries proposed by the developer for impact predictions can be found in the DAR and other relevant assessment materials. The Review Board considered the geographic scope of Project impacts in its analysis and conclusions.

### 3. Environmental assessment process

This Chapter describes the EA process for the Prairie Creek All Season Road Project (All Season Road or the Project). It provides information about participation in the EA and the process steps the Review Board took to identify any likely significant adverse impact on the environment or any aspects of the Project likely to cause significant public concern.

#### 3.1 Requirements of the Mackenzie Valley Resource Management Act

The Review Board conducted the EA for the All Season Road in accordance with Part 5 of the MVRMA and the Review Board's *Rules of Procedure for Environmental Assessment and Environmental Impact Review Proceedings* and *Environmental Impact Assessment Guidelines*.

In every EA, the Review Board must consider the proposed development's impact on the biophysical, socio-economic, and cultural environments (including consideration of evidence derived from Traditional Knowledge), and take the concerns of Aboriginal people and the public into account<sup>1</sup>. Moreover, under subsections 117(1) and 117(2) of the Act, the Review Board must determine the scope of the development and consider a number of other factors, including public input, in conducting the environmental assessment.

After considering all of the evidence on the public record, the Review Board must determine whether the Project is likely to cause a significant adverse impact on the environment or be a cause of significant public concern<sup>2</sup>. The Review Board must then, within 16 months of the Projects' referral, prepare a report of environmental assessment that includes their conclusions and recommendations<sup>3</sup>.

Once completed, the Review Board must provide the report to the federal Minister<sup>4</sup>, and provide copies of the report to the developer, preliminary screening and referral organization(s). After consideration of the report, the Minister<sup>5</sup> must decide among several alternatives, including: ordering an environmental impact review; or accepting the report's

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<sup>1</sup> Sections 114, 115, and 115.1

<sup>2</sup> Subsection 128(1)

<sup>3</sup> Subsections 128(2) and 128(2.1)

<sup>4</sup> The federal Minister will distribute the report to every responsible minister (any territorial or federal minister having jurisdiction in relation to the development under federal or territorial law).

<sup>5</sup> And any responsible ministers, designated regulatory agencies or the Tlicho Government, if applicable.

recommendation along with any recommended measures. If the Minister decides to approve the Project subject to mitigation measures, the developer, government and regulatory authorities must ensure that all approved measures are carried out<sup>6</sup>.

### **3.2 Participation in the environmental assessment**

All ten organizations that applied were granted party status in this EA (PR#394; PR#497). The developer is automatically considered a party to the proceedings, according to the Review Board's *Rules of Procedure*. The other registered parties in the EA were:

- Canadian Parks and Wilderness Society NWT Chapter
- Dehcho First Nations (DFN)
- Department of Fisheries and Oceans (DFO)
- Environment and Climate Change Canada (ECCC)
- Government of the Northwest Territories (GNWT)
- Indigenous and Northern Affairs Canada (INAC)
- Liidlii Kué First Nation (LKFN)
- Nahanni Butte Dene Band (NBDB)
- Natural Resources Canada (NRCan)
- Parks Canada Agency (PCA)

Parties had the opportunity to participate throughout the EA process, though some parties did not actively participate in all stages of the EA. Table 3-1 below illustrates the involvement of parties throughout the phases of the EA, including submission of technical reports and participation at public hearings. During the EA process, other interested groups and individuals had the opportunity to submit comments to the Review Board or participate in the proceedings (e.g., public hearings) as members of the public.

### **3.3 Phases of environmental assessment**

After referral and initial EA start-up activities, the Review Board carried out the EA in four major phases: a scoping phase, an analytical phase, a hearing phase, and a decision phase. The following sections outline the process steps and milestones throughout the major EA phases.

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<sup>6</sup> Section 62 and subsection 130(5)

**Table 3-1: Participation by parties in the environmental assessment**

Party	Information requests, technical sessions (Yellowknife)	Submitted Technical Report	Public Hearing (presentation and questioning)	Submitted Closing Arguments
Canadian Parks and Wilderness Society NWT Chapter	✓			
Dehcho First Nations	✓	✓	✓	✓
Environment and Climate Change Canada	✓	✓	✓	✓
Fisheries and Oceans Canada	✓	✓	✓	✓
Government of the Northwest Territories	✓	✓	✓	✓
Indigenous and Northern Affairs Canada		✓	✓	✓
Liidlii Kué First Nation	✓		✓	✓
Nahanni Butte Dene Band		✓	✓	✓
Natural Resources Canada	✓	✓	✓	✓
Parks Canada Agency	✓	✓	✓	✓

**Scoping phase**

Immediately upon referral to environmental assessment, the Review Board provided the developer with a guidance document for preparing draft *Terms of Reference*. CanZinc submitted its draft *Developer's Proposed Terms of Reference* on June 4<sup>th</sup>, 2014 (PR#6). During the public review period of the developer's draft *Terms of Reference*, the Review

Board held community scoping sessions in Nahanni Butte, Fort Liard and Fort Simpson, followed by a technical issues scoping session in Yellowknife before releasing its own *Draft Terms of Reference* for the All Season Road and airstrip on July 31, 2014 (PR#35).

The Review Board requested comments from parties on its draft and, after considering them, issued its final *Terms of Reference* (ToR) for the All Season Road and Airstrip in September 2014 (PR#42). Following the release of the ToR, the Review Board issued *Reasons for decision on the scope of the environmental assessment* (PR#44) to clarify the scope of development and scope of assessment for the environmental assessment<sup>7</sup>.

### **Analytical phase**

CanZinc submitted its *Developer's Assessment Report* (DAR) to the Review Board on April 23, 2015 (PR#55-57). Following the DAR submission, the Review Board conducted an *Adequacy Review* (PR#77) and required CanZinc to address several items. CanZinc responded to the adequacy review items from June and September 2015, and submitted a *DAR Addendum* (PR#100) and supporting documents (PR#93-97) on September 9<sup>th</sup> 2015. On December 21, 2015, the Review Board issued its *Reasons for decision on the adequacy of the Developer's Assessment Report* (PR#112), concluding that the DAR and CanZinc's DAR Addendum and supporting adequacy materials provided sufficient information for the Review Board and parties to continue with information requests. Four adequacy items that required more time to prepare were submitted in January and April 2016<sup>8</sup>.

In December 2015, the Review Board asked parties to provide written information requests outlining their questions and clarifications related to the DAR and adequacy review materials (including the DAR Addendum) by January 29, 2016. The Review Board extended the due date for information request submissions to February 12, after a series of letters from parties requesting extensions. The deadline for CanZinc's responses to information requests was similarly extended to March 11, 2015<sup>9</sup>.

From June 13–16, 2016, Review Board staff hosted technical sessions in Yellowknife for parties to seek clarification on information request responses and discuss outstanding

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<sup>7</sup> For more information on the scope of the environmental assessment, see Chapter 2.

<sup>8</sup> A fifth adequacy item was resolved to be completed by an independent, third party risk assessor (see Chapter 5)

<sup>9</sup> Due to initial concerns related to some of the information requests, the developer did not submit a complete, formal response to the IR's until May 9, 2016. See PR#188 for a compiled list of the developer's responses to these information requests.

issues face-to-face with CanZinc's representatives and consultants. Following the technical sessions in Yellowknife, the Review Board held Cultural Impact Technical Sessions in Nahanni Butte and Fort Simpson to discuss cultural issues and Traditional Knowledge.

In August 2016, the Review Board asked parties to provide written information requests outlining their questions and clarifications on remaining issues by September 23, 2016. The Review Board extended the due date for information requests related to a technical session undertaking submitted by the developer on September 6, 2016, to October 7, 2016.

### **Hearing phase**

In February 2017, the Review Board advised parties to provide their technical reports (interventions) by March 10, 2017 (PR#412) and hosted a technical report preparation meeting on February 17. For a full list of parties' technical reports including document links, see PR#467.

The Review Board invited parties and hosted a pre-hearing conference on April 10, 2017. The main purpose was to discuss the hearing protocol, describe the difference between technical and community hearings, and to set the hearing agendas.

In April 2017, the Review Board held the following technical and community hearings:

- April 24, community hearing in Nahanni Butte
- April 25, community hearing in Fort Simpson
- April 26-28, technical hearings in Fort Simpson

The Review Board provided public notice (radio, posters, newspapers, and webpage announcements) in advance of the hearings. The main purpose of the hearings was to allow the developer and parties the opportunity to present their views directly to members of the Review Board. It also gave community members and the public an opportunity to hear and discuss issues and concerns related to the Project.

At the technical hearings, the developer and parties that submitted technical reports presented their impact predictions and recommendations (including suggested mitigation measures) to the Review Board. Parties that presented also had the opportunity to question the developer and other parties about their presentations and technical reports.

During the hearings, parties and the Review Board requested additional information in the form of undertakings from the developer and other parties. CanZinc, ECCC, DFO, and GNWT

prepared responses to these undertakings and submitted them to the Review Board on May 10, 2017 (PR#538-540).

The Review Board received final closing arguments from parties on May 26, 2017 and from the developer on June 5, 2017. In their closing arguments, parties and the developer had the opportunity to update their recommendations to the Board, based on discussions at the hearings or the contents of the undertaking responses. The Review Board closed the public record<sup>10</sup> on June 6, 2017.

### ***Decision phase***

After closing the public record, the Review Board considered the evidence to arrive at its decision. Sections 5–16 of this report describe the Review Board’s analysis of the key issues, and present its conclusions including any measures required to address impacts that may result from the Project. The Review Board has prepared this report, and the recommendations contained herein, for submission to the Minister of Indigenous and Northern Affairs Canada, in accordance with Section 128 of the Act.

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<sup>10</sup>The public record refers to the portion of the public registry that the Review Board relies on when reaching its decision. It contains all of the evidence and submissions from parties and the public received by the Review Board up until the end of closing arguments.

## 4. The precautionary approach and adaptive management

Given concerns expressed by the parties over uncertainty in the developer's impact predictions and a lack of confidence in the implementation and effectiveness of mitigation measures, the Review Board considered whether to undertake further review of the Project by way of an environmental impact review. Instead, the Board applied a precautionary approach and, where supported by the evidence on the public record, concluded that significant adverse impacts from the Project are likely and that additional mitigation is needed.

Ultimately, the Review Board concluded that significant adverse impacts can be avoided through appropriate measures, including: specific mitigations (many of which build on developer's commitments and existing mitigations) and adaptive management.

This chapter sets out the Review Board's approach to dealing with the lack of certainty and potential for serious harm resulting from the review of the evidence on the record in this EA. Section 4.1 discusses the Board's application of a precautionary approach in its decision-making, and Section 4.2 describes the need for adaptive management, which is central to the Board's mitigation strategy.

### 4.1 Precautionary approach

In previous EAs<sup>1</sup>, the Review Board has applied a precautionary approach<sup>2</sup> where warranted. The Board may apply the precautionary approach when:

- 1) a lack of information causes a level of uncertainty that is unacceptable, in the Board's view; and,
- 2) there is potential for serious environmental harm.

When the Review Board finds that both of these conditions exist, the Board will act to prevent serious harm by applying an appropriate level of precaution in its decision-making.

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<sup>1</sup> See EA1011-001, EA0809-001, and EA0607-003.

<sup>2</sup> based on the Supreme Court of Canada decision *114957 Spraytech v. Hudson (2001)*, numerous international agreements (such as Principle 15 of the United Nations *Rio Declaration on Environment and Development [1992]*) and widely accepted best practices in environmental management (such as described in the *Wingspread Statement on the Precautionary Principle [1998]*)



Given concerns expressed by the parties over uncertainty in CanZinc's impact predictions and a lack of confidence in the implementation and effectiveness of mitigation measures, combined with the potential for serious harm, the Review Board has decided to apply the precautionary approach where appropriate based on the facts of each issue before the Board<sup>3</sup>.

#### **4.1.1 Lack of certainty**

The EA process relies on predictions that help the Review Board understand how a proposed development will affect the environment and that inform the Board's determination of whether significant adverse impacts are likely. In the Review Board's opinion, the level of uncertainty regarding predicted impacts is particularly high in this EA. This uncertainty is in large part due to a general lack of project-related information, including baseline data, Project design and impact predictions, as well as proposed mitigations (including developer commitments).

##### ***Burden of proof***

As stated in the Board's Rules of Procedure, "any party seeking to convince the Review Board of any point or position in a proceeding bears the burden of proof in so doing and has the responsibility to introduce information or evidence to support their position"<sup>4</sup>. While the actual burden of proof can shift during an EA, issue by issue, depending on whether the developer or a party is attempting to convince the Review Board of a position, to a large extent the obligation to identify and evaluate the environmental impacts of a proposed development rests with the developer. The developer that proposes activities that have the potential to cause impacts on the environment must meet the burden of proof to persuade the Review Board that either: significant impacts can be avoided; or, that they can be satisfactorily mitigated.

A developer's efforts to collect baseline data, predict impacts, and propose mitigations related to matters set out in the *Terms of Reference* should be undertaken with this in mind, and in particular when considering the key lines of inquiry and subjects of note as determined by the Review Board. A developer's analyses and conclusions about predicted

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<sup>3</sup> In some cases this has resulted in the imposition of additional mitigation measures, many of which build on the developer's commitments and existing mitigations.

<sup>4</sup> MVEIRB *Rules of Procedure for Environmental Assessment and Environmental Impact Review Proceedings*, May 1, 2005, Rule 17 on p.4.

impacts, proposed mitigations, and the significance of impacts, as well as plans for monitoring and adaptive management, can all contribute to satisfying its burden of proof.

If the Review Board, under s.128 of the Act, is of the opinion that the work done by the developer does not satisfy the burden of proof on a particular issue, the Board may, after considering all the evidence available, conclude that a significant adverse impact is likely to occur<sup>5</sup>. In such instances the Review Board must, under paragraph 128(1)(b), decide that either measures are required to prevent such impacts, or that an environmental impact review is required. Other parties in an environmental impact assessment attempting to prove that significant adverse impacts are likely or that additional mitigation is required bear their own burden of proof when trying to convince the Review Board of their positions.

#### ***Lack of baseline data and other project-related information***

During this EA, there were several instances where a lack of sufficient baseline information has, in the Board's view, unduly constrained parties' abilities to thoroughly evaluate the developer's impact predictions. For example, Parks Canada Agency notes a general inadequacy of baseline information necessary to evaluate impacts in the context of a national park (PR#452 p58), and cites specific instances of lack of information on recharge rates in water bodies to be used for water withdrawals, and baseline studies on birds, collared pika and vegetation (PR#546 p4). Similarly, LKFN cited a lack of baseline information on wildlife (especially caribou) (PR#550 p3), vegetation, water quality (TSS, turbidity), and fish and fish habitat (PR#550 pp3, 5). LKFN refuted the developer's impact predictions on boreal caribou, citing a lack of baseline information on caribou presence (PR#528 p32), which was also noted by the GNWT (PR#551 p7).

In general, potential impacts arise as a result of how Project activities interact with and affect the biophysical or socio-cultural environments. Without an adequate understanding of the biophysical environment in this EA, parties and the Review Board found it difficult to systematically evaluate the developer's impact predictions. Similarly, for the purposes of effects monitoring, a sound understanding of baseline conditions, including the range of natural variability, is important for determining whether project-related impacts are occurring. Baseline conditions also inform the development of the action levels that form

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<sup>5</sup> See subparagraph 128(1)(b)(ii).

part of an adaptive management framework to manage unforeseen impacts (see Appendix B).

In addition to baseline data, other project-related information that was not made available by the developer during this EA included details regarding 1) road design, 2) monitoring and management plans, and 3) proposed mitigations. For example, DFN cited a lack of information on potential impacts on fish and fish habitat from the Sundog Creek diversion (PR#459 p9). Similarly, Fisheries and Oceans Canada cited concerns about a lack of (proposed) mitigations related to fish and fish habitat from the diversion (PR#449 p8). In addition, DFN observed that there is inadequate information on impacts and mitigations from avalanches on road users and on the surrounding environment from potential concentrate spills (PR#549 pp2,6,8), and including how Project components (blasting) might affect their occurrence. Additionally, Parks Canada Agency (Parks Canada) concluded that there is insufficient information on Project design for the Sundog Creek diversion (PR#452 p31). Moreover, Parks Canada expressed concern that the developer has not described how changes in water quality due to the installation of crossing structures and during road construction and operations generally will be monitored (PR#452 p34).

#### ***Lack of confidence in the developer's impact predictions and proposed mitigations***

Partly as a result of the lack of information discussed above, parties indicated a lack of confidence in the developer's impact predictions and in the adequacy and/or effectiveness of proposed mitigations (including developer commitments). In its closing arguments, DFN argued that despite the developer's proposed mitigations to prevent impacts on boreal caribou in various Project documents and commitments, there is no coherent strategy apparent, and a lack of specific information on the proposed mitigations (PR#549 p24). Similarly, Parks Canada argued in its technical report that due to the inadequacy of the data used by the developer to predict Project impacts and develop mitigations, it was only reasonable to assume a worst case environmental impact, and thus recommended measures to gather additional information and develop additional mitigations (PR#452 p58). Section 9.2.3 provides another detailed example of uncertainty and lack of confidence, in relation to the Sundog Creek diversion channel.

#### ***Developer commitments***

In addition to concerns over lack of information and confidence in mitigations, many of the developer's commitments (many of which include important mitigations to reduce or avoid adverse impacts) are vaguely worded or ambiguous, and/or contain conditional or unclear language. For example, commitment #3 states that the developer will "consider" remote

camera use (PR#553); and the final (June 5, 2017 version) of commitment #147 appeared to backtrack by adding the qualifier “as necessary” to an April 7<sup>th</sup> commitment which originally said a rare plant management plan “will be” developed. Several other examples are discussed in the subsequent chapters of this REA.

Because of this, parties expressed concern that many of the formal commitments made by the developer in this EA (see Appendix C) may either not be effective, or not be implemented at all. Such commitments do not give the Board confidence that the developer will effectively mitigate Project impacts as intended. For this reason, the Board concludes that there is an unacceptable level of uncertainty about whether Project mitigations and commitments will be fully implemented or adequate to protect the environment.

### **Conclusion**

Due to the lack of information and parties’ lack of confidence in the developer’s impact predictions and in the adequacy and/or effectiveness of proposed mitigations, the Review Board concludes in a number of instances that the developer has not satisfied its burden of proof. In these cases, CanZinc has not convinced the Review Board that impacts will be effectively mitigated and, in some cases, has not even provided impact predictions that have a solid evidentiary basis.

#### **4.1.2 Potential for serious harm**

In determining the significance of impacts, the Board considers not only the activity causing the impact but also the context or setting of the impact, and by extension, the values that a particular place holds for society and for the people who use the area. In other words, certain areas are so highly-valued that any impacts would be considered unacceptable. In this case, the area of the proposed development includes a National Park Reserve, an area upstream of a World Heritage Site, an area of cultural and spiritual importance that is used for traditional harvesting by local First Nations, habitat for species at risk, and a glacial refugium.

### **Cultural and spiritual importance**

Throughout this and previous CanZinc EAs<sup>6</sup>, Aboriginal parties such as the Nahanni Butte Dene Band, DFN, and LKFN, have emphasized that they have and continue to use the proposed Project area for traditional harvesting (PR#55 p126; PR#276 p9; PR#232 p280; PR#459 p26). Other Aboriginal parties have also indicated that it is a spiritually important place for them. At the Fort Simpson public hearing, Dehcho First Nations Grand Chief Herb Norwegian stated that: “on the project itself... the mountains have been something that have been very sacred to us... When we go to the mountains, it's a pilgrimage. It's a place of prayer...” (PR#528 pp225-226).

### **Nahanni National Park Reserve**

Eighty-four kilometers of the proposed development is in Nahanni National Park Reserve. National park reserves share the same purposes as national parks: they are intended to offer unique and ecologically-representative places the highest level of protection under Canadian law. The societal values behind this protection are reflected in subparagraph 8(2) of the Canada *National Parks Act*, which states “Maintenance or restoration of ecological integrity, through the protection of natural resources and process, shall be the first priority of the Minister when considering all aspects of the management of parks”. The Review Board recognizes that, for ecological impacts, a high standard of care is warranted in a National Park Reserve. Further, due to the Project’s setting within the NNPR, and the primary objective of national parks to protect natural areas so that they remain unimpaired for future generations, there is a duty to ensure that impacts on the NNPR are avoided.

### **Species at Risk**

Similarly, the Review Board is legally required by Section 79 of the *Species at Risk Act* to address impacts on species at risk in a way that goes beyond the standard best practices in environmental assessment, which seek to mitigate significant impacts on wildlife populations and habitats. For species at risk, the existence of entire species could be adversely affected by the survival of a small number of individuals or an area of critical habitat. These are among Canada’s most vulnerable species. In such cases, a cautious approach is essential. The Board also notes that the preamble to the *Species at Risk Act* states that “if there are threats of serious or irreversible damage to a wildlife species, cost-

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<sup>6</sup> See EA0809-002, EA0405-002, EA01-002, EA01-003, and EA00-002.

effective measures to prevent the reduction or loss of the species should not be postponed for a lack of full scientific certainty”. This precautionary approach with species at risk has been applied in other recent environment impact reviews<sup>7</sup>.

### **Glacial refugium**

Approximately one third of the road is located in a glacial refugium (within the Park), an area that remained free of ice during the last ice age. Many plant species in glacial refugia survived the last ice age, unlike in most other areas of the NWT. Some of those species are thought to exist nowhere else in the world. In the Board’s opinion, an additional degree of caution regarding potential impacts on rare plant species is appropriate in this area.

### **World Heritage Site**

The first 17 km of the proposed road is excluded from the park, but is upstream of the area within the original 1976 boundary of the Nahanni National Park Reserve, a World Heritage Site under the United Nations Educational, Scientific and Cultural Organization. The World Heritage Convention, which Canada accepted in 1976, states that the “deterioration... of any item of the... natural heritage constitutes a harmful impoverishment of the heritage of all the nations of the world”. As such, an additional degree of caution is appropriate when considering the significance of potential impacts on water quality in this area.

#### **4.1.3 The Review Board’s precautionary approach in this EA**

In light of the lack of certainty and potential for serious harm outlined above, including the evidence from parties referenced above, the Review Board has applied a precautionary approach in its reasoned consideration of the evidence. The Review Board observes that a precautionary approach aligns closely with Aboriginal values in such circumstances.

Notwithstanding the overarching concerns related to lack of certainty and potential for serious harm set out above, the specific evidence, analysis, and conclusions related to each

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<sup>7</sup> In *Shell Canada Energy, Re*, 2013 ABAER 11 at para 819, the Panel reviewed the impacts on federally listed species from the proposed Jackpine Mine expansion. The Panel found that the obligation to avoid or lessen effects, and to monitor, applies as long as there is any net harm to species at risk arising from the project as proposed. In the words of the Panel, “the obligation to identify and mitigate adverse effects on listed wildlife species is independent of the likely significance of the adverse effects.” Thus even if residual effects on such species are not significant after mitigation, further mitigation and monitoring may be required.

subject of note are set out in the subsequent chapters of this Report of EA. As explained above, however, where appropriate, the Review Board has applied a precautionary approach to its decision making. This means that the Review Board has not let its hands be tied by a lack of certainty about impact predictions. Where the risk of serious harm to the environment is clear from the evidence, the Review Board has concluded, in spite of the uncertainty, that, in its opinion in accordance with subsection 128(b)(ii), significant adverse impacts are likely. Throughout this document, the circumstances in which the Board has applied a precautionary approach will be specifically identified.

The potential for serious harm was also a consideration in the Review Board's significance thresholds. As described above, biophysical and socio-cultural context plays a role in the Review Board's significance determinations, as does the consideration of societal values. In this case, the Review Board's threshold of significance varied depending on factors such as the status of the species the Board was dealing with and the setting of the impact.

For subjects such as species at risk and for ecological impacts in a National Park Reserve, the Board concluded that it is appropriate to apply a lower threshold of significance when making its significance determinations. In the Board's opinion, the seriousness of potential harm for these impacts is greater than it would be for species that are not at risk, or in most settings outside of protected areas.

## **4.2 Adaptive management**

As described above, the precautionary approach has contributed to the Board's conclusion that, in spite of all the uncertainty and issues outlined above, the Project can proceed to the regulatory phase, but only with additional mitigation measures to reliably protect the environment from significant adverse impacts. Some of the resulting measures build on a good start made by CanZinc with its commitments and proposed mitigations while some require additional mitigations. Adaptive management, as well as the monitoring and reporting needed to support it, is a key component of many of these measures and the Board's overall mitigation strategy in this Report of EA.

The Review Board has decided that adaptive management is necessary due to the lack of certainty described above, and due to the concerns parties raised about the implementation and effectiveness of the developer's proposed commitments and mitigations, and considering the overarching challenges described above. The Review Board agrees with GNWT and other parties (PR#551, p6, PR#549 p23, PR#546 p4-9) that robust and systematic monitoring and adaptive management is required to test impact predictions, monitor impacts on the environment, and adjust mitigations to protect the



environment if unforeseen circumstances arise or if the impacts differ from those predicted in the EA.

Adaptive management, is not sufficient, on its own, to mitigate significant adverse impacts on the environment. The Review Board's approach is to use adaptive management to support the specific mitigation measures committed to by the developer and those required in the measures in this REA, by monitoring and adapting to: (1) ensure mitigations are effective; and (2) to protect the environment in unforeseen circumstances.

From previous experience, the Review Board's view is that for adaptive management to be effective, it needs: 1) a systematic framework of action levels or thresholds within a monitoring program (that identifies when to act); 2) proposed mitigation options, policies, and practices linked to the action levels (which describe what actions to take); and 3) a reporting mechanism to update monitoring programs, mitigations, and the adaptive management framework itself. Planning for adaptive management allows flexibility that can lead to more effective monitoring programs and improved mitigation. Directly linking adaptive management frameworks to regulatory tools provides certainty that timely and meaningful actions will be taken to adjust mitigations and protect the environment.

The Review Board recognizes that the developer's approach to adaptive management may vary in relation to its specific impact predictions and in each of the applicable management and monitoring plans and programs. The Review Board acknowledges that CanZinc has, for example, included adaptive management in its draft Wildlife Mitigation and Monitoring Plan (PR#297) and has further committed to an adaptive management approach in some of their other proposed plans (e.g., PR#553, Commitments #224 and #240). However, the developer has not proposed an approach that will link monitoring results to adaptive actions in a systematic way that would satisfy the requirements for effective adaptive management outlined in the paragraph above.

For these reasons, the Review Board has included requirements for adaptive management frameworks to be developed and implemented as part of several of the recommended measures in this REA<sup>8</sup>. In the Review Board's view, the adaptive management frameworks, in addition to the mitigations proposed by the developer and additional mitigations

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<sup>8</sup> An explanation of why adaptive management is needed and appropriate for a particular issue is provided in each chapter leading up to a measure that includes an adaptive management requirement.

required in the recommended measures, are necessary and should be sufficient to prevent adverse impacts that would otherwise be significant.

Building on the developer's commitments, the adaptive management frameworks required by the Review Board are intended to provide a systematic process for responding to changes observed in the environment, through monitoring programs, and adjusting mitigation actions. As changes are observed, increasingly urgent and substantial management actions will be taken to protect the environment and prevent significant adverse impacts. The approach leaves some flexibility available to the developer (and regulators) to fit the facts to the problem that needs to be managed, while ensuring the environment is adequately protected.

Where it is relied upon as part of the mitigation strategy required by the Review Board, the need for and contribution of adaptive management to the prevention of significant adverse impacts is discussed in Chapters 5-16 of this REA. Where applicable, adaptive management frameworks are specifically required as part of the Review Board's recommended measures in these chapters. The structure and essential parts of an adaptive management framework are set out in Appendix B. The follow-up monitoring and reporting, including Aboriginal monitoring initiatives, that is necessary to evaluate the effectiveness of mitigation measures and support adaptive management is discussed in Chapter 15.

## 5. Human safety

### *Summary of Review Board findings*

As described in the scope of assessment (Section 2.2.2), accidents and malfunctions was a key line of inquiry in this EA, and is part of the Review Board's consideration of impacts on people and the environment. This chapter discusses the likelihood of and contributing factors to accidents and malfunctions, which have implications for people (i.e., human safety, discussed in detail in this chapter) and the environment (e.g., spills affecting water and collisions affecting wildlife, discussed in Chapters 6 and 8).

Having considered all the evidence and submissions on the public record, the Review Board finds that the Project is likely to result in significant adverse impacts on people and the environment due to accidents and malfunctions. The following summarizes the Board's analysis and conclusions related to accidents and malfunctions:

- the Review Board is concerned that the road is not designed to a standard that is appropriate for the complex terrain and the amount and type of traffic that will be on the road (including two-way traffic and non-mine traffic), which will result in increased likelihood of accidents;
- limited geohazard field investigations increase the uncertainty regarding the developer's predictions related to impacts on the road and traffic, and the adequacy of mitigations to avoid these impacts and any associated accidents; and
- the remote location of the road and the length of time to respond to accidents may increase the severity of impacts from accidents and malfunctions.

In the Review Board's view, any impact on people as a result of traffic accidents would be significant, and must be prevented to the greatest extent possible. The Board's analysis and conclusions in relation to human safety (e.g., impacts on people) are presented in this chapter. Impacts on the environment (other than people) from accidents may also be significant, depending on the location and nature of the accident (e.g., spill); the Review Board's analysis and conclusions in relation to these impacts are presented in subsequent chapters of this report (e.g., Chapter 8: Water).

The Review Board concludes that measures requiring an independent technical review panel and Traffic Control Mitigation and Management Plan are necessary to prevent significant adverse impacts on people and the environment.

## **Organization of this chapter**

In order to fully explain the evidence, uncertainties, and concerns on the record related to accidents and malfunctions, and the implications for human safety and impacts on people, the Review Board has decided to include a detailed summary of relevant evidence on the record in Section 5.1. This level of detail is necessary because these uncertainties present a particular challenge to impact predictions and decision making<sup>1</sup>, and are a relevant part of the Review Board's consideration of the evidence in this chapter and for other chapters in this report.

In Section 5.2, the Review Board presents its analysis and conclusions in relation to impacts on human safety from accidents and malfunctions. The Board's analysis and conclusions in relation to impacts on the environment (particularly wildlife and water) from the Project, including accidents and malfunctions, are discussed in greater detail in other chapters of this report.

The Review Board's recommended mitigation measures and suggestions are outlined in Section 5.3.

### **5.1 Evidence from the parties and the developer**

The sections below are organized around topics of major discussion by parties and the developer during the EA, in relation to accidents and malfunctions: geohazards, road design and safety, risk assessments, and non-mine traffic.

#### **5.1.1 Impacts from Geohazards**

##### ***Terrain instability***

CanZinc explained in its DAR that the Project could disturb existing slope instabilities or create new instabilities (PR#55 p232). In Appendix 2 of its DAR, CanZinc stated that existing instabilities (for example, see Figure 5-1) could affect the road or stream crossings through rock slides, rock falls, debris slides, slumps, and high flows (PR#129 p67). CanZinc indicated that managing natural drainage patterns<sup>2</sup> will be important for terrain stability

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<sup>1</sup> See Chapter 4 for further discussion.

<sup>2</sup> See Chapter 8 (Water quality and quantity) for more discussion related to drainage.

(PR#129 p75). In Appendix F of its DAR addendum, CanZinc mapped three areas of high-risk terrain instabilities, including km 48.8 to 51 (west end of Polje reroute), km 53.7 to 59.9 (east end of Polje reroute), and km 115 to 116.5 (east of the silent hills) (PR#99 p3).



**Figure 5-1: Permitted Winter Road around KP 23<sup>3</sup>**

CanZinc stated that, to the extent possible, the road alignment avoids terrain instabilities (PR#129 p75). In its DAR, the developer predicted that there would be no cumulative impacts on terrain stability from the Permitted Winter Road and All Season Road because the Project largely follows the winter road alignment (PR#55 p206).<sup>4</sup> CanZinc concluded that the design and construction of the road will require particular care to avoid settlement issues and instabilities similar to those along Northwest Territories highways 3 and 7

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<sup>3</sup> MV2003F0028 – CZN - Inspection report for September 12, 2016 - GNWT Lands – Dec1-16. P16. This section of the Project has been realigned to the other side of the valley.

<sup>4</sup> See sections 1.2.3 and 2.2.2 regarding the relationship between the Permitted Winter Road alignment and the proposed All Season Road alignment, as well as potential implications for cumulative impacts.



(PR#55 p233). CanZinc also discussed the past occurrence of earthquakes in the area and the possible implications of and responses to an earthquake during the life of the Project.<sup>5</sup>

CanZinc acknowledged in Appendix 2 of its DAR that it is not possible to completely eliminate terrain hazards, but stated that it expects its proposed mitigations to reduce problems (PR#129 p76). CanZinc concluded that administrative controls such as signs, procedures and training, inspection and maintenance schedules, and notification and reporting procedures will assist in addressing residual impacts (PR#129 p76). In addition, for high risk areas of terrain instability, CanZinc proposed monthly visual inspections to establish baseline conditions, followed by inspections prior to freshet and monthly during thaw season (PR#129 p76). CanZinc also stated that inspections will occur within 24 hours of major rainfall events, high spring thaw events, seismic events, and prior to mine traffic travelling the road.

In response to a Review Board IR about mitigation related to geohazard risks, CanZinc commented that its first approach to mitigation is avoidance, and the second will be site-specific review during detailed design (PR#200 p1 ). Similarly, in response to an IR from DFN, CanZinc stated that slope and ground stability issues were largely addressed during the terrain assessment and ground-truthing of the route, and that further mitigation would be added during detailed design (PR#200 p1 ). In response to a Review Board IR CanZinc also described potential mitigation related to permafrost thaw, at crossings and along the road, which has the potential to affect terrain stability and the road itself (PR#200 p4; PR#188 PDF p97)<sup>6</sup>.

In response to a technical session question about landslide risks, CanZinc stated that these events are infrequent and are not a high risk to the road, to traffic, or to vehicle occupants (PR#240 p60). However, CanZinc did mention the potential for administrative controls in areas with high potential for rock falls, such as rules about stopping in rock fall zones. At the technical sessions, CanZinc made commitments to complete a more in-depth terrain stability assessment, focusing on unstable areas, and to consider avalanche and earthquake

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<sup>5</sup> CanZinc indicated that there have been 12 earthquakes of magnitude 4.0 (range 4.0-4.7) or higher within 200 kilometres of the mine in the past 10 years, and 3 magnitude 6.0 (range 6.0-6.9) or higher earthquakes within 200 kilometres of the mine since 1985 (return period 10.6 years) (PR#264 p70; PR#262 p71; PR#282 p104). Discussion around earthquakes during the EA centred on risks to drivers and infrastructure and led to two undertakings (#42 and #43) from the technical sessions (PR#250). If an earthquake happened, CanZinc would use radio communication to talk with drivers and an inspector may go out to inspect the road.

<sup>6</sup> See Chapter 12 for detailed discussion regarding permafrost thaw and associated impacts.

risks to permanent infrastructure (PR#355 p14). CanZinc indicated that additional investigation of terrain stability and monitoring details would be completed during detailed design (PR#320 p5).

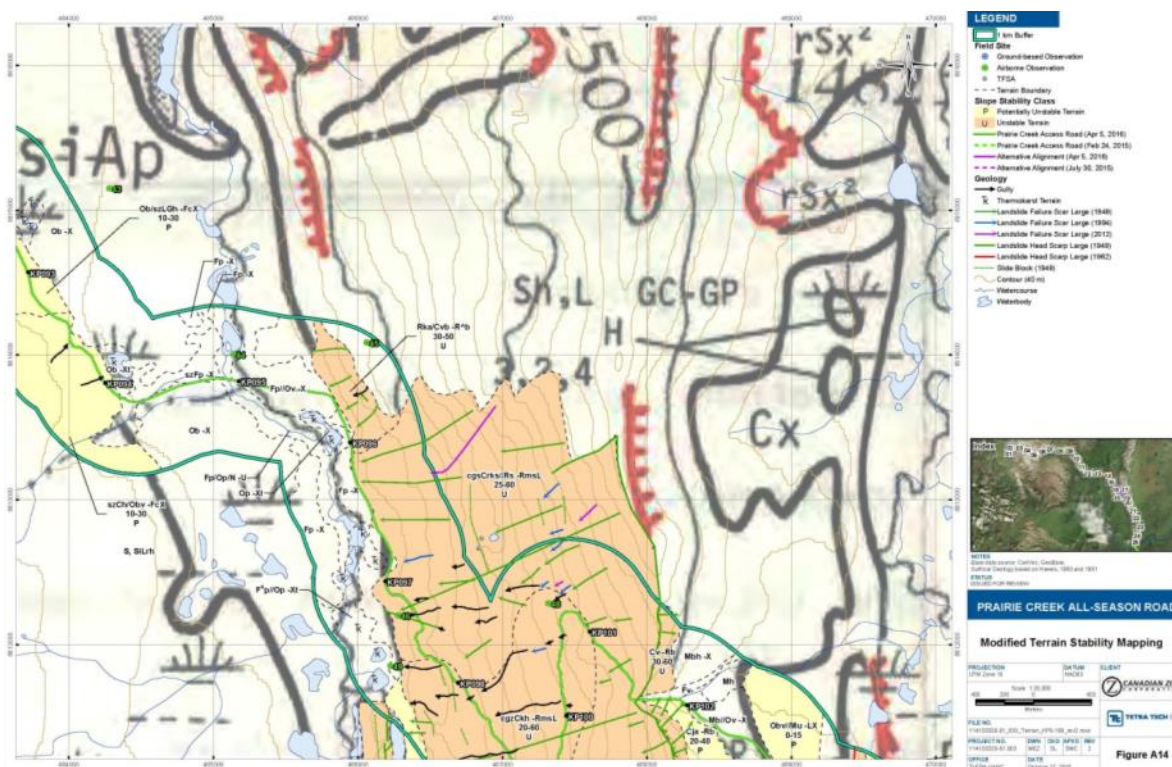
In its independent risk assessment, Oboni Riskope Associates Inc.<sup>7</sup> stated that, in its experience: “[M]an-made slopes generate frequent and damaging slides and rock falls which have not been evaluated to date due to lack of information” (PR#324 pp74/134; PR#376 p4) and even “... small volume events can generate high risks to infrastructure and traffic” (PR#376 p4). In its response to the risk assessment, CanZinc stated that risks from man-made slopes and rock falls will be mitigated during detailed design and “...it is not conceivable that such events would cause significant accidents” (PR#380 p2).

In response to a question from a Review Board technical advisor, CanZinc agreed to respond through an undertaking (#3) about the wide scarps (very steep slopes) on the west end of the Project (PR#532). CanZinc explained that these steep slopes are not an indication of deep-seated instability or large landslide, but instead result from many smaller rock falls or landslides (PR#539 PDF p5). The Review Board also inquired about the ability of the CanZinc’s proposed stability assessment to identify deep-seated landslide hazards in the Silent Hills section from kilometers 95.5 to 102 (for example, see Figure 5-2) and assess associated risks (PR#524 p106). CanZinc indicated that if there is potential for deep-seated landslides in the area, additional site investigation including a deeper set of boreholes, would be required. CanZinc committed to additional site investigation in the Silent Hills area during detailed design to determine if additional work is required to reduce the risk of landslides caused by road construction (PR#524 p115; PR#532).

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<sup>7</sup> Following a public request for proposals, the Review Board retained Oboni Riskope Associates Inc. from February 2016 to April 2017 to conduct an independent third-party risk assessment (PR#146). See Section 5.1.3 for more information.





**Figure 5-2: Silent Hills terrain stability**  
 (PR#360 Figure 14)

### Avalanches

In its DAR, the developer identified a moderate risk of avalanches along 17.8 kilometres of the road (PR#55 p11). The avalanche hazard is generally located between the mine and Cat Camp at kilometre 40, although there is some potential for avalanches in the Grainger Gap area (PR#129 p68). The avalanche report identified 27 avalanche paths with a return frequency of 3 years or less for large avalanches (PR#178 PDF p47).

CanZinc’s avalanche hazard consultant, Alpine Solutions<sup>8</sup>, stated that it could not undertake a complete risk assessment without more information, but described typical mitigation options including an Avalanche Management Plan, safety measures for travel, training for road users, avalanche explosive control, and possible structural diversions (PR#178 PDF

<sup>8</sup> Alpine Solutions was the developer’s technical advisor on mitigating impacts from avalanches during the mine and winter road EA (EA0809-002).

p61). In relation to the All Season Road, Alpine Solutions recommended that (PR#178 PDF p62):

- the road should be reviewed once the alignment is finalized,
- a helicopter based survey should be completed to refine avalanche paths and hazard areas,
- an Avalanche Hazard Management Plan should be prepared,
- an assessment of potential impacts on bridges should be completed, and
- if more detailed analysis is required, a linear risk analysis should be undertaken

In response to a first round IR, CanZinc committed to following the recommendations outlined in the Alpine Solutions report, which included monitoring (PR#200 p1 ). During the technical sessions, CanZinc pointed out that avalanches were assessed during the mine and winter road EA (PR#237 p192); however, parties pointed out that this only included avalanche risks until the end of the winter road season in March, that it did not consider potential impacts of avalanches on bridges, since the winter road would not have needed bridges, and did not consider the different alignment of the All Season Road. CanZinc acknowledged that there are four bridges near identified avalanches paths (PR#240 p14).

CanZinc committed to examining the impacts of avalanches on bridges and camps during detailed design and to consider and factor in the risk of avalanches and earthquakes on permanent infrastructure (PR#240). CanZinc also clarified that none of the avalanche paths conflict with the realignments it has proposed, and reiterated that it will follow up on the recommendations regarding avalanches, including further avalanche reconnaissance, a risk and impact assessment if necessary, and an Avalanche Hazard Management Plan (PR#320 p24 ). CanZinc's avalanche consultant, Alpine Solutions, noted in its report that (PR#178 PDF p48):

If avalanche risk is determined to be unacceptable, options for mitigation should be considered. Mitigation measures for industrial roads typically includes an avalanche management plan which would specify weather and snowpack monitoring (to determine if avalanche threshold has been reached), safety measures for travelling the road, training for road users, and avalanche explosive control if required. Mitigation measures may also include structural protection or diversion earthworks for high risk areas or for structures such as bridges.

DFN raised the subject of avalanches with regard to risk and safety in its technical report, at the hearing, and in closing arguments, and identified several factors it took into consideration in determining the significance of impacts from avalanches, including (PR#459 p6):

- In the avalanche risk assessment for the Permitted Winter Road, Alpine Solutions concluded that it could not complete a risk assessment without further details.
- Alpine Solutions stated that large avalanches could be expected every 3 years or less, and typically in spring.
- Alpine Solutions identified avalanche consequences such as traffic delays, vehicle damage, injury/fatality, spills, and risk to fixed infrastructure.
- CanZinc committed to following Alpine Solutions' recommendations in advance of winter road construction.

DFN acknowledged the general commitments CanZinc has made for avalanche work in the detailed design phase, but noted there are currently no specific mitigation measures in place for avalanches (PR#459 p6) and indicated that it wants clearer commitments. In its closing arguments (PR#549 p18), DFN recommended two measures to the Review Board regarding the work CanZinc has said it will complete during detailed design (Appendix D, DFN recommendations #8 and #9). DFN recommendation #8 was consistent with Alpine solutions recommendations (bullets above). Recommendation #9 was for CanZinc to provide information on how it will detect and mitigate high avalanche hazards in December to February (PR#549 p18).

CanZinc reiterated its commitment to follow up on the Alpine Solutions recommendations, and considers any additional work on avalanches unnecessary at this time (PR#178 PDF p46; PR#484 p26; PR#524 p254). CanZinc did not respond to DFN's final recommendations in its closing arguments (PR#553).

### **5.1.2 Early information on road design and safety**

In its DAR, CanZinc indicated that drivers will receive an orientation package prior to driving the road, and will be required to check in and out and be in communication throughout their journey (PR#55 p201). In its DAR Addendum, CanZinc identified possible causes of accidents as including driver error (e.g., speed, falling asleep) and vehicle failure (e.g., losing breaks or steering) (PR#100 p48). CanZinc stated that safety mitigation along the road will include proper design and construction, avoiding steep terrain and hairpin turns, posted speed limits, in-vehicle communication, and vehicle tracking (PR#55 p243). Additional mitigation CanZinc identified in its DAR Addendum included assessing whether drivers are fit to drive, considering minimal visibility, and regular vehicle maintenance (PR#100 p48).

In response to a first round DFN IR, CanZinc explained that the road would have posted speed limits on all sections, and would be operated using a journey management system

including logging start and end times, and monitoring truck speed and stops (PR#200 p21). CanZinc reported that it will consider sight distances and blind corners when determining the speed limits, and that radio contact will be used to facilitate vehicle passing. CanZinc agreed to add a commitment to abide by and enforce GNWT commercial truck load restrictions or justify variance, and explained that it will monitor vehicle progress to identify potential speeding (PR#200 p22; PR#355 p4).

In responses to IRs about safety, CanZinc explained that drivers will rest in their cabs if necessary, that drivers will be able to complete their journeys within the daily maximum work times, and that road operations may be suspended if visibility is poor (PR#188 PDF P92; PR#184 p16). If a driver cannot complete their journey CanZinc explained that, they will turn around at a camp or borrow pit, stay in their cab until they can safely move, or detach the trailers and return with just the truck rig (PR#240 p129).

After the second round of IRs, CanZinc informed the Review Board that the Liard Transfer facility would no longer be required as originally described, and that the transfer location would instead be moved to the laydown area near the south side of the Liard River crossing (PR#375 p1). CanZinc estimated that this would result in round-trip journeys of approximately 10.4 hours from Fort Nelson to and from the Liard River transfer location, and 10.5 hours on the All Season Road from the mine to and from the Liard River transfer location. In an undertaking (#38) from the technical sessions, CanZinc predicted a maximum of 25 round trips by trucks each day (PR#250; PR#264 p68).

In response to IRs about the need for runaway lanes in steep road sections, CanZinc responded that runaway lanes are not considered necessary by CanZinc's road design subcontractors (PR#200 p3, 20, 21; PR184 p). However, CanZinc agreed to review the use of safety railings and runaway lanes during detailed design (PR#184 p16). In an undertaking (#20) from the technical sessions, CanZinc indicated that there were no specific standards for where to use runaway lanes or safety railings, though one guide did suggest using retardation barriers and runaway lanes where grades exceed 5% and where risks warrant them (PR#250; PR#282 PDF p35). CanZinc later stated that it will use the B.C. Ministry of Forests, Lands and Natural Resources Operations Engineering Manual for the "...primary design and construction standards..." for the Project (PR#320 p34).

During the technical session, Parks Canada expressed concern with the sections of road that will only be 4 metres wide and the width of pullouts being only 3 m wide (PR#232 p253). Parks Canada explained that there can be softening of edges of the road, which can reduce the useable section of the road (PR#232 p253). In response, CanZinc indicated that maintenance will address any issues of softened shoulders. CanZinc also provided the

following details on road design and road use that were not described in the DAR (PR#320 p31-39; PR#364 p2).

- CanZinc provided details on road width and traffic flow, including:
  - one pullout per kilometre;
  - one-directional haul traffic for most of the day;
  - radio control of haul traffic at all times; and,
  - pullouts in close proximity to 4 m wide stretches of road.
- CanZinc committed to further review three sections of road that may warrant runaway lanes or safety railings.
- CanZinc provided information on minimum lines of sight and speed limits.
- CanZinc discussed brakes and stopping distances and confirmed that brake tests will be performed.
- CanZinc provided details on convoys, specifically that:
  - in winter, vehicles will travel in convoys of 3-15 separated by 50 -100 m; and
  - in summer, vehicles will not travel in convoys and will be about 30 minutes apart.
- CanZinc provided information on driver fitness, and described the journey management system that will have a road operations superintendent who will oversee maintenance, operations, and safety decisions. This system will:
  - consider vehicle maintenance;
  - include provisions for driver fitness; and
  - include standard drug and alcohol screening.

### **5.1.3 Risk assessment**

In order to evaluate the impacts of potential accidents and malfunctions, the ToR required CanZinc to conduct a risk assessment using best practices, including components, systems, hazards, and failure modes (PR#42 p26). CanZinc was asked to assess the likelihood and severity of each risk and provide details on site-specific contingencies for high risk areas.

In the Review Board's Reasons for Decision on CanZinc's DAR Adequacy (PR#112 p7), the Review Board concluded that the risk assessment undertaken by CanZinc in its DAR and DAR Addendum was inadequate and did not allow for a meaningful review by parties or the Review Board (PR#112 p7). The Review Board also noted that the methodology and approach used for the risk assessment was not provided by CanZinc in its DAR or DAR Addendum. In the Review Board's Reasons for Decision, the risk assessment was noted as an important component in assessing the impacts of potential accidents and malfunctions. As a result of these inadequacies, the Review Board hired an independent third party to



complete a risk assessment for the proposed Project (PR#112 p8). Following a public request for proposals, Oboni Riskope Associates Inc. (Oboni Riskope) was retained by the Review Board from February 2016 to April 2017 to complete this task (PR#146). Oboni Riskope participated in both rounds of IRs, the technical sessions, and hearings. Based on the information on the public record, Oboni Riskope prepared a risk assessment document and submitted it on November 19<sup>th</sup>, 2016 (PR#324).

In its risk assessment, Oboni Riskope concluded that “...it becomes apparent that mitigations, as proposed to date, are not sufficient to bring the risks within the tolerance levels described by [CanZinc]” (PR#324 p21 and p133)<sup>9</sup>. In other words, the independent risk assessment concluded that there would be more accidents along the road than CanZinc anticipated (PR#324 p133). Oboni Riskope identified a series of systemic mechanisms as the main causes of potential failure<sup>10</sup>, including the following (PR#324 p22, 134; PR#376):

- Narrow road base;
- Human behaviour;
- Normalization of deviance (i.e., when small, unacceptable practices or behaviours become normal over time);
- Use of forestry codes for mine traffic (e.g., concentrate hauling);
- Use of limited road design drawings to generalize the composition of the road; and,
- Optimistic scenarios from the developer that did not consider some risks.

With regard to non-mine traffic, Oboni Riskope stated that “...the opening of free private/passenger traffic would completely alter the risk study methodology and conclusions” (PR#324 p32).

CanZinc responded to the independent risk assessment several times, including by letters in December (PR#380; PR#384; PR#391) and in a formal response in February (PR#407). In reply to CanZinc’s first letter (PR#380), Oboni Riskope indicated that “[t]here are no

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<sup>9</sup> Oboni identified several sources of uncertainty in its assessment, including climate change, human factors, vehicle collisions, and uncertainty regarding type of trucks and exact cargo containment (PR#324 p23, p135). Oboni did not consider vehicle collisions because CanZinc indicated it would have one-way haul traffic and Oboni was asked to assume there was no public traffic on the road. Oboni Riskope commented that inclusion of public traffic would lead to predictions of significantly more accidents, including with private traffic victims.

<sup>10</sup> Oboni defines a failure as one or more of the following: an event that prevents a truck, cargo, or driver from reaching their destination; an event with high potential impacts on drivers, vehicles, or cargo (i.e., off-road excursions); and an event with impacts on the environment (PR#324 p29).

errors of fact identified in CanZinc's letter that would modify or change the risk assessment findings and conclusions, based on the information available at the time of preparation of the Risk Assessment Technical Report..." and that "[t]he consideration of new evidence outlined in CanZinc's letter does not change the findings of risk" (PR#387 p40). In reply to CanZinc's third letter (PR#391), Oboni Riskope again indicated it was confident that its risk assessment is valid and credible (PR#393 p14).

In its February 2017 response to the risk assessment, CanZinc indicated it was not satisfied with Oboni Riskope's responses to its December letters (PR#407 p1). CanZinc raised several concerns regarding how Oboni Riskope determined accident probability, related to: driver behaviour, examples used, road width, and choices for road comparisons (PR#407 p2). CanZinc expressed concerns over how Oboni Riskope determined consequence, Oboni Riskope's use of Parks Canada's information on environmentally sensitive locations, and Oboni's choice of consequence classes in areas with fish, karst terrain, and caribou (PR#407 p4). CanZinc also expressed concern with the proprietary Optimum Risk Estimates system used by Oboni Riskope to complete the risk assessment, because it limited CanZinc's ability to fully understand how risks were calculated (PR#407 p5). CanZinc concluded that it disagrees with the number of off-road excursions predicted by Oboni Riskope and that its review indicated that Oboni Riskope's predictions are an order of magnitude too high (PR#407 p6).

Oboni Riskope presented the main conclusions from its risk assessment on the first day of the formal hearings in Fort Simpson, including (PR#524 p135): five metre road width (with some four metre sections) is too narrow, there is no room to install heavier barriers to protect trucks from leaving the road, private traffic on the road would have "dire" consequences, and emergency response times have been underestimated. Oboni Riskope also expressed concern with the use of forestry road codes from British Columbia and gave examples of spills that resulted from accidents under similar conditions and on roads more comparable to the Project. Oboni Riskope commented that CanZinc has not addressed challenges of removing vehicles and responding to spills at the bottom of very steep slopes, or dealing with bottle-necked traffic following an accident (PR#524 p138). With regard to risks during construction, Oboni Riskope considered them to be small in comparison to operations.

In response to a question at the hearing from DFN, Oboni Riskope described its recommendations for reducing risk along the road (PR#524 p143). Oboni Riskope's primary recommendation was to widen the road (e.g., to allow for berms or barriers) by at least 1 m, with no sections of 4 m width. Oboni Riskope described smaller or lighter barriers that could fit on a narrow road base as being of mostly psychological value. Oboni



Riskope's second recommendation was to assess man-made slopes and identify protection techniques, but pointed out that this cannot be done until detailed drawings are available. Oboni Riskope also commented that there will always be some risk, but identifying the right mitigation for the highest risks is important (PR#524 p144).

CanZinc had many questions for Oboni Riskope at the public hearing. In response to one of these, Oboni Riskope confirmed that it believes the All Season Road is safer than the Permitted Winter Road (PR#524 p175). CanZinc asked why Oboni Riskope projected almost ten times as many off-road excursions as CanZinc. Oboni Riskope explained that there were several reasons, outlined in the following bullets.

- Oboni Riskope pointed out that comparing accidents and consequences based on the environment is very different from using the information in the forestry analysis CanZinc used, which is about health and safety. For example, not all forestry accidents are reported, so the data might be biased.
- CanZinc presented a combined range of Oboni Riskope's consequence classes, Oboni Riskope considered misleading.
- Oboni Riskope disagreed with CanZinc's choices of forestry road versus highway kilometers and use of statistics that are partially informed by travel on highways in southern British Columbia.

Oboni Riskope also pointed out that CanZinc's estimate of ten times fewer accidents is unrealistic because it would mean that the Project - an unpaved, 5 m wide road, with winter and summer traffic, and dark conditions for winter - would have the same number of accidents as a paved 8 m wide road that is very well designed and built (PR#524 p153; PR#324 p98). In contrast, Oboni Riskope's predictions were similar to a road that Oboni Riskope found was a reasonable comparison considering the similarities in traffic numbers, traffic speed, and terrain (PR#524 p179; PR#376 p3). In response to a question from Review Board member David Krutko, Oboni Riskope described how alcohol, drugs, fatigue, and speed are key factors in the risk assessment and how they are taken into account (PR#524 p201). Oboni Riskope stated that it considered CanZinc's proposed controls for these factors (e.g., journey management system for tracking vehicle speed and checking driver fitness) and used projects with similar controls in place for comparison. Oboni Riskope explained that even with these controls in place, accidents occurred on the comparison projects.

#### **5.1.4 Post-risk assessment evidence**

Despite its concerns regarding the independent risk assessment, CanZinc updated its own risk assessment based on the results and identified three stretches of road that may require

additional mitigation, including kilometres 12.3-17, kilometres 25.2-28.7, and kilometres 53.5-57.4 (PR#407 p9). In addition, CanZinc proposed to consider additional mitigations for risk of accidents to people and the environment, including:

- modified seat-belt arrangements or a mechanism that prevents operation of unit without the seatbelt;
- cargo safety, particularly anchoring;
- for the stretches of road that may require additional mitigation:
  - moderate widening of the road (0.5-1m); and
  - perimeter barriers if necessary – e.g., earth berm or cables/guardrails,

At the community hearings, CanZinc described changes to the Project design related to the risks of accidents and malfunctions. CanZinc indicated that the road will be 5 m wide with the exception of only about 550 m of road that will be 4 m wide in rock cut areas (PR#519 p38). CanZinc also discussed an operational risk assessment prior to operations, with the intention of having a road supervisor and others assess the constructed road (e.g., reviewing sign placement, etc.) (PR#524 p125).

In closing arguments, DFN weighed the conclusions of the independent risk assessment and CanZinc's position, and concluded that the Project could result in significant adverse impacts on people or the environment from accidents and malfunctions (PR#549 p5). In order to mitigate significant adverse impacts, DFN submitted a recommended measure to the Review Board related to human safety (PR#549 p5; Appendix D, DFN recommendation #1) to require:

- final road design to be stamped and signed by a professional engineer;
- a detailed map of landslide and avalanche hazards;
- additional details on man-made slopes;
- an updated risk assessment; and
- plans for avalanche hazards, emergency response, spills, and traffic management.

Parks Canada also recommended that the Review Board impose a measure requiring an updated risk assessment (considering all phases of the Project and to be completed prior to construction) to inform detailed design and operations, including mitigation accidents and consequences and spill response (PR#452 p48; Appendix D, Parks Canada recommendation #27).

CanZinc agreed that the updated risk assessment should inform detailed design and operation of the road, but pointed out that Oboni Riskope appeared to conclude that operations included the highest risks, so an updated risk assessment for construction and

closure is unnecessary (PR#553 PDF p15). CanZinc did not respond to DFN's recommendations (PR#553).

On the final day of the hearings, CanZinc made a commitment to form an independent technical review panel with a mandate to recommend road design principles and evaluate, and potentially improve, the risk assessment to minimize impacts on safety and the environment satisfactorily (PR#528 p243).

In its closing argument, LKFN concluded that, based on the information on the record, there is the potential for significant adverse impacts from accidents resulting in injury, death, or environmental damage (PR#550 p5). LKFN discussed CanZinc's commitment to form an independent technical review panel and to provide an updated risk assessment. LKFN provided two recommended measures to the Review Board related to the independent review panel (Appendix D, LKFN recommendations #18 and #19). Recommendation #18 suggested the Review Board consider requiring the independent technical review panel to assess risks and consequences on the road. Recommendation #19 suggested the collection of additional data prior to construction, particularly in areas with high potential for significant impacts. CanZinc did not respond to LKFN's recommendations in its closing arguments (PR#553).

NBDB advised the Review Board in its closing arguments that it sees little value in the independent risk assessment and "...suggest that there is an issue of not setting aside our common sense in favour of an 'expert'" (PR#548 p4).

In its closing argument Parks Canada also discussed CanZinc's commitment to an independent technical review panel to inform the updated risk assessment. Parks Canada supports this approach, and recommended that the panel's mandate include the design of the road and the update to the risk assessment to minimize significant impacts (PR#546 p17; Appendix D, Parks Canada recommendation #34). Parks Canada proposed that the panel should review the updated risk assessment, road design and road operations plans, and road closure and reclamation plans and should advise on permitting, licensing, design, construction, operation, and maintenance over the life of the Project (including design, construction, operation, closure, post-closure).

CanZinc suggested, in its closing argument, that the panel's focus should be on road design principles and risk for the operations phase and not construction or closure (PR#553 PDF p3). CanZinc proposes that the mandate of the panel would be to recommend road design principles, including improving and updating risk assessments (PR#553 PDF p3). CanZinc suggested that the focus would be on road design, but that the panel could make other recommendations on road operations and maintenance as well. CanZinc proposed that

panel member selection would include a shortlist of professional engineers with northern experience and no conflict with CanZinc or Oboni Riskope, from which three members would be selected. The selection process and panel ToR would be prepared in a report and provided to the MVLWB, GWNT, and Parks Canada for comment (PR#553 PDF p3). CanZinc believes a permit condition could include the formation of the panel and inclusion of its results in detailed design process. CanZinc committed to this in commitment #238 (Appendix C).

In response to a question at the hearings about non-spills emergencies, CanZinc committed to developing an Emergency Response Plan for non-spill emergencies (PR#524 p117). During questioning by DFN on a later hearing day, CanZinc further clarified that the Emergency Response Plan would likely also address how CanZinc will respond to accidents that result in injuries (PR#528 p29). CanZinc indicated that it would likely have a helicopter on call for possible medical evacuation during operation.

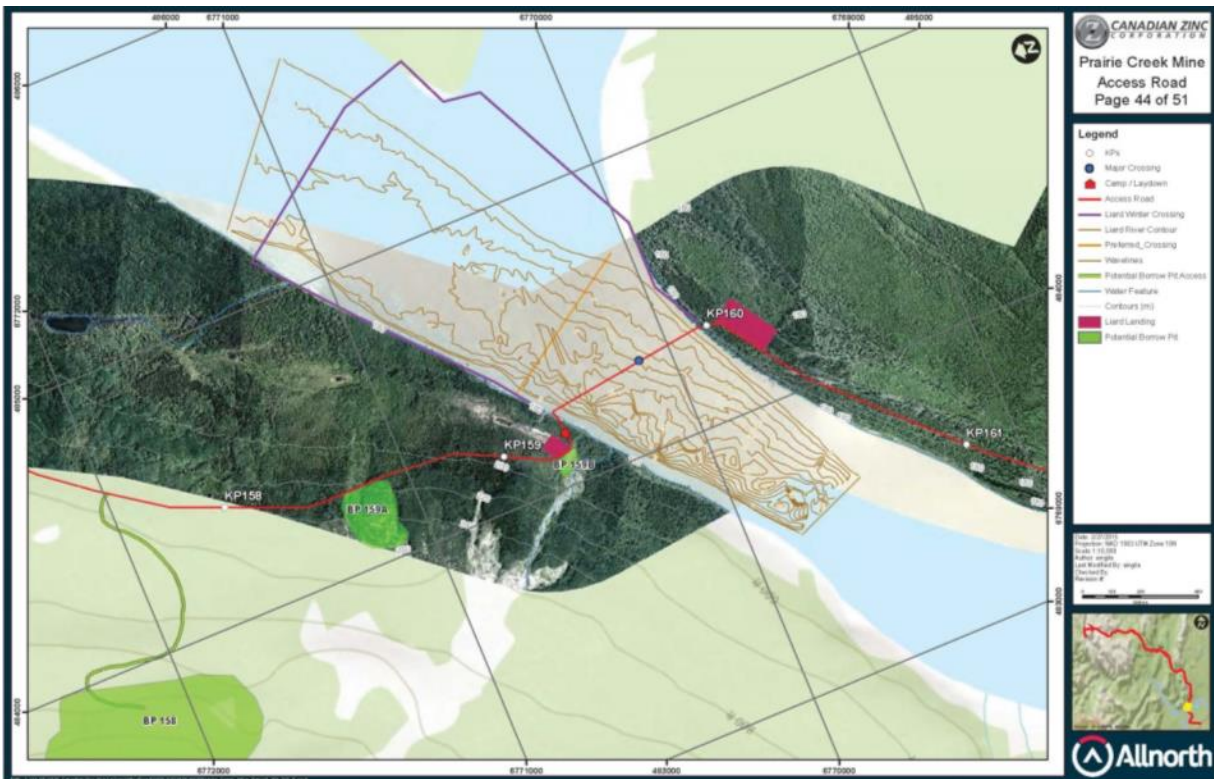
#### **5.1.5 Non-mine traffic on the road**

In its DAR, CanZinc stated that Nahanni Butte has raised concerns about non-resident use of the road for hunting (PR#55 p146). CanZinc indicated there will be a checkpoint along the road staffed by NBDB members, who will record and deter non-mine travel along the road. CanZinc will post signs warning of the danger of using the road, identifying the land as the traditional territory of NBDB, requesting that people do not use the road and that no hunting occur. CanZinc also noted that the Liard River (see Figure 5-3) barge operation would be private and not available to the public; however, individuals could cross the river on their own (or over the ice) and access the road further along (PR#55 p146).

In response to first round IRs, CanZinc confirmed that the checkpoint between the Laird River and Grainger Gap would be staffed during daylight hours when the road is in use (PR#200 p13). In addition, it agreed to consider motion-triggered cameras along the road to monitor if traffic is bypassing the checkpoint (PR#200 p13). CanZinc also suggested the possibility of having beacons available for vehicles that do not have radios (PR#240 p136).

CanZinc indicated that road monitors could potentially assist Parks Canada in identifying public use of the road and any entry of NNPR without permits (PR#230 p73). Similarly, road maintenance crews and the ferry operator will have radios they could use to report on road use. Crews would likely report when they see vehicles that are not using radios (PR#240 p137).

In response to an IR, CanZinc indicated that if the mine is temporarily closed, the checkpoint will not be operated; however, other access deterrents such as bridge deck removal or tank traps will be considered (PR#200 p14). Parks Canada responded to an IR to describe its access management on the Howard's Pass access road in NNPR. Parks Canada explained that to manage access that road has an NNPR boundary sign, an open gate at the park boundary, and law enforcement patrols (PR#200 p15). CanZinc was asked to define *residents* that would be allowed to use the barge crossing (PR#200 p13). CanZinc clarified that residents are individuals from Nahanni Butte, and that all other users are non-residents, who will not be able to use the barge crossing. CanZinc further stated that “[i]f the [NBDB] are interested in pursuing tourism or allowing other resource development, [CanZinc] will accommodate their wishes, such as allowing barge use and coordinating road use” and that CanZinc is open to joint road use with Parks Canada to promote NNPR tourism (PR#200 p14).



**Figure 5-3: Liard River crossing diagram**  
(PR#67 PDF p45)

### **Access Control**

During the EA, parties discussed whether or how CanZinc might control access to the road, including possibly through leases at the Liard River crossing (on the south side on INAC



Indian Affairs Branch (IAB) land and/or on the north side on GNWT land). In its technical report, GNWT restated that there is no specific way to manage and administer industrial or resource roads in the NWT (PR#455 p11). The developer will need to apply for a licence, which allows occupancy but does not allow exclusive use of the road. GNWT stated that (PR#455 p11):

Under the current legislative and regulatory framework, if the proposed development is approved to proceed to the regulatory phase and GNWT issues a licence to the developer, neither GNWT nor Canadian Zinc would have the authority to deny the public access to the road.

GNWT stated that the developer will need to obtain surface leases for the north side Liard barge landing site and the water areas on either side of the Liard River (required for construction barge landing infrastructure below the high water mark), which would grant exclusive access to the lease holder, allowing CanZinc to control access. GNWT concluded that (PR#455 p13):

Based on the conceptual information reviewed to date, GNWT believes that it is possible that the developments at the barge landing sites, along with geographic features, and the developer's proposed check-points, can act as barriers to access, should the developer decide to exercise its right to restrict access to leased parcels.

However, GNWT pointed out in its technical report that individuals can still travel around the lease parcels and access the road, but this would be more difficult because of the leases (PR#455 p13; PR#525 p236). GNWT offered two recommendations to the developer support responsible road operation (PR#455 p13; Appendix D, GNWT recommendations #1 and #2). Recommendation #1 stated that the developer should review its commitments for consistency with legislative and regulatory frameworks and recommendation #2 recommended that the developer continue to work with GNWT and INAC on lease requirements. CanZinc responded that its commitments are consistent with EA0809-002 and current legislative and regulatory frameworks and that it has already discussed and found consensus with NBDB, GNWT, and INAC on lease and licence issues (PR#484 p1).

In response to questioning by the GNWT at the public hearings, CanZinc confirmed that it will exercise its right to control access to the lease parcels, likely by employing NBDB (PR#524 p67)<sup>11</sup>. CanZinc stated that a mitigation approach that might help during times of

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<sup>11</sup> At the public hearing, CanZinc also made a new commitment that NBDB members would operate the barge crossing on CanZinc's behalf (PR#521 p44).

higher non-mine traffic (e.g., traditional harvesters) would be to have a tracking or monitoring device (e.g., GPS or radio) for vehicles when they pass through the Liard crossing or the checkpoint (PR#524 p118).

In its closing arguments, GNWT observed that based on discussions to date and commitments from the developer, with respect to access control, the barge landing leases can act as barriers to access (PR#551 p4). GNWT concluded that given CanZinc's commitment to restrict access through its leases, it expects the level of public access around the leases to be similar to the current level of public access to the area.

INAC clarified that, similar to GNWT, it cannot restrict access to the road and that although CanZinc could deny access to the lease parcel, it cannot prevent users from circumventing the lease area and accessing the road at another point (PR#450 p7). INAC concluded that having a lease on both sides of the Liard crossing would provide a way to control most access (PR#450 p7). INAC indicated that it believes public access concerns have been somewhat resolved because CanZinc can use the barge landing leases to control access (PR#525 p227).<sup>12</sup>

### **Traffic Management**

In closing arguments, DFN argued that there are numerous remaining questions about access control, and that unauthorized use of the Project could be a significant risk to all traffic on the road (PR#549 p17). To mitigate these impacts, DFN recommended that CanZinc develop a Traffic Management Plan for approval. DFN recommended that this Plan include (PR#549 p17; Appendix D, DFN recommendation #7):

- CanZinc's response procedure for unauthorized vehicles;
- an outline of responsibilities and mechanisms for access control;
- installation of remote cameras along the road; and,
- funding for the DFN Guardians Program so that independent monitors can assist with monitoring or managing access issues.

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<sup>12</sup> In its closing arguments, INAC reiterated that NBDB will need to relinquish its interest in the IAB lands in order for INAC to issue a license or lease to CanZinc (PR#552 p3; Appendix D, INAC recommendations #1 and #2). In response, CanZinc pointed out that it believes this will be the logical step following the completion of negotiations between CanZinc and NBDB on the Traditional Land Use Agreement and that no measure is necessary, or potentially legally possible (PR#553 p5).



CanZinc did not respond to DFN's closing arguments (PR#553).

At the public hearing, Parks Canada indicated that it has not yet discussed potential Parks Canada use of the road, but would be amenable to this discussion with other parties in the future (PR#525 p214). In response to a question from LKFN, Parks Canada indicated that it has not yet discussed enforcement and resourcing for the road (PR#528 p118).

In response to a question by Review Board Member Bertha Norwegian, CanZinc described a potential scenario of tourism on the All Season Road (PR#528 p62). CanZinc expects the best approach would be to have a bus or minivan of tourists, rather than allowing tourists to travel the road in their vehicles. In response to a question by Review Board Member Joe Handley, CanZinc indicated that it is willing to share the road with other uses if this can be done in a controlled way (PR#524 p58). In response to a question from Review Board Member Sunny Munroe about the tourism causing increased pressure and impacts on human safety from additional traffic, CanZinc indicated that it does not believe a small amount of tourism traffic (e.g., one van or bus a day) would be a big increase considering it assessed a range of daily traffic volumes (PR#528 p67).

At the community public hearing in Nahanni Butte, NBDB stated that it believes CanZinc has done a credible job of analyzing risks (PR#521 p84). NBDB further explained that it understands the risk of increased access, but believes it can be managed and done safely.

## **5.2 Review Board analysis of road design and accidents and malfunctions**

### **5.2.1 Summary of Review Board Findings**

As described in the scope of assessment (Section 2.2.2), accidents and malfunctions was a key line of inquiry in this EA, and is part of the Review Board's consideration of impacts on people and the environment. This chapter discusses the likelihood of and contributing factors to accidents and malfunctions, which have implications for people (i.e., human safety, discussed in detail in this chapter) and the environment (e.g., spills affecting water and collisions affecting wildlife, discussed in Chapters 6 and 8).

Having considered all the evidence and submissions on the public record, the Review Board finds that the Project is likely to result in significant adverse impacts on people and the environment due to accidents and malfunctions. The following summarizes the Board's analysis and conclusions related to accidents and malfunctions:

- the Review Board is concerned that the road is not designed to a standard that is appropriate for the complex terrain and the amount and type of traffic that will be on the road (including two-way traffic and non-mine traffic), which will result in increased likelihood of accidents;
- limited geohazard field investigations increase the uncertainty regarding the developer's predictions related to impacts on the road and traffic, and the adequacy of mitigations to avoid these impacts and any associated accidents; and
- the remote location of the road and the length of time to respond to accidents may increase the severity of impacts from accidents and malfunctions.

In the Review Board's view, any impact on people as a result of traffic accidents would be significant, and must be prevented to the greatest extent possible. The Board's analysis and conclusions in relation to human safety (e.g., impacts on people) are presented in this chapter. Impacts on the environment (other than people) from accidents may also be significant, depending on the location and nature of the accident (e.g., spill); the Review Board's analysis and conclusions in relation to these impacts are presented in subsequent chapters of this report (e.g., Chapter 8: Water).

The Review Board concludes that measures requiring an independent technical review panel and Traffic Control Mitigation and Management Plan are necessary to prevent significant adverse impacts on people and the environment.

### **5.2.2 Uncertainty of traffic volume and use**

The Project is designed as a single lane, one-way haul road. While haul traffic will be one-directional for most of the day, the Review Board understands there will be portions of the day when haul trucks are travelling in opposite directions (PR#320 p31). CanZinc indicated that there will be a maximum of 25 round trips by mine trucks each day (PR#250; PR#264 p68). Based on the Project design and discussions throughout the EA process, the Review Board understands that the Project is not designed for public use of the road. CanZinc has proposed a journey management system to track maintenance, journey lengths, speed, and driver fitness (PR#200 p21; PR#320 p39). The Review Board heard from Oboni Riskope that CanZinc's plans for a pullout every 1 kilometre could be sufficient mitigation for the narrow sections and bridges only if: traffic is always one-way; there is no public traffic; all traffic is linked by radio; and, all other conditions or assumptions are complied with (PR#376 p3).

The Review Board acknowledges that the Oboni Riskope risk assessment identified the Permitted Winter Road as being riskier than the proposed All Season Road (PR#324 p21;

PR#524 p175). However, the Review Board notes that Oboni Riskope was asked to consider no public access and no two-way traffic scenarios (including no potential accidents between vehicles). The Review Board also heard from parties and the developer that public access cannot be legally prevented on the road (PR#55 p146; PR#200 p15; PR#455 p11). This is of concern to the Review Board because the road is designed as a one-way haul road.

Some of the access control mitigations CanZinc mentioned in its DAR included a checkpoint staffed by NBDB members, the presence of a (barge) crossing at the Liard River, and warning signs and signage that the road is on NBDB traditional territory (PR#55 p146). The Review Board heard that the developer will consider motion-triggered cameras, as well as beacons or radios for non-mine vehicles that do not have radios, and that work crews on the road would likely report any vehicles they observed that were not using radios (PR#200 p13; PR#240 p136).

GNWT and INAC agree that CanZinc will require surface leases for the barge landing sites, and this would allow CanZinc to restrict or allow access at those locations (PR#455 p12; PR#450 p7). Although individuals could travel around the leases, GNWT concluded that the level of public access around the lease would be similar to current levels of public access in the area, and INAC concluded that leases on both sides of the river would control most access (PR#535 p236; PR#551 p4; PR#525 p227).

The Review Board agrees that the best opportunity for controlling public access appears to be at the barge crossing. The Board further agrees with the GNWT and INAC that the barge crossing will likely provide opportunity for effective mitigation for access during summer months when the barge is operating, because the public would have to find a way to transport vehicles across the river and around the lease site. However, during winter months, the Review Board believes it will be easier for members of the public to cross the frozen river and avoid the lease site. Members of the public may be more motivated to access the road in winter because of hunting opportunities in the area. The Review Board understands that winter is a typical time for traditional harvesting activities to occur, and it is likely that NBDB members will hunt on the road by crossing the lease with CanZinc's permission. However, the Review Board also accepts that other determined individuals will likely find their way around the barge lease over the frozen river.

The Review Board observes that there is uncertainty related to the effectiveness of all of the access control mitigations, and agrees with DFN that there are many outstanding questions related to access control (PR#549 p17). In the Board's opinion, while all of the above access control mitigations (e.g., barge, checkpoint) can contribute to limiting public

access, none of them can prevent it. Drivers may choose to ignore the checkpoint and signs, and there could be ways to travel around the barge lease area. In the Review Board's view, use of the road by non-mine<sup>13</sup> vehicles cannot be completely controlled because of government's inability to regulate road use and uncertainty in the effectiveness of the developer's proposed access control mitigations.

In addition, CanZinc has indicated that residents from Nahanni Butte will be able to cross using the barge<sup>14</sup>, and has committed to working with NBDB members to allow them to use the road as they wish (PR#200 p14). CanZinc indicated during the first round of IRs that that "[i]f the [NBDB] are interested in pursuing tourism or allowing other resource development, [CanZinc] will accommodate their wishes, such as allowing barge use and coordinating road use" and that CanZinc is open to joint road use with Parks Canada to promote NNPR tourism (PR#200 p14). Parks Canada indicated it would be amenable to such discussions in the future (PR#525 p214). CanZinc commented that an approach to managing tourism-related traffic could be to use a bus or minivan on the road, rather than allowing individuals to travel in private vehicles (PR#528 p67).

In light of the evidence described above, the Review Board concludes that there will be non-mine traffic use of the road, but that the extent is currently unknown. Oboni Riskope indicated that "...the opening of free private/passenger traffic would completely alter the risk study methodology and conclusions" (PR#324 p32) and would have "very dire consequences" (PR#502 p30). Similarly, DFN concluded that unauthorized use of the Project would be a significant risk to all traffic (PR#549 p17). The Review Board agrees with Oboni Riskope and DFN.

The Review Board is of the view that non-mine activity along the road is more likely during frozen conditions when individuals can more easily cross the Liard River<sup>15</sup>. The Review Board finds that if there will likely be non-mine traffic using the road, the road should be designed to the safety standards of a public road, which it is not. In the Review Board's opinion, the presence of public vehicles, resulting in two-way traffic, on a road designed for one-way hauling (of lead and zinc concentrates, fuel, and mine reagents) will cause

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<sup>13</sup> The Review Board considers mine traffic to include any vehicle driven by CanZinc employees, agents, contractors or subcontractors on behalf of CanZinc. The Review Board considers non-mine traffic to be all other traffic.

<sup>14</sup> At the public hearings, CanZinc committed that NBDB members would operate that barge crossing on CanZinc's behalf (PR#521 p44).

<sup>15</sup> The Review Board notes that this season will be longer than the original winter road season, as the Liard River will be crossable to lighter weight vehicles during the shoulder seasons as well.

significant adverse impacts from increased accidents. Some of these accidents are likely to result in impacts on people and the environment.

### 5.2.3 Uncertainty related to geohazards

Throughout the EA, the Review Board heard concerns from parties about geohazards (including terrain instabilities, avalanches, and permafrost) along the proposed road and their potential impacts on safety and the environment (see Section 5.1.1). Considering the evidence on the record, the Board remains concerned about the lack of field investigations, site-specific information, and effects assessments related to geohazards, including terrain instabilities, avalanches, and permafrost.

In its DAR, CanZinc explained that the Project could disturb existing slope instabilities or create new instabilities (PR#55 p232). In response to specific questions about mitigating terrain geohazards during the EA, CanZinc indicated that its first mitigation is avoidance, and the second is site-specific review during detailed design (PR#200 p1). When Oboni Riskope was asked at the public hearing about its key recommendations for increasing safety on the road, its second recommendation was to assess the impacts of man-made slopes, once detailed design is available, and identify mitigation (PR#524 p143).

During this EA (EA1415-01), CanZinc has relied on avalanche work completed by Alpine Solutions during the mine and winter road EA (EA0809-02). The Review Board notes that Alpine Solutions concluded that it could not complete a thorough risk assessment without additional information. Alpine Solutions instead offered six recommendations to CanZinc for future work, and provided suggestions for the types of mitigations that might alleviate risks, if identified. The Review Board heard from DFN in technical reports, at the hearing, and in closing arguments that it had outstanding concerns regarding avalanches<sup>16</sup> (PR#459 p6; PR#549 p18). The Review Board notes that developer's commitment #114 states that it "...will be following up on the recommendations in the (Alpine Solutions) report (re avalanches) at the appropriate time in advance of winter road construction" (PR#553 p14).

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<sup>16</sup> In response to DFN's technical report and questions at the public hearing, CanZinc pointed out that it assessed avalanche risks during the mine and winter road EA (EA0809-002) (PR#484 p26). The Review Board notes that while avalanches were assessed for the Permitted Winter Road for the period of December to March annually, there are aspects of avalanches that are still under consideration for this EA. Avalanches outside the December to March season, potential impacts of avalanches on bridges (not part of the Permitted Winter Road design), and avalanches on realigned stretches of road have not been previously assessed and are within the scope of this EA.

In the Board's view, the language in this commitment of 'will be following up on' and 'at the appropriate time' is vague and falls short of a reliable commitment.

The Review Board considers permafrost degradation to be another source of potential instability on the road. In order to identify permafrost occurrence, CanZinc has used visual and remote terrain analysis, soil characterisation, shovel tests, and test pits undertaken locally (PR#200 p19). The developer indicated it will construct in wet or permafrost areas using best practices related to permafrost, such as the corduroy technique<sup>17</sup>, thicker embankments, culverts to prevent ponding, and mitigation for snow clearing (PR#102 p242; PR#188 PDF p13). While NRCan appeared satisfied with commitments and the level of work for this stage<sup>18</sup> (PR#547), LKFN and GNWT expressed concern about the available information for this stage of Project and the ability to assess significance of impacts based on that information (PR#455; PR#550). The Review Board also heard that because the extent of permafrost is currently unknown, no site-specific mitigation has been identified (PR#452 p48).

The Review Board notes that CanZinc's work to date does not include detailed site assessments of any of the above geohazards. However, the Board is aware that CanZinc has committed that during detailed design it will complete in-depth terrain stability assessments (including consideration of man-made slopes), site-specific geotechnical and permafrost investigations, additional investigation in the Silent Hills area, follow up on the Alpine Solutions recommendations, and an assessment on impacts of avalanches and earthquakes on permanent infrastructure (Appendix C, commitments #114, #116, #126, #129, #137, #139, #156, #232).

The Review Board concludes that although CanZinc has made numerous commitments to complete additional work related to the topics discussed above during detailed design, the lack of detailed work to date and resulting effects assessment creates a high degree of uncertainty in the developer's predictions and mitigations. CanZinc's conclusions and discussion around mitigating geohazards appear to be based on an assumption that CanZinc will be able to identify all such hazards and mitigate them appropriately during

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<sup>17</sup> Corduroy construction involves placing a foundation layer of logs, perpendicular to the road direction, in wet or permafrost areas. This technique avoids disturbing the active layer, and includes sealing the logs under the road materials to greatly slow decomposition of the logs.

<sup>18</sup> As noted in Chapter 12, NRCan and several other parties recommended that further investigations are needed to inform design and permafrost mitigations, and ongoing monitoring is needed to detect effects and inform adaptive management to avoid impacts associated with permafrost degradation.



detailed design. In the Board's view, the effectiveness of the developer's proposed mitigation is difficult to assess without an understanding of the existing conditions. As a result, the Review Board does not have confidence in the developer's impact predictions from geohazards on the road, accidents, and people.

Geohazard impacts (such as landslides and permafrost thaw<sup>19</sup>) have the potential to cause significant adverse impacts on human safety. In the Review Board's view, these uncertainties can only be addressed after detailed geotechnical site assessments during detailed road design have occurred, and appropriate site-specific mitigations based on those site assessments have been identified and implemented. While the Review Board agrees that some of these events may not be very likely, the consequence of such events could be very high, including loss of life. The Review Board finds that adverse impacts from geohazards are possible and the developer has not demonstrated that it will mitigate these impacts to the Board's satisfaction. The Review Board has, therefore, decided to take a precautionary approach<sup>20</sup>.

#### **5.2.4 Road design**

CanZinc stated that it will use the B.C. Ministry of Forests, Lands and Natural Resources Operations Engineering Manual for the "...primary design and construction standards..." for the Project (PR#320 p34). The Review Board has concerns about the use of forestry road standards for British Columbia for a mine haul road in the Northwest Territories that crosses high alpine areas, sensitive permafrost terrain, and the NNPR. The Review Board is uncertain about the applicability of the Engineering Manual for road design criteria such as grade, width, curvature, and slope angles. The Review Board is also concerned that the road design criteria specified in the Engineering Manual may not be appropriate for this road.

For the purpose of its DAR and the EA, CanZinc completed preliminary design drawings for approximately 20% of the road (PR#324 p10). The developer and parties used these preliminary designs to assess the impacts of the Project on the environment, including people. The Review Board recognizes that CanZinc has committed to additional site investigations (Appendix C, commitment #129, #137, #232, and #235) and will produce final, detailed drawings of the entire road following permitting and prior to construction.

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<sup>19</sup> Permafrost is discussed in more detail in Chapter 12.

<sup>20</sup> See Chapter 4 for more discussion related to the Board's precautionary approach.



However, the Review Board finds that it is challenging to comprehensively assess the impacts of the Project when it has concerns regarding the road design standards, with only a portion of the road alignment provided and in the absence of detailed site information.

The Review Board also heard from parties, particularly DFN and LKFN, that they believe the Project, based on current design, could result in significant adverse impacts on people (and impacts on the environment from spills<sup>21</sup>) as a result of accidents and malfunctions (PR#549 p5; PR#550 p5). DFN concluded that the minimum road width should be 5 m (PR#459 p4). Oboni Riskope concluded that 5 m, with some 4 m sections, was too narrow, and recommended that the road be widened by at least 1 m (PR#524 p135). The Review Board acknowledges that CanZinc attempted to address these concerns, both by reducing the stretches of road that will be 4 m wide and by agreeing to consider road widening and barriers for certain stretches of the road (PR#407 p9; PR#484 p25).

Despite CanZinc's responses, the Review Board remains concerned with the use of design standards that may not be appropriate for this Project and with only having preliminary design for a portion of the Project. If the Project is not designed appropriately for local conditions, the Review Board's view is that it will result in significant adverse impacts.

### **5.2.5 Remote location of the Project**

The All Season Road crosses remote and mountainous terrain that may restrict the timeliness or method of responding to accidents and spills. The Review Board acknowledges the commitments and mitigations that CanZinc has provided regarding spill response and equipment, but notes that the road is long (184km), emergency response may take several hours, and that approximately 84 kilometres of the Project is located in NNPR.

During the EA, the Review Board heard from CanZinc that the maximum response time for the spill response teams (located in Nahanni Butte and at the mine site) would be 3 hours. At the public hearing, Oboni Riskope stated that one of its main conclusions was that CanZinc's emergency response times have been underestimated (PR#320 p40; PR#524 p135). The Review Board also heard from CanZinc that there are stretches of road where the slopes are steep enough that if a vehicle leaves the road, a winch would be required to recover vehicles and spill response would be by foot (PR#200; PR#524). The long

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<sup>21</sup> See Chapter 8 on water quality and quantity.

emergency response time for some stretches of the Project concerns the Review Board, particularly because of the implications for human safety.

### 5.2.6 Independent panel

In response to questions and concerns about human safety at the public hearings, CanZinc committed to establishing an independent technical review panel to oversee road design (PR#532 p3). In its commitment, CanZinc stated that the panel's mandate would be to recommend road design principles as well as to evaluate and improve the current status of the risk assessment<sup>22</sup> to minimize impacts on safety and the environment. CanZinc suggested a selection process that included developing a shortlist of professional engineers with northern experience.

In its closing arguments, Parks Canada and LKFN recommended that the Review Board impose measures related to an independent technical review panel. Parks Canada recommended that the panel's mandate should include road design and the risk assessment road operations plans, and road closure and reclamation plans (PR#546 p17; Appendix D, Parks Canada recommendation #34). CanZinc responded that the scope Parks Canada described for the panel is too broad and unnecessary (PR#553 PDF p15). CanZinc believes the panel's focus should be road design principles and risk, and making recommendations on road design as well as operations and maintenance. CanZinc requests that the Review Board agree to its proposed panel scope and mandate as outlined in its final commitment (Appendix C, commitment #238). In CanZinc's view, a measure is therefore not required.

The Review Board notes that CanZinc's original commitment made at the public hearings mentioned that the panel's report would be submitted prior to construction (PR#528 p244), and that the final version of the commitment (Appendix C, commitment #238) states that CanZinc would prepare a report on the selection process and panel ToR, but

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<sup>22</sup> It appeared to the Review Board that there was some confusion amongst parties regarding an updated risk assessment. The Review Board's understanding of the situations is as follows. In response to Parks Canada's requests for an updated risk assessment, CanZinc indicated it already updated its risk assessment in its final response to Oboni Riskope (PR#553 PDF p14). However, in Appendix C, commitment #241, CanZinc also committed to providing an updated risk assessment during detailed design (that is, prior to construction). In Appendix C, commitment #105, CanZinc committed to a road team (supervisors, operators, and maintenance staff) completing an operational level risk assessment prior to operations. The Review Board's understanding based on the timing and descriptions provided by CanZinc is that the operational risk assessment is not the same type of risk assessment as those completed to date and is different from the updated risk assessment referred to in commitment #241.

does not mention submission of the panel's report prior to construction. The Review Board is uncertain why the panel's report on road design was excluded in the final commitment.

The Review Board agrees that the establishment of an independent technical review panel for road design could resolve many of the Review Board's concerns regarding design uncertainties, non-mine traffic, and safety, as long as the panel's role is carefully established. The Review Board finds that CanZinc's commitment is a good starting point, but the Board has determined that a measure is necessary to ensure the panel is effective, provides meaningful input into Project design, and substantively contributes to the prevention of those impacts.

### **5.2.7 Conclusion**

In the Review Board's view, there is a high degree of uncertainty in the topics discussed in this chapter, including what traffic will be travelling the road, whether there will be two-way traffic, and limited information on and potential underestimation of geohazard impacts. Considering these uncertainties and the remote location of the project, the evidence and analysis discussed above, and the material on the public record, the Review Board concludes that the Project, as currently designed, is likely to cause significant adverse impacts on human safety as a result of road design that has not adequately considered and mitigated accidents and malfunctions.

In the Review Board's view, significant adverse impacts on human safety can be prevented with additional mitigation measures in place. The Review Board finds that measures for an independent technical review panel for road design and for a Traffic Control Mitigation and Management Plan will, together with CanZinc's proposed mitigations and commitments, reduce the risks of serious harm to people on the road, and prevent likely significant adverse impacts from the Project.

## **5.3 Measures and suggestions**

In order to prevent significant adverse impacts on human safety from accidents and malfunctions, the Review Board recommends the implementation of the following two measures. The Review Board notes that Chapter 8 also finds that significant impacts on water quality from spills resulting to road design and accidents and malfunctions are likely. Similarly, Chapter 6 finds that significant impacts on wildlife from public access to the road are likely. The two measures set out below will also prevent significant adverse impacts on water quality and wildlife from road design and Project-related accidents and

malfunctions. In addition to the measures, the Review Board has provided two suggestions below.

### **Measure 5-1**

The Review Board finds the uncertainties related to geohazards and preliminary road design, along with concerns regarding non-mine traffic on a single lane haul road, result in uncertainty regarding the adequacy of road design and an unacceptable risk of significant adverse impacts on human safety and the environment. The Review Board agrees with the developer and parties that an independent technical review panel would likely resolve these concerns.

Measure 5-1 builds on commitment #238, and will reduce the likelihood of significant adverse impacts by minimizing traffic-related accidents, road failure and malfunctions, through improved road design and construction. Additionally, this measure will increase the Review Board's and parties' confidence that these issues will be adequately addressed following the EA process and prior to construction and operation of the road.

Other chapters in this Report of EA also rely on this measure to help mitigate significant adverse impacts that are likely to arise from accidents, such as spills affecting water quality (discussed in Chapter 8).

#### **Measure 5-1: Independent technical review panel**

##### **5 -1, Part 1: Introduction**

In order to prevent significant adverse impacts on people and the environment, CanZinc will establish and fund an independent technical review panel to evaluate and approve the final road design. The developer will follow the final recommendations of the review panel with respect to road design. CanZinc will develop a terms of reference for the panel based on the requirements of this measure.

##### **5 -1, Part 2: Panel mandate**

The mandate of the independent technical review panel will be to provide independent expert advice and recommendations on the design and construction of the road to minimize: traffic-related accidents, road failure or malfunctions, and any resulting significant adverse impacts on human safety or the environment.

The panel will ensure that the road is designed and constructed to an appropriate standard that is highly protective of people and the environment, including consideration of:

- i. the number and type of mine and non-mine related vehicles expected to use the road;
- ii. two-way traffic;
- iii. human safety and minimizing traffic related accidents;
- iv. permafrost degradation and impacts on water quality; and,
- v. appropriate road design criteria, including but not limited to:
  - o watercourse crossings;
  - o right of way clearing width;
  - o road alignment, grades, subgrade width, and road widening at curves;
  - o cut and fill slopes, cut and fill slope angles, slope stability; and
  - o number of, and distance between, pullouts.

### **5 -1, Part 3: Panel composition**

At a minimum, the panel will be comprised of three members who are professional engineers and geoscientists. The panel must have expertise in northern road design, including permafrost and mountainous terrain experience. Members of the panel will have knowledge and experience to appropriately address the mandate in Measure 5-1 part 2 and considerations in Measure 5-1 part 5. CanZinc will engage with Parks Canada, the Mackenzie Valley Land and Water Board, the Government of the Northwest Territories, Nahanni Butte Dene Band, Liidlii Kué First Nation, and Dehcho First Nations on the panel composition. Members of the panel will be independent and will be approved by the Mackenzie Valley Land and Water Board and Parks Canada.

### **5 -1, Part 4: Panel activities and timing**

The panel will be established prior to detailed design of the road. CanZinc will engage with Parks Canada, the Mackenzie Valley Land and Water Board, the Government of the Northwest Territories, Nahanni Butte Dene Band, Liidlii Kué First Nation, and Dehcho First Nations on the panel activities. CanZinc will provide the panel's reports to Parks Canada and the Mackenzie Valley Land and Water Board. At a minimum, the panel will complete the activities listed below.

- i. Prior to detailed design of the road:
  - o review and comment on the Panel's terms of reference.
- ii. During detailed design of the road:

- work with CanZinc to review updated information, design plans, and detailed design work, including the terrain stability assessments undertaken for the proposed cut and fill slopes, and the developer's detailed interpretation of the permafrost conditions at the site upon completion of geotechnical site investigation work; and,
  - provide advice and recommendations for improving road design, following the mandate above, and considering construction, operations and maintenance, closure and reclamation, and temporary closure.
- iii. Following detailed design of the road:
- review the detailed design documents for the road;
  - provide a preliminary report to CanZinc on the panel's findings and conclusions, including any additional or outstanding recommendations;
  - review CanZinc's response and justification for any recommendations the developer does not wish to follow;
  - prepare and submit a final report to CanZinc that includes the panel's findings and conclusions on the final design.
- iv. During construction:
- work with the developer and regulatory authorities to determine the frequency and nature of the panel's activities during construction (at a minimum, the panel will be consulted and have the opportunity to revise its final report if any material changes to design are made following the panel's report).

### **5-1, Part 5: Other panel considerations**

The independent technical review panel will also consider any relevant information on the record from EA1415-01, information gathered as a result of relevant CanZinc commitments, and the requirements and outcomes of Review Board measures. This includes, but is not limited to:

- i. the updated risk assessment (Appendix C, commitment #241);
- ii. terrain stability assessment reports (Appendix C, commitment #137) and any additional mitigation required to address instability;
- iii. avalanche related information (Appendix C, commitment #114; Suggestion 5-1);
- iv. individual detailed borrow site plans and designs (Appendix C, commitment #119);
- v. geotechnical, geophysical, permafrost, and hydrological investigations (Appendix C, commitments #129, #156, #232, #235; measure 12-1; measure 8-1);
- vi. the Traffic Control Mitigation and Management Plan (Measure 5-2);

- vii. relevant management plans and proposed mitigations;
- viii. extreme weather events;
- ix. climate change; and,
- x. karst features.

### **Measure 5-2**

In the Board's view, non-mine traffic on a single lane one-way haul road will likely result in significant adverse impacts on human safety and the environment from accidents. In addition, public use of the road will lead to significant adverse impacts on wildlife from increased access. The Review Board recognizes that CanZinc has limited ability to control and prevent non-mine traffic. The Board has determined that it is therefore important to consider adaptive management in the context of access control, so that mitigation can be adjusted or additional mitigation identified if there is more non-mine traffic on the road than expected or than is safe.

Since public traffic cannot be entirely prevented, the Review Board finds that it will also be important to carefully manage all traffic that is on the road, in order to minimize risk and maximize safety on the road. CanZinc has identified a journey management system for mine traffic, but the Review Board finds that an overarching system or plan for approaches to managing all traffic on the road is required.

In order to limit access and manage traffic on the road, the Review Board believes that developing and implementing a Traffic Control Mitigation and Management Plan is necessary to prevent significant adverse impacts on human safety, water quality, and wildlife resulting from accidents, spills, and increased harvest. This measure replaces and builds on Section 7.1 of the existing Road Operations Plan.

### **Measure 5-2: Traffic Control Mitigation and Management Plan**

#### **5-2, Part 1: Introduction**

In order to prevent significant adverse impacts from the Project on human safety, water quality, and wildlife from accidents and increased harvest along the road, CanZinc will create a Traffic Control Mitigation and Management Plan. The purpose of the plan is to manage access control mitigations and all traffic on the road, including mine and non-mine traffic. The plan will consider all Project phases (construction, operation, closure [including temporary closure]) as well as seasonal or weather related closure. This plan will replace



Section 7.1 of the Road Operations Plan.

Prior to construction, the developer will submit this plan to the Mackenzie Valley Land and Water Board and Parks Canada for approval, as a condition of respective land use permits. CanZinc will operate in accordance with the approved plan.

**5-2, Part 2: Managing traffic on the road**

CanZinc will include all the mitigations it has identified for controlling non-mine traffic on the road in the Traffic Control Mitigation and Management Plan. The plan will describe roles and responsibilities for non-mine traffic mitigation and monitoring. At a minimum CanZinc will:

- i. exercise its right to control access on the lease parcels at the Liard River to control non-mine traffic;
- ii. operate a checkpoint when haul trucks are using the road and document all traffic known to be on the road; and
- iii. install signs indicating that the road is operated as a mine haul road and any public traffic using the road does so entirely at its own risk.

In the Traffic Control Mitigation and Management Plan, CanZinc will also address mitigation and management strategies for all traffic on the road, including how this relates to the Journey Management System that CanZinc intends to use for mine traffic. Mitigations to increase safety on the road with both mine and non-mine traffic present should consider:

- a. the independent technical review panel's conclusions on road design and safety; and,
- b. data sources that can provide information about high wildlife collision areas and non-mine traffic presence (such as wildlife camera traps [see Measure 6-3] and the harvest monitoring program[see Suggestion 7-1]).

CanZinc will monitor non-mine traffic on the road and establish adaptive management, following the guidance in Appendix B of this Report of EA, within the Traffic Control Mitigation and Management Plan.

## Suggestions 5-1 and 5-2

The following suggestions are intended to reduce the likelihood of adverse impacts on human safety and Project infrastructure resulting from avalanches. They build on CanZinc's commitments to follow-up on the Alpine Solutions recommendations at an appropriate time and to incorporate the avalanche assessment already completed into the Road Operations Plan. Suggestion 5-1 is directed at the developer. Suggestion 5-2 is directed at regulatory agencies.

### **Suggestion 5-1: Avalanches (for the developer)**

In order to reduce the likelihood of potential adverse impacts on human safety and Project infrastructure resulting from avalanches, the Review Board suggests the developer implement the following recommendations, prior to construction in high avalanche risk areas, based on the Alpine Solutions report<sup>23</sup> and CanZinc's commitments.

- i. Review and update the avalanche hazard maps based on the final road alignment.
- ii. Complete a helicopter based reconnaissance in order to refine avalanche path locations and hazard areas. The helicopter based access will allow for ground based assessments in select areas. This reconnaissance could be completed in summer or winter.
- iii. Prepare an Avalanche Hazard Management Plan prior to construction. The plan will specify all measures employed to reduce risk to vehicles and occupants. This plan could be stand-alone or housed within the Emergency Response Plan (Appendix C, commitment #244).
- iv. If CanZinc or the independent technical review panel determine that more detailed avalanche risk assessment is required, complete a linear risk analysis. A typical method which can be used to compare with other industrial roads is the 'Avalanche Hazard Index'.<sup>24</sup>
- v. Incorporate the potential impacts of avalanches on crossings structures near avalanches paths (see also Appendix C, commitment #116).

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<sup>23</sup> PR#178 PDF p49.

<sup>24</sup> Schaerer, P. 1984. The Avalanche-Hazard Index. National Research Council of Canada. Annals of Glaciology, 13, 1989, p.241-247.

- vi. Use all avalanche assessment and mapping information, including relevant mitigation options identified in the Alpine Solutions report, when updating the Road Operations Plan and the Avalanche Hazard Management Plan.
- vii. Provide the results of the above work to the independent technical panel (Measure 5-1).

The Review Board acknowledges that there may be new or preferred methods of completing the above work and preventing significant impacts from avalanches and encourages the developer to use these where applicable.

**Suggestion 5-2: Avalanches (for regulators)**

The Review Board suggests that the Mackenzie Valley Land and Water Board and Parks Canada consider the Alpine Solutions recommendations, CanZinc's commitments, and Suggestion 5-1 when setting land use permit conditions.

## 6. Wildlife and wildlife habitat

### *Summary of Review Board findings*

The Review Board finds that the Prairie Creek All Season Road Project (All Season Road or the Project) is likely to cause significant adverse impacts on wildlife and wildlife habitat. The Review Board's reasons for this determination are summarized as follows:

- The proposed All Season Road is located within Nahanni National Park Reserve (NNPR) and its construction, operation and closure over a 20-year period will degrade the ecological integrity of NNPR and its value as wildlife habitat.
- The proposed Project will have adverse impacts on species at risk listed under the federal *Species at Risk Act* including mountain caribou, boreal caribou, collared pika, bird species at risk and their respective critical habitats.
- The Project is likely to have adverse impacts on wildlife through direct habitat loss from road construction, direct mortality from vehicle collisions, disturbance and displacement of wildlife during road operations, and through wildlife habitat fragmentation.
- The developer is unable to reasonably predict impacts on wildlife and wildlife habitat from the Project and identify appropriate mitigations due to a lack of baseline data on the presence or absence of key species, the location of critical habitat and the seasonal use of the Project area by wildlife.
- There is a high level of uncertainty in the effectiveness of the developer's proposed mitigations to limit impacts on wildlife.
- Increased hunting pressure on wildlife is likely to occur due to uncertainty in the effectiveness of access control methods.
- Requiring a Wildlife Management and Monitoring Plan (WMMP) under the regulatory framework of the *Wildlife Act* is essential to ensure that the developer's wildlife mitigations and commitments are implemented and effective.

It is the developer's responsibility to verify the presence or absence of wildlife in the Project area, reasonably predict Project impacts, and propose appropriate mitigations to prevent significant adverse impacts. In addition, the Board finds the developer has failed to collect adequate baseline information for species at risk, particularly mountain caribou within NNPR, bird species at risk, and collared Pika.

The Board finds a high level of uncertainty in the developer's impact predictions for mountain caribou and its ability to mitigate those impacts due to its unwillingness to accept evidence from Parks Canada that suggests caribou are present along the proposed All Season Road. In the Review Board's opinion, the developer's impact predictions and views on significance are questionable as it has not determined presence or absence of several wildlife species and has therefore not met its burden of proof. The Board lacks confidence that the developer can adequately mitigate adverse impacts on wildlife and therefore requires legally binding and enforceable measures to ensure wildlife commitments and mitigations are fulfilled. The Review Board has recommended measures intended to prevent or reduce adverse impacts on wildlife so that they are no longer significant.

### ***Organization of this chapter***

In Section 6.1 below, the Review Board has provided readers with a more thorough and detailed summary of the evidence than it has in other environmental assessments. This is intended to allow readers to see firsthand the range and degree of uncertainty identified throughout the environmental assessment. These uncertainties present a particular challenge to impact predictions and decision making<sup>1</sup>, and are a relevant part of the Review Board's consideration of the evidence in this chapter.

In Section 6.1 the Review Board presents its analysis and conclusions. The Review Board's recommended measures are outlined in Section 6.3.

This chapter addresses impacts on all wildlife and wildlife habitat including species at risk both inside and outside of the Nahanni National Park Reserve. Impacts on traditional harvesting of wildlife are discussed in Chapter 7.

## **6.1 Evidence from the parties and the developer**

The Review Board's Terms of Reference (ToR) identified impacts on wildlife and wildlife habitat, including birds and species at risk, as subjects of note for the environmental assessment. The ToR also required consideration of wildlife and wildlife habitat within two key lines of inquiry: 1) impacts on traditional harvesting, and 2) impacts on the ecological integrity of Nahanni National Park Reserve.

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<sup>1</sup> See Chapter 4 for further discussion.

This section summarizes the evidence on the public record related to wildlife and wildlife habitat, including: information presented by the developer in its Developer's Assessment Report (DAR) and DAR Addendum submissions, parties' submissions through information requests, technical reports and closing arguments (including developer responses), and evidence heard at the technical sessions and public hearings. Preceding the evidence on impacts on specific valued components in sections 6.1.7-6.1.10, Section 6.1.6 presents the developer's predictions on project interactions (pathways) that may contribute to impacts on valued components.

### **6.1.1 Baseline information – general considerations**

In its DAR Addendum, CanZinc submitted an updated effects assessment on wildlife and wildlife habitat from the construction, operation and closure of the All Season Road (PR#102). CanZinc described the environmental setting, including baseline wildlife and wildlife habitat conditions in the study area, and summarized wildlife studies that have been done to date. Baseline field surveys for wildlife from 1980 through 2014, including information contained in the Developer's Assessment Report for the mine and Permitted Winter Road (EA0809-002), were used to support the effects assessment in the DAR Addendum.

Wildlife, including birds and amphibians, that are potentially present along the All Season Road were listed in terms of conservation status, population trends and size (if known), sensitivities or threats, health and presence of parasites and contaminants. Species were described in terms of expected presence, seasons of use, key habitats and expected harvesting pressure in the Project area. Traditional Knowledge related to wildlife was also presented in the DAR Addendum (PR#102 p15-60).

During the first round of IRs and at the technical sessions in June 2016, Parks Canada stated that baseline information was incomplete (PR#200 p23, PR#232 p 116-119). At the technical session, Parks Canada noted that some of the baseline wildlife surveys presented in the DAR Addendum were twenty to thirty years old and of short duration. Of the 21 federal and territorial species at risk, specific baseline wildlife surveys have only been done for caribou, and no baseline surveys have been done for waterfowl or forest birds (PR#232 p116).

At the technical sessions, Parks Canada advised that additional and current baseline information is required to properly assess Project impacts on wildlife. Parks Canada stated that without this baseline information there is no way of knowing whether mitigations

proposed to reduce impacts on wildlife are working, and that any adaptive management undertaken will be based on assumptions (PR#230 p95, PR#232 p116-119).

According to Parks Canada, specific species listed as threatened under the *Species at Risk Act* (SARA) that may occur in the Project area but whose presence is unknown due to absence of baseline data include: common nighthawk; olive-sided flycatcher; bank swallow; barn swallow; and, Canada warbler (PR#232 p118). Protection of critical habitat is required under Section 79 of the SARA for threatened species. However, according to Parks Canada, appropriate mitigation and monitoring depends largely on the results of baseline data collection (PR#232 p119-120). Environment Canada expressed similar concerns at the technical session regarding the adequacy of baseline information for wildlife and offered to assist in establishing an appropriate monitoring protocol (PR#232 p121). Parks Canada advised that, in its view, while monitoring requirements can be determined during the regulatory phase, baseline information is required during the environmental assessment so that the Review Board can determine if there will be significant adverse impacts (PR#232 p122).

As a technical session undertaking, Parks Canada agreed to provide CanZinc with a written description of its expectations regarding baseline wildlife data collection during the EA (PR#250 p2). In response, Parks Canada submitted a detailed request for baseline data to the developer on July 14, 2016. Specifically, Parks Canada requested baseline information on (PR#273 p2):

- population characteristics and habitat use of the Project area by forest bird communities, waterfowl, migratory birds and avian species at risk;
- habitat suitability for black bears in the Project area, including foraging, denning and travel considerations; and
- species presence of collared pika.

Parks Canada provided rationale for why the baseline work was needed, stating that confirmation of species' presence or absence is necessary in order to determine whether Project activities would have significant adverse impacts on wildlife, including species at risk. Parks Canada recognized, however, that certain wildlife surveys are time-sensitive and could not be undertaken during the 2016 field season (PR#273 p2-3). Parks Canada advised that while it considered the amount of information for mountain caribou to be adequate, it requested a commitment for a comprehensive monitoring program to be completed during permitting (PR#372 p3).



The developer conducted additional baseline wildlife field surveys in July 2016 in order to address Parks Canada's request (PR#289). Baseline surveys were conducted for black bear habitat potential, collared pika, peregrine falcon and harlequin duck along with reconnaissance surveys for trumpeter swan and beaver (PR#289 p12-17). The July 2016 surveys also included a discussion of Project interactions with these species. For black bears and collared pika, CanZinc provided modifications to its original impact predictions and proposed new mitigation based on the survey results (PR#289 p20-22).

During the July 2016 surveys, incidental wildlife sightings (including signs and trails) were also recorded. Moose and snowshoe hare were the most common sightings. Grizzly bear and caribou signs were primarily observed along the Permitted Winter Road, with grizzly bear signs in particular noted from km 1 to 12.5 and caribou signs from km 10 to 13.5. Dall's sheep ewes and lambs were noted at km 8.5 and 16 (PR#289 p18).

In its September 30, 2016 correspondence to the Review Board, Parks Canada reiterated its view that there are specific baseline information requirements that the developer has not met and that this information is necessary for Parks Canada to complete a full examination of the potential for significant adverse impacts from the Project on wildlife in NNPR (PR#308 pp1-12). Without an accurate description of baseline conditions, including species presence, distribution, abundance and use of the Project area, Parks Canada argued that it is not possible to assess the potential for significant adverse impacts on wildlife from the Project. According to Parks Canada, there is inadequate baseline information for forest birds, waterfowl, migratory birds, bird species at risk and collared pika, which is also a species at risk (PR#308 p1-3).

In response to Parks Canada's letter, CanZinc acknowledged that there are some baseline information gaps that should be addressed prior to construction of the All Season Road. However, CanZinc noted that the additional data could only be collected in the spring of 2017, which would result in a significant delay in the environmental assessment. CanZinc further stated that such additional baseline data is not required at this time for the effects assessment, and any such delay in the EA is not justified (PR#315 p1-3). Further in response to Parks Canada's letter, NBDB advised that if there are baseline data information gaps, these can be addressed as co-management undertakings within their Traditional Land Use Agreement with CanZinc (PR#313 p1).

On October 31, 2016 the Review Board responded to Parks Canada's request for additional baseline data collection. The Review Board noted that impacts on the ecological integrity of NNPR are a key line of inquiry in this EA and that the Board is obligated to consider species at risk under Section 79 of the *Species at Risk Act*. The Review Board advised Parks Canada

that it may present evidence to the Board in its technical report on whether the Project is likely to have significant impacts on the ecological integrity of NNPR or on species at risk or other wildlife. Parks Canada may also discuss the implications of baseline information gaps on CanZinc's impact predictions and describe how these may result in the potential for significant adverse impacts. The Review Board further advised Parks Canada that it could assist the Review Board by suggesting specific baseline requirements in its technical report. In addition, the Board indicated that technical reports should include mitigations for any impacts identified, including adaptive management solutions that could be implemented prior to any potential impacts occurring (PR#321 p1-2).

### **6.1.2 Baseline information gaps for migratory birds and bird species at risk**

Both Parks Canada and ECCC expressed concern that the baseline information on migratory birds, forest birds and bird species at risk presented by the developer is insufficient to validate the developer's effects assessment and adequately assess Project impacts on valued components. For example, ECCC's technical report makes recommendations that the absence of nesting bird species at risk (and other migratory birds) "should be confirmed in borrow and gravel pits prior to commencing disruptive activities during the general nesting period" and that ECCC should be consulted regarding recommended mitigations specific to migratory birds (PR#448 p24).

ECCC additionally pointed out that "few details are provided about the pre-clearing surveys to assess any residual impacts (e.g., expected frequency, types of circumstances, survey methods and experience level of personnel)" with respect to the baseline information required and proposed by CanZinc related to migratory birds (PR#448 p19). In its technical report, ECCC made a number of recommendations specific to the conduct of migratory bird surveys and baseline information collection, including the need to incorporate these specific recommendations into the next version of the WMMP. ECCC explicitly supported Parks Canada's recommendations for "a robust monitoring program, including pre-construction information" for migratory birds and bird species at risk along the All Season Road alignment, and further recommended that this monitoring program include at least one year of baseline conditions (PR#448 p17).

CanZinc responded to recommendations for additional baseline work from ECCC on April 7, 2017. With respect to baseline work recommended for migratory birds and species at risk, CanZinc stated that it has already committed to a field program for migratory birds and species at risk using automatic recording units, and that the survey would be developed in cooperation with both ECCC and Parks Canada (PR#484 pdf p40-41). Parks Canada's recommendation for additional baseline information for migratory birds, forest birds and

species at risk is based on its view that “there are potential impacts to birds (including waterfowl), including several SARA-listed species, resulting from the proposed all season road” and that the “baseline data provided does not meet the requirements of the ToR for the current proposed all season road EA” (PR#452 p20). As such, Parks Canada submitted three recommendations for the Board’s consideration (PR#452 p22-23):

1. Parks Canada’s recommendation #6 requires the collection of baseline data as outlined in the ToR and as required by Parks Canada prior to permits or licenses being issued.
2. Parks Canada’s recommendation #7 requires that CanZinc use the updated baseline information to re-assess potential Project impacts on forest birds, waterfowl, migratory birds and bird species at risk, and to update planned mitigations as required.
3. Parks Canada’s recommendation #8 proposes a systematic monitoring program, supported by ECCC as discussed above, which links monitoring data to adaptive management.

At the April 28, 2017 public hearing in Fort Simpson, Board staff asked Parks Canada whether the timing of baseline data collection for birds relates directly to the prevention of significant adverse impacts or the fulfilment of requirements under the *Species at Risk Act*. Parks Canada clarified that it is working directly with CanZinc and ECCC to conduct these baseline surveys in the spring and summer of 2017 (PR#528 p91-92). Parks Canada advised that it would provide additional information in its closing arguments to support each significance finding and its reasoning behind why its recommendations are necessary to mitigate potentially significant adverse impacts (PR#528 p94-95).

In its response to Parks Canada’s recommendations for additional baseline studies, CanZinc stated that “with a few modifications, CanZinc agrees to undertake those studies” (PR#484 p9). While CanZinc views the significance of impacts on avian species to be low, it has committed to undertake a survey of bird species in NNPR prior to construction. CanZinc stated that it agrees with Parks Canada that additional baseline studies are needed prior to construction, but does not agree that they should be done prior to permitting. In CanZinc’s view, where additional baseline work is requested, the significance of predicted impacts are low and unlikely to change based on additional baseline work (PR#484 p10). CanZinc advised that it collected sufficient baseline data for the Permitted Winter Road, and if there is a need for more data, it will work collaboratively with Parks Canada to collect more in due course. CanZinc further stated that the Project is not likely to have a significant impact on the environment and on that basis, does not support Parks Canada’s proposed recommendations requiring additional baseline work during the EA (PR#484 p11).

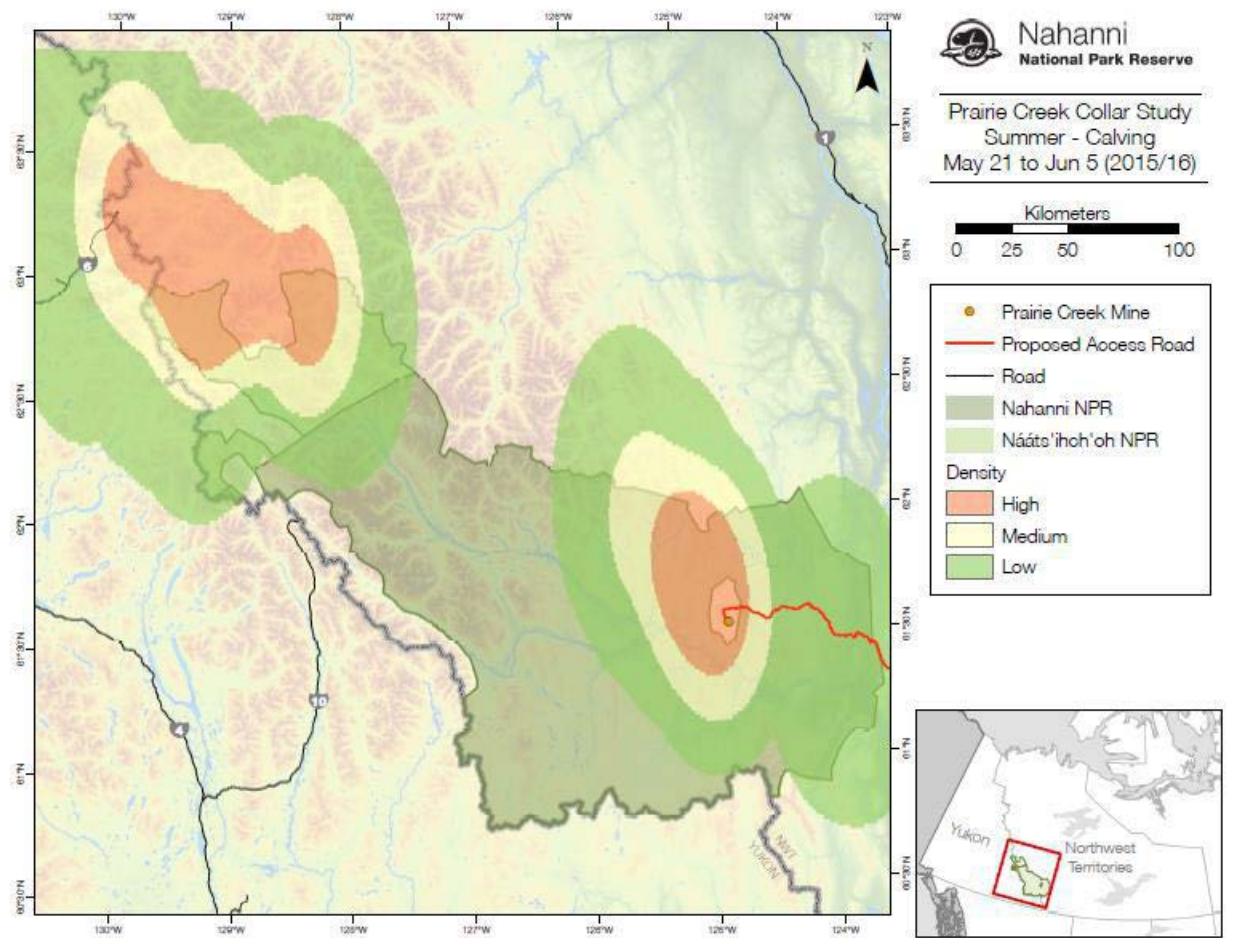
At the public hearings, Nahanni Butte Dene Band questioned ECCC on its recommended timing of baseline surveys. In response, ECCC clarified that its recommendation for baseline surveys for bird species at risk prior to initial clearing of a winter road is specific to the winter-season clearing of the road being considered in this environmental assessment (PR#499 p5, PR#528 p129).

In response to questioning at the hearing, CanZinc agreed to an undertaking to provide a list of monitoring and management plans that will be developed or updated, including details on what the plan applies to, to which Project phase(s) it applies, and what government agencies will be involved in plan review and approval (PR#532 p2).

In its presentation at the Fort Simpson public hearing, the developer stated it will conduct additional baseline surveys for birds and species at risk in collaboration with Parks Canada in 2017 (PR#528 p18). Following the hearing, CanZinc applied to GNWT for a Wildlife Research Permit to conduct additional baseline surveys for migratory birds, pikas and plants from mid-May to September 2017 (PR#530).

### **6.1.3 Baseline information gaps for northern mountain caribou**

DFN disagrees with CanZinc's assertion that there are few northern mountain caribou within the Project area (PR#459 p22), citing supporting evidence from Parks Canada. In its technical report, Parks Canada indicated that the evidence CanZinc used to support its position that the Project area is "outside the defined species range" for woodland caribou is "incorrect, outdated information" (PR#452 p13). Parks Canada supported its position with new collar data which indicates that "of (these) collared females, the majority spend part of the year in the Prairie Creek valley, and migrate northwest in the summer" and that "[a] smaller number of these caribou spent the entire year in close proximity to the project area" (PR#452 p13). In its technical report, Parks Canada provided a map of the density of locations for all collared caribou in the calving season from recent surveys (Figure 6-1). The mine site and first 20 km of the proposed access road fall within the southeastern area of high-density use (PR#452 p13).



**Figure 6-1: Kernel density map of locations for all collared caribou in calving season (PR#452 p15)**

In DFN's view, this discrepancy between the developer's assertion and new collar data results reflects the need for more detailed information on baseline caribou population as well as for more robust and detailed effects monitoring plans. Specifically, DFN recommends a "systematic monitoring program" that includes: aerial surveys to provide more population information during rut, additional seasonal ungulate surveys, and the inclusion of local members and Traditional Knowledge (PR#459 p23). Parks Canada also requested a systematic monitoring program that demonstrates how program results will be incorporated into adaptive management to ensure that significant adverse impacts on northern mountain caribou do not occur as a result of the Project (PR#452 p16).

In its response to DFN's technical report recommendation on monitoring, CanZinc noted that the DAR acknowledged that some caribou may occur near the Project and that monitoring is needed to integrate Project-specific mitigation with road activities and to apply adaptive management. CanZinc proposed this monitoring at the local scale, which it



considers appropriate for determining road-related impacts on caribou. CanZinc stated that its understanding of fall composition surveys is that they are used to determine trends at the regional or subpopulation level. Based on this, CanZinc does not believe that fall composition surveys are a preferred method to monitor Project-related impacts on mountain caribou at the local level (PR#484 pdf p37-38). Further, CanZinc does not believe it is practical or necessary to conduct aerial surveys to determine Project impacts or for adaptive management. CanZinc has, however, offered to provide logistical and monetary support to Parks Canada's more broadly-scoped northern mountain caribou monitoring programs. CanZinc advised that the caribou monitoring (PR#484 pdf p38):

(w)ould be combined with the opportunistic but structured recording of caribou observations along the proposed all season road by truck drivers and environmental monitors, as an effective monitoring program appropriate for the caribou near the road and possible adaptive management.

In its public hearing presentation, Parks Canada provided evidence on the proximity of mountain caribou to the proposed road based on recent collaring data. Three of 18 collared caribou (17 percent) crossed the road, and two spent the entire year in close proximity to the Project area. These two caribou crossed the proposed All Season Road multiple times. Parks Canada noted that the CanZinc range map did not include the Parks Canada collar information and is therefore out of date (PR#528 p71). Parks Canada also advised that it is currently gathering information on sedentary and migratory caribou in the study area using genetic analysis. It presented preliminary results indicating that caribou in the study area are part of the Redstone herd and that the sedentary animals may belong to a genetically distinct subgroup (PR#528 p71).

At the public hearing, Parks Canada also contended that the Project could have an adverse impact on the local population, including (PR#528 p72):

- avoidance of the road resulting in habitat fragmentation;
- loss of habitat effectiveness;
- noise disturbances;
- increase in predation risk; and
- direct mortality.

Parks Canada stated that the northern mountain population of woodland caribou is a listed species of special concern on Schedule 1 of the *Species at Risk Act* with known occurrences in the Project area. Parks Canada advised that, in its view, there is the potential for an adverse impact on the species from the Project (PR#528 p70-72).

During the public hearing, Liidlii Kué First Nation advised the Board that it supports Parks Canada's position on the presence of mountain caribou in the Project area and the potential for Project-related impacts on caribou. Liidlii Kué First Nation (LKFN) does not accept CanZinc's conclusions that there are few northern mountain caribou along the All Season Road, because there is not enough information to support CanZinc's arguments. LKFN recommended that the Review Board require monitoring with involvement of local Denendeh resource monitors (PR#528 p32).

In its presentation at the public hearing, CanZinc restated its prediction that impacts on caribou from the construction, operation and closure of the All Season Road are expected to be low. The developer stated that most mountain caribou occur to the north and west of the mine and road and that it has not recorded many sightings along the All Season Road (PR#528 p12-17).

#### **6.1.4 Baseline information gaps for boreal caribou**

In its technical report, the GNWT pointed out that the “density and distribution of boreal caribou in the area of the road alignment is not well documented”, although local Traditional Knowledge indicates that boreal caribou are found in the Project area. As such, the GNWT recommended that CanZinc consider designing and implementing a trail camera study along the Territorial Lands portion of the Project in order to confirm the presence of boreal caribou in the region and evaluate the need for additional mitigation and evaluation of the effectiveness of proposed mitigations (PR#455 p22).

In its response to technical reports, CanZinc agreed that woodland caribou density and distribution around the road is not well documented. During All Season Road operations, haul traffic, maintenance crews and environmental monitors will potentially observe boreal caribou. CanZinc noted that GNWT's recommended camera would have many false readings due to the traffic. CanZinc advised that there will be times when traffic is not on the road (such as at night and during spring and fall road closures) and that trail cameras could be considered on a limited basis during these periods to check on other road users and caribou occurrence (PR#484 p3).

At the public hearing, GNWT advised that new disturbance and habitat loss for boreal caribou created by the All Season Road would be greater than CanZinc predicted. However, the GNWTs' prediction of 5590 ha of effective habitat loss from Project activities does not cause the percentage of disturbed habitat in the Northwest Territories boreal caribou range to fall below the 65% threshold (the limit identified in the 2012 federal boreal caribou recovery strategy ) (PR#528 p144-145). The strategy's threshold of a minimum of



65% undisturbed habitat is required to achieve the recovery objective of a self-sustaining local population of boreal caribou (PR#190 p19-20).

At the hearing, GNWT advised that when the boreal caribou recovery strategy came out in 2012, there was 69% undisturbed boreal caribou habitat in the Northwest Territories range. As of fall 2015, there is roughly 66% undisturbed habitat remaining. Based on local knowledge and the fact that the Project is located on the edge of the boreal caribou range, the GNWT concluded that it is unlikely that the Project will lead to or accelerate declines of boreal caribou in the southern portion of the range (PR#528 pp145-146).

During questioning at the public hearing, Review Board member Yvonne Doolittle observed that the GNWTs' presentation showed variation in habitat disturbance levels in the northern and southern portions of the range. Ms. Doolittle questioned the GNWT on whether there were different levels of management and monitoring for boreal caribou in different areas of the range (PR#528 p184).

In its response, the GNWT advised that portions of the range in the north are well above the 65% threshold while areas near the Project are well below the threshold. Within the Dehcho and South Slave portion of the range, there was 50.5 percent undisturbed habitat as of fall 2015. At present, the GNWT views the boreal caribou population at the range level of the entire territory. Since there is currently over 65% undisturbed habitat in the territory-wide habitat range for boreal caribou, the GNWT believes the population as a whole is likely self-sustaining. The GNWT is developing a framework for range planning, with priority on the southern portion of the range. The framework is due in the fall of 2017 (PR#528 p184-185).

At the public hearing, Review Board member David Krutko asked the GNWT if it has baseline information for boreal caribou specific to this Project. Mr. Krutko also asked what type of baseline data the GNWT used for its conclusions on the potential impacts on caribou from the Project. In response, the GNWT advised that while it has been collaring boreal caribou since 2004, the Project is at the edge of the boreal caribou range and it does not have any collar data specific to the Project area. The GNWT stated that it has tried to collar caribou several times unsuccessfully in the Project area. When asked by Mr. Krutko whether other types of surveys have been conducted, the GNWT stated that there have been no incidental boreal caribou sightings during moose and bison surveys in the Project area. The GNWT's biologist who conducted these surveys further stated that boreal caribou are found about 40 km away from the Project area towards Antoine Lake on the north side of the Liard River (PR#528 p178-179).

During the public hearing, CanZinc defended its predicted boreal caribou habitat disturbance calculation of 1,700 ha, stating that it already has a winter road permit for portions of the alignment that have not changed (PR#528 p17). In its disturbance calculation, CanZinc subtracted the Permitted Winter Road area and did not include borrow sources and access roads (PR#528 p17).

### **6.1.5 Baseline information gaps for collared pika**

Parks Canada's technical report states that the baseline data collection proposed by CanZinc with respect to collared pika, a species of special concern on Schedule 1 of SARA, is insufficient to inform the mitigations and monitoring legally required under SARA. CanZinc has proposed surveys to identify areas of pika occupation. However, in its technical report, Parks Canada indicates that this will "only allow detection of change in distribution and (will not) provide adequate information to detect changes in population" (PR#452 p18). Parks Canada further believes that CanZinc has not adequately demonstrated that the road alignment and proposed mitigations are protective of pika habitat, and that "road construction and operation could therefore have a greater impact than predicted" (PR#452 p18).

In its technical report, Parks Canada made two recommendations regarding baseline information requirements for collared pika:

- 1) CanZinc shall survey the proposed All Season Road alignment and proposed borrow sources from km12-39 to determine species presence, distribution and relative abundance.
- 2) Based on this updated baseline information data, the developer shall update its effects assessment on collared pika, including any additional required mitigations to prevent significant adverse impacts (PR#452 p19).

In its response to Parks Canada's recommendations, CanZinc stated that a survey of collared pika was completed and that it commits to conducting pre-construction disturbance surveys in collaboration with Parks Canada and GNWT (PR#484 p10). In addition, CanZinc agreed to include a monitoring program for collared pika in its WMMP and to collaborate with Parks Canada and GNWT to monitor Project impacts (PR#484 p39).

At the public hearing, Parks Canada advised the Review Board that while CanZinc has committed to conducting presence-absence surveys for pika in gravel pits from km 12 -19, these surveys do not provide adequate information to detect population changes. As a result, Parks Canada believes this type of survey will not provide adequate baseline

information to inform the mitigations and monitoring required, but noted that any baseline survey must be completed prior to permitting. Parks Canada asked that CanZinc provide an updated effects assessment and develop a systematic monitoring program for collared pika following the survey. Parks Canada also stated that this baseline survey must be completed prior to permitting (PR#528 p74-75).

During the hearing, GNWT advised the Review Board that it does not necessarily disagree with CanZinc's conclusion that impacts on pika from the Project are predicted to be low. However, the GNWT added that there is sufficient uncertainty in the effectiveness of the proposed mitigation to warrant long-term monitoring, particularly given the species' at risk status (PR#528 p143).

To address this, GNWT also recommended longer-term monitoring of pika population, relative abundance distribution, and patch occupancy in talus habitats and within a certain distance of the road. GNWT stated its willingness to be part of discussions between Parks Canada and CanZinc on what the monitoring program will look like and how or if it will be incorporated into the Wildlife Mitigation<sup>2</sup> and Monitoring Plan (PR#528 p143).

In its public hearing presentation, CanZinc advised that it has committed to do an additional presence-absence and distribution survey for potential pika habitat within the Project area. CanZinc stated it is currently discussing the format and schedule for those surveys with Parks Canada (PR#528 p17-18).

#### **6.1.6 Project interactions and developer predictions on impacts on wildlife**

Project interactions with wildlife and wildlife habitat were described in the DAR and updated in the DAR Addendum for the construction, operations and closure phases of the Project. . The Project interactions that may affect wildlife and wildlife habitat that were considered by the developer include (PR#102, Appendix C, pp1-9):

- Clearing of vegetation for road, borrow pits
- Dust loading to vegetation from vehicles and borrow pits
- Noise from vehicles, equipment, borrow pits and blasting activities
- Visual disturbances from Project activities
- Fire risk

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<sup>2</sup> Also referred to as a wildlife management and monitoring program (e.g., in the *Wildlife Act*).

- Access
- Accidental spills from vehicles at camps, barge landings, borrow pits or along the road
- Erosion
- Altered drainage patterns
- Waste management
- Vehicle collisions and mortality
- Human-wildlife interactions

Throughout the remainder of the analytical phase of the EA, discussion regarding pathway analysis focussed primarily on direct and indirect habitat loss, impacts from disturbance (noise, dust, visual), human-wildlife interactions, and vehicle collisions and mortality. This chapter focusses on the impact pathways that generated the most discussion between parties.

In the DAR Addendum, the developer described impacts from the Project on wildlife within Nahanni National Park Reserve, and impacts on species at risk and other wildlife separately. This section combines impacts on wildlife both inside and outside Nahanni National Park Reserve, including species at risk. Impacts on traditional harvesting activities are discussed in Chapter 7. In the DAR Addendum, the developer: proposed mitigations to reduce impacts on wildlife, predicted whether there would be residual impacts after mitigation, and provided its opinion on the significance of any residual impacts (PR#102 pp12-13). The developer's impact predictions and significance determinations are described in the following subsections.

#### ***Impacts from habitat loss and fragmentation***

In its DAR Addendum, CanZinc predicted direct impacts from the Project causing loss of wildlife habitat for areas within and outside of the NNPR (PR#102 p 162-165 and p203-208). Based on its effects assessment criteria, CanZinc predicted that direct loss of habitat for individual wildlife species would be negligible to low and that the habitat loss from the Project overall would be of low significance (PR#102 p 164-165).

In a second round information request, Environment Canada requested a revised effects assessment of habitat loss and fragmentation for the entire All Season Road alignment and preferred alignment options for migratory birds including avian species at risk (PR#320 p19). In response, CanZinc submitted a revised effects assessment that considered direct habitat loss for migratory birds and species at risk (PR#341 p7-10). The developer presented direct and indirect habitat disturbances from the Project on species at risk and

migratory birds (PR#341 p12). CanZinc provided recommended setback distances for Project activities from occupied nests of bird species at risk. The prediction for overall significance of adverse impacts from habitat loss and fragmentation was low (PR#341 p12).

In the DAR Addendum, CanZinc described baseline information related to Little Brown Myotis, Northern Myotis, and Western Long-eared Myotis, which are ranked as “may be at risk” in the NWT. Key habitats are overwintering areas, or hibernacula, in rock crevices and karst terrain. Caves and rock crevices in the Project area have the most potential as hibernacula, and possibly occur in the karst terrain between km 60 and km 64. According to CanZinc, the All Season Road has been re-routed from the original Permitted Winter Road route to avoid potential disturbances to these sinkholes and poljes (PR#102 pdf p48) and the developer does not consider myotis susceptible to Project-related disturbances since the All Season Road avoids karst features, which may support hibernacula (PR#102 p36-37 and PR#186 pp26-27).

#### ***Impacts on habitat effectiveness***

In its DAR Addendum, CanZinc stated that without mitigation, the Project may indirectly change the quality of habitat adjacent to the road and its ability to support wildlife species. Potential changes to habitat effectiveness may occur during construction, operations, and closure phases of the Project. The developer stated that changes in habitat effectiveness relate primarily to dust accumulation on plants (including metal accumulation) changes in plant community composition, as well as habitat alteration from localized erosion, spills and altered drainage patterns (PR#102 p208). The developer specifically identified testing and monitoring of soil for contaminant loading along the road right-of-way, as described in the Contaminant Loading Management Plan, as a measureable parameter for habitat effectiveness during the life of the Project (Appendix C, commitments #151, #152). With implementation of mitigation, the developer predicted the overall significance of impacts from the Project to habitat effectiveness to be low, with no residual impacts anticipated (PR#102 p212).

#### ***Impacts on abundance and occurrence of wildlife***

In its DAR Addendum, the developer described impacts from the Project on wildlife species in terms of sensitivity to disturbance (avoidance behavior), level of attraction and vulnerability to road mortality. Disturbances from road construction and use included noise and visual impacts that may cause a range of reactions in different species. Depending on their sensitivity to disturbance, wildlife species may alter the size or location

of their home ranges, interrupt sensitive life stages, avoid preferred habitat and may alter population abundance and occurrence (PR#102 p213).

The DAR Addendum described potential sensitivities from Project disturbances to species at risk. Winter construction may disrupt collared pika, wood bison and northern goshawk, while other species at risk are not present in the winter. The developer stated that the species assessed are generally most sensitive to disturbance in summer in nests, dens and calving sites and that the Project will interact with species during these sensitive time periods during the operations and closure phases. CanZinc stated however that these potential impacts are reversible over the life of the Project and proposed the following mitigations to reduce direct Project-related disturbances (PR#102 p217):

- discouraging non-mine related traffic by operating the barge as private crossing;
- restricting use of the road to the extent possible using a check-point station;
- enforcing low speeds to reduce noise and visual disturbance (60 km/hr);
- communication between mine vehicles by radio to alert drivers of wildlife;
- giving right-of-way to all wildlife and stopping for all wildlife on or immediately adjacent to the road; and,
- prohibiting use of salt for winter road maintenance to avoid wildlife attraction.

The developer predicted that the overall significance of Project impacts on the abundance and occurrence of wildlife species at risk will be low with adherence to mitigation, with no residual adverse impacts anticipated (PR#102 p219).

#### ***Impacts on wildlife dispersal and local movement***

In the DAR Addendum, CanZinc stated that changes to movement patterns for species depend on their 1) sensitivity to disturbances from Project activities, 2) the extent of and sensitivity to habitat connectivity, and 3) its movement capabilities. In its effects assessment, the developer noted that routing of the road limits disturbance on assessed species' local movements and dispersal by minimizing habitat loss and fragmentation, keeping traffic volumes and speeds low and reducing proximity of Project activities to important habitats. For example, some of the route realignments avoid wetland habitat, which prevents disturbance to feeding areas for bird species at risk (PR#102 pp219-221).

CanZinc proposed mitigations to maintain opportunities for wildlife to cross the All Season Road, including low vehicle speeds and a policy of granting all wildlife right-of-way along the road if crossing or attempting to cross. The developer stated that if mitigations are followed, impacts on movement and dispersal from Project activities are considered

negligible to low in magnitude and reversible at Project closure. CanZinc predicted an overall low level of significance of impacts on wildlife dispersal and movement (PR#102 p221).

***Impacts on health and survival including risk of Project-related mortality***

Risk of mortality to traditionally harvested wildlife species is discussed in Chapter 7. In the DAR Addendum, CanZinc stated that the risk of Project-related mortality from temporary and permanent structures was assessed as part of the Permitted Winter Road and has therefore not been considered.

The DAR Addendum noted that no overhead electrical wires will be installed at or along the access road and that these wildlife mortality risks were therefore not assessed (PR#102 p222). The developer further advised that clearing for construction will only occur during the winter months at a time when most species at risk are not present, with the exception of collared pika, wood bison and northern goshawk.

According to the developer, vehicle collisions with wildlife could result in direct mortality. As a result of Project design, moose or caribou could become trapped on the road in the high valley walls or between snowbanks (PR#102 p128). Moose, grey wolf and Dall's sheep may be attracted to the road and therefore be more likely to be involved in a collision (PR#102 p128). Additionally, vehicle collisions could disproportionately affect less agile wildlife (for example, beaver) that are susceptible to traffic-related mortality (PR#102 p128).

In its DAR Addendum, the developer stated that traffic and equipment during the operations and closure poses the greatest risk to bird species at risk and wood bison, particularly during the summer months. These species may be attracted to the road right-of-way and the forested edge in order to forage and hunt, therefore having the greatest potential to be hit. Wood bison are known to be a problem on NWT highways and vehicle collisions can cause significant damage to vehicles, risk human life, and kill bison (PR#102 p222). In its DAR Addendum, CanZinc determined the impacts on wood bison resulting from direct mortality from vehicle collisions to be moderate in magnitude, duration and frequency, with a low likelihood since traffic volumes and speed limits are low (PR#102 p223).

According to the DAR Addendum, bird species at risk may be attracted to the vegetation transitions (edge effects) created by clearing of the road right-of-way) and may hunt along the road, particularly in low traffic volume scenarios. While mortality due to vehicle collisions is possible, the developer stated that vehicle collisions are not expected to occur



to a large enough extent to affect local populations. Project activities may also affect species at risk through increased predation risk. Predators may be attracted to the road corridor to hunt, feed on carcasses (including from hunter harvests), or by deliberate feeding by Project employees (PR#102 p223). During road operations, species that are more tolerant to Project activities, such as wood bison, common nighthawk and forest raptors, are at greater risk of road-related mortality. The DAR Addendum noted that Project design mitigations reduce the risk of mortality associated with construction and operation of the road by (PR#102 p224):

- completing clearing and most construction activities during the winter when many species at risk are not present;
- routing the Project at least 100 m from open water bodies which are preferred nesting and feeding areas for some assessed species; and,
- maintaining low traffic volumes and speeds and re-aligning the route away from identified wildlife areas.

The DAR Addendum presents additional mitigation including updating the *Waste Management Plan* to reduce mortality from attractants, enforcing maximum traffic speeds, radio communication between vehicles, reporting by environmental monitors, and educating employees and contractors (PR#102 p224-225). These and other mitigations to reduce impacts from direct mortality to species at risk and other wildlife are outlined in the *Wildlife Monitoring and Management Plan* (PR#297). A complete list of Project design mitigations is found in Appendix C of Appendix E of the DAR Addendum (PR#102). CanZinc will report the total number of wildlife-vehicle collisions to test the effectiveness of its mitigations (PR#102 p221-226).

The developer predicted that adverse impacts on assessed species due to Project-related mortality will be low and that Project activities that lead to mortality will be reversible following closure and reclamation of the All Season Road; as a result, residual impacts are not anticipated (PR#102 p226).

### ***Impacts on predator-prey relationships***

Impacts on predator-prey relationships for gray wolf, boreal caribou, moose and Dall's sheep are discussed in the context of traditionally-harvested wildlife (see Chapter 7). For other wildlife species and species at risk, the developer stated that appropriate mitigations have been incorporated into Project design. These mitigations include removing carcasses from the road and adherence to a waste management plan (PR#102 p139-140). After

mitigation is applied, the developer predicts that impacts on predator-prey relationships will be low in significance, with no residual impacts predicted (PR#102 pp229-230).

### **6.1.7 Impacts on migratory birds and bird species at risk**

In its technical report, ECCC recommended a number of mitigations to ensure that direct and indirect impacts of the Project do not adversely affect migratory birds. For example, ECCC notes planned mitigations such as avoiding clearing activities during general nesting periods for migratory birds, but points out that “breeding periods may vary from year to year” and may vary in the mountainous landscapes occurring in the Project area, and will require adaptive management and monitoring to ensure that impacts are properly measured and mitigated. ECCC’s recommendations, include suggestions such as (PR#448 p21):

- carrying out all phases of the Project in a manner that protects migratory birds;
- the use of non-intrusive search methods when surveying for evidence of nesting prior to the commencement of clearing activities;
- considering options such as avoiding, adapting, rescheduling or relocating activities if there are indications of migratory bird nests where disturbance activities are proposed;
- halting all disrupting activities in nesting areas if nests containing eggs or young are discovered;
- a buffer zone for forest songbirds incorporated into the WMMP; and
- contacting ECCC for advice or additional mitigations if required.

ECCC made specific recommendations to minimize noise to protect trumpeter swans, which have been acknowledged as sensitive to disturbance by the developer, and are classified as “sensitive” in the NWT. ECCC supports the existing mitigations proposed by CanZinc to protect trumpeter swans, but wishes to see them strengthened by a) reducing noise levels to below 50 dB within 800m of trumpeter swans and b) ensuring that monitoring and mitigation efforts are focused where the Project overlaps the Southeastern Mackenzie Mountains Key Migratory Habitat Site, which is used as nesting habitat by approximately 8% of the breeding trumpeter swan population in Canada (PR#448 p18).

In response to measures recommended by ECCC, CanZinc advised that a clearing schedule has been planned outside of the nesting season and for that reason, the developer does not anticipate a need for pre-clearing surveys. If clearing is required during the nesting season, CanZinc will work with ECCC to develop a pre-clearing survey design (PR#484 p42). With respect to the buffer zone for forest songbirds, the 250 m buffer between Project activities

and nests from Appendix C of the WMMP will be updated to include forest birds. CanZinc's environmental monitors will be responsible for identifying avoidance or relocation options for nests that may be disturbed by Project activities and will seek advice from ECCC on additional mitigation measures as required. CanZinc agreed to add this statement to the next version of the WMMP (PR#484 p42).

In response to ECCC's technical report, CanZinc stated that it will ensure that mitigation and construction monitoring focusses on the areas from km 98 to 117 where the Project overlaps the key Migratory Bird Habitat Site and where swans are observed. CanZinc acknowledges the concern that construction activities (if critical for development but excluding blasting) may occur within 800 m of trumpeter swans from April 1 to September 30 and commits to include crushing as a prohibited activity. If construction activities are required during the restricted period for trumpeter swans, those activities will be conducted with the assistance of a CanZinc environmental monitor (PR#484 p41). In its closing arguments, Parks Canada re-stated its view that there are potential significant adverse impacts from the Project on forest birds, waterfowl, and migratory birds, including SARA-listed species. Parks Canada stated that there is insufficient baseline data in the study area for it to determine the likelihood of those significant adverse impacts, and therefore disagrees with the developer's conclusion that adverse impacts on birds from the Project are of low significance (PR#546 p7-8). In Parks Canada's view, additional baseline information is required because specific mitigation to reduce impacts depends on the lifecycle and sensitivity of various bird species. A better understanding of population sizes of these species and their use of different habitats in the Project area is required to effectively mitigate significant adverse impacts on birds (PR#546 p8). Parks Canada acknowledged commitments made by CanZinc to mitigate impacts on birds, but does not agree that these commitments sufficiently address the following key concerns (outlined in measures 6, 7 and 8 of its technical report) (PR#546 p8, and REA Appendix D):

- the timing and methodology of baseline studies;
- an effects assessment based on complete baseline information;
- a systematic monitoring program; and
- an adaptive management framework based on impacts detected by monitoring within the WMMP.

In its closing argument, Parks Canada recommended that the Review Board include its technical report measures 6, 7, and 8 as measures in the Report of EA in order to mitigate potential significant adverse impacts on birds (PR#546 p8). Parks Canada further advised that these measures should be included in the Wildlife Mitigation<sup>3</sup> and Monitoring Plan, and expects that the WMMP will identify a suite of mitigations (including triggers) that will be updated based on baseline information and monitoring results. Parks Canada will review and approve the WMMP as a permit condition and expects that the adaptive management framework outlined in the WMMP will be activated by an annual review of monitoring results within an annual report (PR#546 p8).

Parks Canada summarized its position by stating that the potential significant adverse impacts on birds can be mitigated through the implementation of this measure and all of CanZinc's commitments (PR#546 p7).

In its closing argument, ECCC refers to its three technical report recommendations to monitor migratory birds and bird species at risk. ECCC advised that the developer has committed to these three recommendations by implementing an autonomous recording unit field program. ECCC acknowledged the commitments CanZinc has made to begin collecting required baseline data (PR#518) and has discussed monitoring protocols and study design with CanZinc (PR#544 pp4-5). Since CanZinc has committed to the collection of baseline data to validate its predictions, and has committed to ECCC's recommended mitigations, ECCC had no outstanding concerns related to migratory birds and bird species at risk (PR#544 p5).

ECCC noted that CanZinc has committed to its technical report recommendations specific to mitigating Project-related impacts on trumpeter swans. ECCC stated that CanZinc has committed to all of ECCC's technical report recommendations with respect to migratory bird mitigation and monitoring, and committed to updating the WMMP to incorporate these changes. These include commitments to protect bird species at risk from quarry operations. ECCC advised that it therefore has no further concerns related to bird species at risk or migratory bird mitigation or monitoring (PR#544 p7-8).

In its closing argument, CanZinc responded to measures proposed by Parks Canada noting that ECCC did not consider measures to be necessary for birds. With respect to Parks Canada's measure #6 recommending additional baseline data, CanZinc noted that it has

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<sup>3</sup> Also referred to as a wildlife management and monitoring plan.

agreed to conduct a pre-development survey to establish a baseline (PR#553 p7). Acoustic monitoring units have already been placed along the road with assistance and input from Parks Canada and ECCC. CanZinc therefore believes that it has addressed Parks Canada's recommendation #6 (PR#553 p7).

CanZinc does not support Parks Canada's recommendation #7, which requests an updated effects assessment that considers the new baseline work prior to permitting. Instead, in its closing argument, CanZinc stated that (PR#553 p7):

the data from the bird surveys will be incorporated into adaptive management plans, and may, in turn, result in further mitigation actions. This we commit to (Commitment #161 modified), but not PC's recommendation 7 as written.

The modified commitment #161 from CanZinc's closing argument states that (PR#553 p20):

Additional baseline wildlife surveys for forest and wetland birds are planned for the May to June window, with input from ECCC and Parks Canada. The resulting data will be incorporated into adaptive management plans and may result in further mitigation actions. A suitable operations phase monitoring program will be developed with input from Parks Canada. At the time of the baseline bird survey, additional waterfowl and cliff-nesting raptor surveys may be conducted concurrently, and the black bear habitat potential maps may be updated with any new relevant information.

Similar to its position on other wildlife monitoring, CanZinc stated that it is amendable to developing a suitable monitoring program for birds with input from Parks Canada, and that the details of this program can occur during the regulatory phase. The developer accepted the development of a monitoring program during the regulatory phase as a commitment, but stated that the monitoring proposed in Parks Canada's recommendation #8 is too broad in scope at this stage and should not be adopted (PR#553 p7).

In its closing arguments, CanZinc explained that based on its commitments for baseline surveys, mitigation and monitoring as described in this section, it believes that measures for birds are not necessary (PR#553 p7).

### **6.1.8 Impacts on northern mountain caribou**

As described in Section 6.1.3, there is a lack of consensus between parties regarding the use of the Project area by northern mountain caribou. Figure 6-2 shows a northern mountain caribou. In Parks Canada's opinion, northern mountain caribou do occupy the Project area, and are therefore "reasonably expected" to be affected by the Project (PR#452 p13). Specific impacts of the Project on northern mountain caribou could include avoidance of

the road resulting in habitat fragmentation and loss of habitat effectiveness, noise disturbance, increase in predation risk and direct mortality (PR#452 p14). Parks Canada therefore recommended, in its measure #2, the development of a systematic monitoring program that must (PR#452 p16):

- include annual aerial surveys to provide a population index and composition during rut, and possible track and scat surveys or the use of a camera trap design;
- demonstrate how the resulting data will be incorporated into adaptive management;
- be developed in collaboration with and approved by Parks Canada during the regulatory phase; and
- incorporate additional mitigations as required, such as timing windows or limited use within identified sensitive areas.

In response to technical report recommendations, CanZinc stated that it does not anticipate that the Project will have an adverse impact on northern mountain caribou. In CanZinc's view, the potential for significant impacts is low and the impacts are at the scale of individuals and not at the population level (PR#484 pdf p35).



**Figure 6-2: Northern mountain caribou**  
(PR#505 p3)

CanZinc agrees with Parks Canada's current data indicating a small number of sedentary individuals occur in the region and that the Parks Canada's collaring data shows seasonal variability of individual caribou occurring near the All Season Road. However, in CanZinc's



opinion, the proposed All Season Road represents an area where only a few individuals of the Redstone subpopulation are present (PR#484 p37). CanZinc agreed with Parks Canada that monitoring of mountain caribou is needed to directly correlate road-related activities with impacts on caribou, and to integrate effective mitigation and adaptive management (PR#484 p37).

In its closing arguments, Parks Canada reiterated its position that there are potential impacts on the northern mountain population of woodland caribou from the proposed Project (PR#546 p4). Parks Canada clarified that northern mountain caribou are a population of special concern on Schedule 1 of the *Species at Risk Act*. Section 79 of the *Species at Risk Act* requires Parks Canada to identify adverse impacts of Projects on the species, ensure that measures are taken and monitored to avoid or reduce impacts (PR#546 p4).

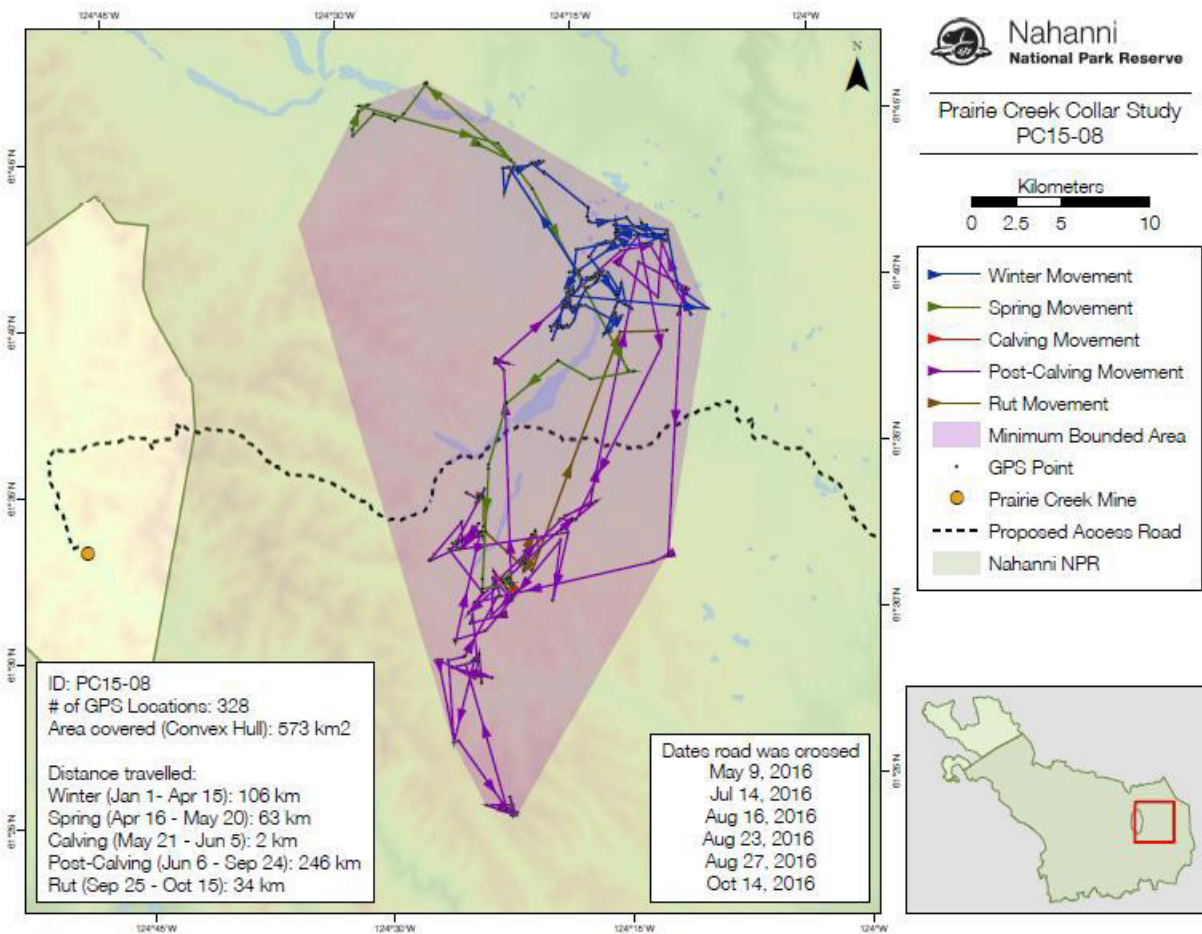
Parks Canada stated that supporting evidence characterizing these impacts and their likelihood is provided in scientific literature which demonstrates the adverse impacts of infrastructure such as resource roads on woodland caribou. This supporting evidence was submitted by Parks Canada as part of its technical report and is found on the public record (PR#429, PR#432, PR#434, PR#435, PR#436).

Parks Canada disagreed with CanZinc's conclusion that Project impacts on northern mountain caribou are low and disagrees with the developer's rationale that the Project area is "outside the defined species range" and "well outside known calving and wintering areas". In Parks Canada's opinion, these assertions are based on incorrect and outdated information and do not take Parks Canada's ongoing collaring Project results into account (PR#456 p4).

Parks Canada observed that information from hunting outfitters, Park staff observations, remote camera images, and recent collar data confirm year-round presence of caribou in the Project area. Since caribou are known to be in the area, Parks Canada concluded that construction and use of the All Season Road can be expected to affect them based on literature cited above (PR#456 p5).

With respect to baseline information and caribou presence in the area, Parks Canada noted that a census has never been completed and it is therefore not known how many caribou are part of the sedentary or migratory groups that either reside or seasonally occur in the Project area. Parks Canada provided preliminary analysis of raw collaring data to the developer in March 2017 and presented some of the findings at the public hearings in April 2017 (PR#528 pp70-73, PR#456 p4, PR#507)(See Figure 6-3).





**Figure 6-3: Mountain caribou collar study, Parks Canada**  
 (PR#507 p4)

In its closing arguments, Parks Canada observed that CanZinc’s proposed mitigations and commitments to reduce impacts on caribou do not address the need for systematic long-term monitoring of northern mountain caribou within an adaptive management framework. Parks Canada believes that its measure #2 (REA Appendix D) is essential to ensure that mitigations are effective at preventing significant adverse impacts on caribou, to address impacts detected by monitoring, and to satisfy its responsibilities under Section 79 of the *Species at Risk Act*.

In order to address significant adverse impacts, Parks Canada stated that (PR#546 p6):

[...]unless CanZinc updates their commitments table to include our requested measure 2, Parks Canada submits that the Board should recommend Parks Canada’s measure 2 (as outlined in PC’s technical report) in their Report of Environmental Assessment in order to prevent potential significant adverse impacts on Northern Mountain Caribou.

Parks Canada further advised that this measure be included in the Wildlife Mitigation and Monitoring Plan. Parks Canada expects that the WMMP will outline a caribou monitoring plan that includes adaptive management with a suite of mitigations (including thresholds) that will be implemented based on monitoring results. Parks Canada will review and approve the WMMP as a permit condition and expects that the adaptive management framework outlined in the WMMP will be activated by review of monitoring results in an annual report (PR#546 p6).

Parks Canada summarized its position by stating that potentially-significant adverse impacts on northern mountain caribou can be mitigated through the implementation of this measure in addition to all of CanZinc's commitments (PR#546 p6).

In its closing argument, LKFN remained concerned that there is the potential for significant adverse impact to mountain caribou – including both sentinel (sedentary) and migratory herds – from the All Season Road. In LKFN's view, CanZinc's conclusion of only a few mountain caribou in the Project area is inconsistent with the evidence. LKFN concluded that without proper baseline studies and ongoing monitoring, it is not possible to determine the extent or severity of impacts on caribou (PR#550 p4).

In its closing argument, LKFN agreed with Parks Canada that mountain caribou range data in the developer's DAR is both incorrect and outdated. LKFN advised the Review Board that it accepts Parks Canada's findings of the potential for significant adverse impacts on mountain caribou resulting from the proposed road (PR#550 p4). Mechanisms for this include avoidance of the road by caribou resulting in fragmentation and loss of habitat effectiveness, noise disturbance, increased predation risk and direct mortality (PR#550 p4).

Recommendations from LKFN's closing argument support Parks Canada's recommendations for systematic monitoring, mitigation and adaptive management. In addition, LKFN recommends local resource monitors from affected First Nations (PR#550 p4). The entire detailed recommendation can be found in Appendix D.

In its closing argument, DFN maintained that there is the potential for significant adverse impacts on northern mountain caribou from the All Season Road, particularly at the local population scale. DFN stated that this position is based on evidence presented in its own and Parks Canada's technical reports, as well as statements made by Parks Canada during the public hearings. In particular, DFN cited evidence from Parks Canada that (PR#549 p15):

...wildlife studies in the project area, albeit limited, consistently report caribou in the project area. Information from hunting outfitters, park staff observations, remote camera images, and recent satellite collar data confirm caribou in the project area and their year round presence, as well as calving activity in the area.

In DFN's view, there is insufficient evidence for CanZinc to determine that only "trace occurrence" of northern mountain caribou in the Project area. In order to prevent significant impacts on northern mountain caribou from the Project, DFN recommended that the Review Board adopt a measure. Similar to Parks Canada, DFN's recommendation outlines a requirement for systematic monitoring that links the monitoring with mitigation in an adaptive management framework. DFN also recommended annual reporting (PR#549 p15-16). The entire detailed recommended measure can be found in Appendix D.

In its closing argument, DFN notes that CanZinc has committed to numerous mitigation measures to reduce impacts on caribou. However, these mitigations are spread throughout numerous documents, appendices, responses to information requests and memos (PR#549 p24). . DFN concluded that significant adverse impacts on caribou could result due to a poor understanding of the Project mitigations. For example, DFN noted that if there is a change in management at CanZinc or if the company is sold, the commitments and mitigations could be unclear to the new management. In addition, numerous regulators will be involved in Project permitting and without clear commitments and mitigation measures it will be difficult for regulators to understand what was committed to during the environmental assessment (PR#549 p24-25).

In order to address this issue, DFN recommended in measure #12 of its closing arguments that the Review Board include detailed mitigation measures and commitments related to boreal caribou and northern mountain caribou. As part of this measure, DFN submitted a compiled list of mitigations in table format (PR#549 pp25-33).

To mitigate potential impacts from vehicle collisions or sensory disturbance on caribou, CanZinc plans to use wildlife warning signs at crossing zones (once identified), and travel at reduced speeds through these zones. CanZinc stated it is willing to work with Parks Canada and other parties on adaptive management actions and community-based monitoring (PR#528 p15-16). At the public hearing, CanZinc added that it will have environmental monitors from Nahanni Butte Dene Band on the road to record animal sightings among other duties. . Discussions with Parks Canada regarding monitoring will occur in the near future (PR#528 p22).

In its closing arguments, CanZinc agreed to develop a monitoring program for mountain caribou in collaboration with Parks Canada. However, the developer stated that Parks

Canada's recommended program, in particular the proposed aerial surveys, has a low potential to produce useful information for the purposes of adaptive management. CanZinc has nonetheless offered to provide logistical and financial support for these surveys (PR#553 p5).

In its closing arguments, CanZinc agreed with Parks Canada that there may be a small sedentary group of caribou at Sundog Lake that periodically cross the road. However, CanZinc advised that the vast majority of the herd are north and west of the Project. For this reason, CanZinc believes the potential for disturbance-related impacts is low and that the Project will not result in significant adverse impacts on mountain caribou (PR#553 p6). CanZinc stated it is amendable to reasonable and relevant monitoring of caribou but believes this can be done with Parks Canada during the regulatory phase. In CanZinc's opinion, an EA measure is therefore not necessary and Parks Canada's recommendation #2 is not appropriate (PR#553 p6).

In its closing arguments, CanZinc did not respond to DFN's position or recommended mitigations for northern mountain caribou.

#### **6.1.9 Impacts on boreal caribou**

CanZinc proposed that the All Season Road would directly affect 53.3 ha of boreal caribou habitat, or 1700ha if a 500m buffer is assumed (PR#371 p76/318). GNWT, however, indicated that this may underestimate the actual amount of caribou habitat affected by the Project since it a) does not include the Permitted Winter Road and b) may underestimate the zone of influence of the road for caribou, which other studies have indicated can be up to 5km (PR#455 p22). GNWT estimated that the actual amount of new habitat disturbance for the proposed All Season Road is 5590 ha, which includes the road, borrow sources and spur roads (PR#455 p24). Both DFN and ECCC supported the GNWT's footprint estimate (PR#459 p10, PR#448 p26), and ECCC further recommended that CanZinc review its disturbance estimates for the Project.

Boreal caribou are listed as threatened under both the federal SARA and the *NWT Species at Risk Act*. GNWT advised that the 2012 federal *Recovery Strategy for Woodland Caribou, Boreal population, in Canada* identifies a minimum of 65% undisturbed habitat must be maintained within each boreal caribou range. Despite an enlarged Project disturbance footprint, the GNWT indicated that the Project will likely only contribute ~0.01% new disturbance to the NT1 caribou range, which represents a single continuous boreal caribou range in the Northwest Territories extending from the Alberta/BC border to the Inuvialuit region and into the Yukon Territory. Moreover, even at the higher level of habitat

disturbance calculated by the GNWT and supported by other parties, the proposed Project would not cause the NT1 range to fall below the 65% undisturbed habitat threshold (PR#455 p24).

In its technical report, GNWT stated that the density and distribution of boreal caribou in the Project area is not well documented (PR#455 p21). According to GNWT, while CanZinc did not conduct formal surveys for abundance and distribution of boreal caribou during this EA, limited winter aerial survey work for caribou was conducted by CanZinc in 2011 (PR#446).

In response to GNWT's technical report recommendation #5 regarding the collection, management and use of wildlife sightings in an adaptive management context, CanZinc responded that "[i]n essence, we agree with the recommendation" (PR#484 p2). CanZinc elaborated that the Journey Management System (JMS) will assist in logging wildlife sightings and that any trends in wildlife sightings along the road would be discussed at pre-travel tailgate meetings. If a wildlife occurrence becomes common in a given area along the road, the supervisor of road operations would then consider formalizing a wildlife caution zone with signage. CanZinc further stated that road maintenance crews and environmental monitors will routinely be on the road and will record wildlife sightings and provide records of these sightings (PR#484 p2). In response to GNWT's recommendation #7, CanZinc advised that trail cameras could be considered during the operations phase on a limited basis for periods when there is no traffic on the road to check for caribou presence and other road users (PR#484 p3).

In response to ECCC's technical report recommendation on the adequacy of mitigation, CanZinc advised that it will consult with GNWT regarding the adequacy of mitigation and monitoring measures for boreal caribou (PR#484 p43). CanZinc agreed to incorporate its commitments to mitigate impacts on boreal caribou into a revised WMMP, and in addition, reiterated its acceptance of commitment #6 from the technical sessions. This commitment states that (PR#246 p1):

CanZinc commits to installing windrows, lumber, or other brush clearing material to discourage access (and limit sightlines) to the road corridor by wildlife and humans at intersections with linear features.

Local knowledge provided at the Cultural Impacts technical session in Nahanni Butte (PR#275 p7) confirms that boreal caribou are found in the Project area. Community members identified areas along the road where caribou were observed and harvested (PR#275 p7). GNWT has had limited success in locating animals to collar and has not conducted any formal aerial surveys west of the Liard River (PR#528 p158).



In its technical report, GNWT observed that the developer's approach to obtain site-specific information (by documenting wildlife sightings along the road) that will inform adaptive management of collision risks is vague. GNWT notes that it is not clear how sightings from various mine users of the road will be recorded, georeferenced, and entered into a database. Further, in GNWT's view, it is not clear how this information will be analyzed in combination with other data sources (e.g., formal surveys of high-value habitat that has been identified) to inform site-specific mitigations. GNWT stated that technologies such as trail cameras and wildlife sighting applications could be effective in a formalized program; a well-designed camera study, for example, can identify whether wildlife is more likely to cross the road in a particular high-value habitat location (PR#455 p18).

In order to minimize direct impacts on wildlife including boreal caribou from collisions along the All Season Road, GNWT recommended that CanZinc develop a more formal, detailed approach to identifying and communicating seasonal "wildlife caution zones" in its WMMP. Specifically, GNWT's recommendation #5 states that the WMMP include (PR#455 p18):

- how information collected by drivers will be collected and recorded;
- which datasets will be used to identify "wildlife caution zones" and how often they will be combined and analysed;
- tools that might be used to facilitate recording and georeferencing; and
- how often the need to add, remove or change signage will be assessed and reported on (seasonally, annually).

In addition, GNWT's recommendation #7 from its closing argument states (PR#551 p11):

GNWT recommends that Canadian Zinc consider designing and implementing as part of its WMMP a trail camera study along the Territorial Lands portion of the all-season road alignment west of the Liard River to confirm presence of boreal caribou and evaluate the need for further monitoring of boreal caribou in this area. This program, including the identification of appropriate study locations, can also help to confirm the effectiveness of mitigations to deter public access on the road.

In its closing arguments, GNWT advised that it supports CanZinc's conclusion that significant adverse impacts on wildlife within GNWT's jurisdiction (which includes boreal caribou) are not likely. GNWT believes that adaptive management will help ensure that potential impacts remain below the level predicted in its technical report, and thus predicted no likely significant adverse impacts from the Project (PR#551 p6).

In GNWT's view, the monitoring and mitigation for wildlife outlined in CanZinc's August 31, 2016 WMMP (PR#27) forms part of an adaptive approach to managing Project interactions

with wildlife. With respect to wildlife including boreal caribou, GNWT believes that the developer has committed to providing necessary monitoring and mitigation in its final WMMP, apart from GNWT's updated recommendations described in this section and recommended adjustments to the scope of development<sup>4</sup> (PR#551 p6).

In its closing arguments, GNWT restated its position that it disagrees with the developer's calculation of boreal caribou habitat disturbance from the Project. However, GNWT maintains that even using its own disturbance calculations, the Project does not cause the percentage of disturbed habitat to fall below the 65% undisturbed habitat threshold identified in the 2012 federal *Recovery Strategy for the Woodland Caribou, Boreal population, in Canada* (PR#551 p7).

GNWT noted that it has obligations under the federal recovery strategy and objectives under its own territorial strategy for boreal caribou. In order to meet these obligations, GNWT is developing a framework that outlines an approach to boreal caribou range planning. This framework will be ready for public review and consultation in the fall of 2017 (PR#551 p7).

GNWT stated that, in its view, a trail camera study along the road would provide greater certainty about boreal caribou presence in the Project area and the potential need for further monitoring or mitigations. GNWT noted that CanZinc had modified commitment #3 from the April 7 commitments table (PR#485) to include "consideration of using cameras during periods of fall and spring road closure, and at night, to check on other road users and caribou occurrence" (PR#484 p3). However, GNWT believes that cameras should be used continuously throughout the year to increase the likelihood of detecting boreal caribou. GNWT therefore reiterated recommendation #7 from its technical report as follows (PR#455 p22):

GNWT recommends that Canadian Zinc consider designing and implementing as part of its WMMP a trail camera study along the Territorial Lands portion of the all-season road alignment west of the Liard River to confirm presence of boreal caribou and evaluate the need for further monitoring of boreal caribou in this area. This program, including the identification of appropriate study locations, can also help to confirm the effectiveness of mitigations to deter public access on the road.

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<sup>4</sup> See Section 2.1.2 for more on GNWT's recommended changes to the scope of development.



GNWT provided an update on recommendation #8 (technical session commitment #6) from its technical report (this recommendation is also commitment #81 in the April 7 commitments table) (PR#485). It states that “CZN commits to installing windrows, lumber, or other brush clearing material at intersections with other linear features to discourage access (and limit sightlines) to the road corridor by wildlife and humans”, CanZinc agreed to incorporate this commitment into the WMMP in its response to technical reports and GNWT is therefore satisfied that this commitment will be addressed. GNWT submitted a revised recommendation #8 stating (PR#551 p11):

The GNWT acknowledges the developer’s commitments concerning boreal caribou habitat and to revise the WMMP to incorporate Commitment #6 from the technical sessions. GNWT recommends that the MVEIRB recognize these commitments as developer’s commitments to be included in the scope of development for this EA and captured in the Report of Environmental Assessment.

Measure #8 further requests that the Review Board “[i]nclude the developer’s commitments in the scope of development and the Report of Environmental Assessment” (PR#551 p11).

With respect to the disagreement between the developer and GNWT on the boreal caribou habitat disturbance estimate, ECCC’s buffered estimate within the NT1 boreal caribou range is consistent with the GNWT’s (PR#544 p8-9). In its closing argument, ECCC acknowledges that while the contribution of the Project to the disturbance levels in the entire NT1 range is small, accurate disturbance estimates are important when evaluating cumulative effects. The technical report recommendation for boreal caribou from ECCC asked the developer to review habitat disturbance estimates and consult with GNWT on these estimates as well as on the adequacy of mitigation and monitoring. In its closing argument, ECCC acknowledged that the developer has committed to consulting with the GNWT regarding the adequacy of proposed mitigation and monitoring measures for boreal caribou (PR#544 p8-9).

LKFN, in its closing argument, primarily focused its discussion on potential impacts, a significance finding and recommendations related to the mountain woodland eco-type of caribou found within NNPR. However, a portion of recommendation #12 addresses potential impacts along the entire road route and is relevant to the boreal woodland eco-type. This recommendation requests that the Review Board require that CanZinc “develop a monitoring program to address potential impacts on the caribou from the construction and operation of the all season road throughout the project area” (PR#550 p4).

CanZinc states in its closing argument that it agrees with GNWT’s view that the Project does not cause the percentage of disturbed habitat to fall below the 65% threshold

identified in the federal recovery strategy. CanZinc also agrees with the GNWT statement that “the Project falls within the edge of the boreal caribou range and local knowledge and limited aerial survey data suggest that densities are low” (PR#553 p3).

#### **6.1.10 Impacts on collared pika**

The developer stated that collared pika overwintering sites in talus are at greatest risk during the construction phase and that construction activities at talus slopes and in borrow pits may kill pikas. In the developer’s view, potential mortality is considered moderate in magnitude, low in duration and geographic extent, with a moderate likelihood of occurrence without mitigation (PR#102 p222).

The July 2016 field survey demonstrated that collared pikas are present in talus habitat as far east as km 38 along the road route (PR#289). Figure 6-4 shows a collared pika. Construction and operation of the road and proposed borrow pits, particularly along Sundog Creek, could result in direct habitat loss for collared pikas, which are a species at risk. In response to a second round information request, CanZinc identified ways to mitigate adverse impacts on collared pikas. CanZinc committed to (PR#341 p13):

- avoiding talus to the extent possible, and conducting presence/not detected collared pika surveys in all borrow sources selected for development and along the proposed All Season Road alignment that disturbs talus;
- re-aligning a section of the proposed All Season Road that was once on, or adjacent to, talus habitat at km 34.8 to 39 in the lower Sundog Creek area;
- conducting pika surveys to determine their presence prior to development (such as of the road alignment and borrow sources) in pika habitat;
- using a replacement borrow source should pikas occupy a proposed borrow source or portion thereof, prior to development; and,
- replacing borrows sources 33 and 34 should pikas be determined to be present prior to development unless significant unoccupied portions exist beyond the designated buffer to pikas.

In its technical report, Parks Canada notes that the Project has the ability to affect collared pika, a species of Special Concern on Schedule 1 of SARA, due to (PR#452 p18):

- clearing of the right of way, causing direct loss of habitat and fragmentation;
- construction, blasting and traffic noise impacts on mating and breeding success;
- snow plowing and other maintenance activities affecting habitat;
- direct mortality;

- alteration of habitat increasing edge effects, including predation;
- introduction of invasive species to the alpine environment; and
- dust impacts on pika habitat and food sources.

Parks Canada believes that the mitigations proposed by CanZinc will help to reduce impacts on pika, but that additional mitigations may be required “depending on the lifecycle and distribution of the species”. As such, Parks Canada recommends the development of a “systematic monitoring program” to address potential impacts of the Project on collared pika, and to link this monitoring program with adaptive management actions. Parks Canada further requires that “until further notice, CanZinc shall provide annual monitoring updates to Parks Canada to ensure that appropriate management responses/adjustments can be implemented” and that these adjustments must be approved by Parks Canada (PR#452 p19).



**Figure 6-4: Collared pika**  
(PR#505 p3)

In its response to technical reports from parties, CanZinc advised that it will update its WMMP to include the commitments outlined in its response to second round information request MVEIRB IR#5 (PR#484 p44). The commitments are as follows (PR#341 p13):

Additional mitigation, beyond that previously identified in the DAR (e.g., low truck volumes, reduced traffic speeds, dust suppression, response to accidental spills, prohibit littering) specific to collared pika are:

- prohibit the storage of snow, including along roadside snow banks, on or within 10 m of talus habitat (within pika range);
- prohibit the disturbance of talus habitat (within pika range) year round unless pre-disturbance presence/not detected surveys have been completed and pikas were determined to be not present; and
- if required, determine a sufficient buffer distance from which borrow construction can occur near active pika habitat, based on guidance from a biologist. CZN will update the Commitments Table to reflect these commitments.

In addition, CanZinc will develop a monitoring program for collared pika in collaboration with GNWT and Parks Canada to monitor potential impacts from the All Season Road (PR#484 p44).

In its closing argument, Parks Canada restates its view that there are potential significant adverse impacts from the Project to collared pika. Parks Canada does not support the developer's prediction that the Project has a low potential for significant adverse impacts, because there is a lack of baseline information on distribution and abundance of pika to make such a finding. Parks Canada observes that information on abundance and population size is necessary for baseline and future monitoring to meaningfully detect impacts from the Project on the species (PR#546 pp6-7).

Parks Canada points out that over the course of the EA, CanZinc has made a number of commitments to mitigate the impacts on pika (PR#485) including:

- a presence absence survey from km 12-39 (commitment #176);
- specific mitigations for pika (commitment #179); and,
- long-term monitoring (commitment #198).

In addition, discussions between Parks Canada and CanZinc have resulted in an informal commitment to conduct relative abundance surveys for pika during the summer of 2017 (PR#546 p5). Parks Canada advises that while it is pleased with commitments to date, key concerns remain including; survey methodology, timing of surveys, updating the effects assessment based on the surveys and an adaptive management framework in the WMMP as described in technical report measures 3,4 and 5 (sections 6.2.4 and 6.2.8 in this report) (PR#546 p7). In its closing argument, Parks Canada recommends that (PR#546 p7):

Unless CanZinc updates their commitments table to reflect our requested measures 3, 4 and 5, Parks Canada submits that the Board should recommend measures 3, 4 and 5 (as outlined in PC's technical report) in their Report of Environmental Assessment in order to mitigate potential significant adverse impacts on collared pika.

Recommended measures 3, 4 and 5 from Parks Canada's technical report, referenced above, can be found in Appendix D. The recommendations provide details on the timing and methodology for required baseline studies prior to permits being issued, identification of specific mitigations prior to permits being issued and a systematic monitoring and adaptive management program (PR#546 p7 and Appendix D in this report).

Parks Canada further states that these three recommended measures will be included in the Wildlife Mitigation and Monitoring Plan. Parks Canada expects that the WMMP will identify a suite of mitigations (including thresholds and triggers) that will be updated based on baseline information and monitoring results. Parks Canada will review and approve the WMMP as a condition of a permit and expects that the adaptive management framework outlined in the WMMP will be activated by review of monitoring results within an annual report (PR#546 p7).

Parks Canada summarizes its position by stating that the potential significant adverse impacts on collared pika can be mitigated through the implementation of these three recommended measures and all of CanZinc's commitments (PR#54 p7).

GNWT reiterated in its closing argument that there is sufficient uncertainty to warrant long-term monitoring of the collared pika population. To address this uncertainty, collared pika abundance, distribution and patch occupancy in talus habitat should be included in monitoring (PR#551 p7). GNWT acknowledges CanZinc's commitment, which states:

CanZinc will update the WMMP to include Collared Pika monitoring program in collaboration with Parks Canada and the GNWT to monitor potential effects associated with the proposed all season road. [...]CanZinc will include in its final WMMP the Collared Pika commitments outlined in its response to MVEIRB IR#5 (PR 320) and will conduct long term monitoring of Collared Pika abundance and patch occupancy in talus habits within 300 m of the road.

GNWT advises that this commitment addresses its technical report recommendation #6, provided the Review Board recognizes the commitment as a developer's commitment to be included in the scope of development for this EA and captured in the Report of Environmental Assessment (PR#551 p7). In its closing arguments, the GNWT's revises its technical report recommendation #6 to state (PR#551 p11):

The GNWT acknowledges the developer's commitments with regard to Collared Pika and recommends that the MVEIRB recognize these commitments as developer's commitments to be included in the scope of development for this EA and captured in the Report of Environmental Assessment. The GNWT agrees that the specifics of this monitoring can be discussed during the regulatory phase.

In its closing argument, CanZinc stated that in its view, it has committed to Parks Canada's recommended measure #3 regarding collared pika surveys. The commitment is described in the modified commitment #231 (Appendix C). It reads as follows (PR#553 p31):

CZN will include in its final WMMP the Collared Pika commitments outlined in its response to MVEIRB IR#5 (PR 320), and will conduct long-term monitoring of Collared Pika abundance and patch occupancy in talus habits within 300 m of the road, with input on study design from the GNWT and Parks Canada. The resulting data from surveys will be incorporated into adaptive management plans and may result in further mitigation actions.

In its closing arguments, CanZinc contended that additional baseline data requested by Parks Canada is not justified because it is unlikely to change predicted impacts from the Project. While committing to baseline data collection and incorporating it into adaptive management, CanZinc did not commit to Parks Canada's request for an updated effects assessment in its recommendation #4 (PR#553 p6).

CanZinc stated that it is amenable to developing a suitable monitoring program for collared pika with input from Parks Canada. CanZinc contends that the details of this monitoring can be determined during the regulatory phase. The developer accepts this as a commitment, but feels that the monitoring proposed in Parks Canada's recommendation #5 is too broad in scope at this stage and should not be adopted (PR#553 p6).

In its closing arguments, CanZinc stated that, based on its commitments for baseline surveys, mitigation and monitoring as described in this section, it believes that measures for collared pika are not necessary (PR#553 p6).

### **6.1.11 Wildlife Management and Monitoring Plan**

Many of the developer's mitigations for reducing Project impacts on wildlife are documented in its WMMP (PR#270). Key mitigations outlined in the WMMP to reduce the attraction of wildlife to the road and camps include (PR#270 p 11):

- prohibiting littering;
- prohibiting salt on the roads;
- eliminating human waste and wildlife carcasses on the road;
- following its Waste Management Plan; and
- following the GNWT Camp Waste and Wildlife Attraction Guideline.

Key mitigations described in the WMMP to reduce impacts on wildlife from vehicle collisions include (PR#270 p11):



- highly visible signs to indicate “wildlife caution zones,” areas;
- a wildlife advisory system to communicate and record wildlife sightings in the Project area; and
- give wildlife the right-of-way when crossing; and speed limits that will be implemented and enforced.

A number of parties expressed concern in their technical reports that mitigation actions committed to by CanZinc need to be formalized either in the Wildlife Mitigation and Monitoring Plan or as required Project description components (PR#549 p24, PR#551 p8). Dehcho First Nations (DFN) highlighted a number of key actions for boreal and northern mountain caribou from both the current environmental assessment (EA) and from EA0809-002 (for the Permitted Winter Road) that have not been incorporated either into the WMMP or the commitments table (PR#459 p12).

In order to fulfill the requirements of Section 79 of SARA, Parks Canada has recommended the development of a systematic monitoring program to address potential impacts on the local caribou population from the All Season Road (PR#528 p72). Adaptive management techniques suggested by Parks Canada during its hearing presentation include convoys to reduce the risk of collisions and seasonal closure during spring calving or fall rut (PR#528 p111).

At the public hearing Dehcho First Nations asked CanZinc for more details on community-based monitoring.<sup>5</sup> Dehcho First Nations advised that triggers for mitigation actions using adaptive management must be developed in order to prevent significant adverse impacts, and asked whether the developer had considered what these triggers might be. CanZinc responded that if more caribou are found in a given area than predicted, it would be an early warning for mine traffic to reduce speeds and consider any further adaptive management (PR#528 p25-26).

The GNWT made recommendations that commitments relevant to caribou and pika also be incorporated into the WMMP (PR#455 p33). Similarly, ECCC made several recommendations in addition to existing developer’s commitments to reduce impacts on migratory birds and requested that these commitments be included in the next version of the WMMP (PR#448 p21).

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<sup>5</sup> See Chapter 15 for more discussion related to monitoring, including Aboriginal monitoring initiatives.



During the public hearing in Fort Simpson, GNWT advised the Review Board that in the absence of a WMMP under Section 95 of the *Wildlife Act*, GNWT could not enforce the mitigations and commitments made by the developer to reduce adverse impacts on wildlife (PR#528 168-170).

In its closing arguments, GNWT provides recommendations on the developer's Wildlife Management and Monitoring Plan, commitments to mitigate impacts on wildlife and on its role as a regulator of wildlife on territorial lands. GNWT states that based on CanZinc's commitment to develop a final WMMP along with wildlife mitigation in the commitments table (PR#485) and response to undertakings (PR#539), it supports CanZinc's conclusion that significant adverse impacts on wildlife within GNWT's mandate are not likely. In GNWT's opinion, adaptive management will help ensure that potential impacts remain below levels predicted in GNWT's technical report (PR#551 p6). In GNWT's view, the monitoring and mitigations in the developer's draft WMMP (PR#297) will form part of a robust adaptive management approach to manage Project interactions with wildlife. With respect to wildlife, GNWT believes that the developer has committed to providing the necessary monitoring and mitigation in a final WMMP with the exception of outstanding and updated recommendations for the following issues (PR#551 p6-8):

- harvest;
- risk of collisions;
- collared pika; and
- boreal caribou.

In its closing arguments, GNWT concluded that significant adverse impacts on wildlife and wildlife habitat are not likely provided that CanZinc updates and implements the WMMP according to commitments made during the EA. In addition, GNWT restates its request that (PR#551 p8):

All of the developer's commitments be included in the scope of development for this EA and captured in the Report of Environmental Assessment. The GNWT further notes that in the case that one or more of the conditions under Wildlife Act ss. 95(1) (a), (b), (c) and (d) are satisfied, the Minister of ENR may formally require a WMMP as per ss. 95(1).

GNWT's recommendation regarding the WWMP and adaptive management is unchanged from its technical report and is restated in its closing argument as follows (PR#551 p10):

To support an adaptive approach to minimizing collision risks along the proposed road, the GNWT recommends that Canadian Zinc develop a more formal, detailed approach

to identifying and communicating seasonal “wildlife caution zones” in its WMMP that includes:

- how information collected by drivers will be collected and recorded;
- which datasets will be used to identify “wildlife caution zones,” and how often they will be combined and analyzed;
- tools that might be used to facilitate recording and georeferencing; and
- how often the need to add, remove or change signage will be assessed and reported on (seasonally, annually).

The GNWT is not seeking action from the Review Board with respect to this recommendation.

In its closing arguments, CanZinc responded to GNWT’s recommendation #5 which seeks to mitigate impacts on wildlife from vehicle collisions during road operations. CanZinc’s response advises that it (PR#553 p2):

...believes we are essentially in agreement that “in case wildlife occurrences become common in terms of location along the proposed road, the road Supervisor should formalize the caution zone with signage”. Further discussion during the regulatory phase would be useful to agree on the approach, including a definition of “common”, however we believe it will quickly become obvious where wildlife occurrences are common and where signage is needed. This information is not available currently.

#### **6.1.12 Protection of species listed under the Species at Risk Act**

In its correspondence to the Review Board, ECCC advised of its responsibilities under ss79 (2) of the *Species at Risk Act* (PR#14). This subsection of SARA requires the Review Board, in the course of the environmental assessment, to (PR#14):

...identify the adverse effects of a Project on the listed wildlife species and its critical habitat and, if the Project is carried out, must ensure that measures are taken to avoid or lessen those effects and to monitor them. These measures must (a) be consistent with best available information including and Recovery Strategy, Action Plan or Management Plan in a final or proposed version, and (b) respect the Terms and Conditions of the Species at Risk Act regarding protection of individuals, residences and critical habitat of extirpated, endangered or threatened species.

ECCC speaks to its own mandate to administer the *Species at Risk Act* (SARA) through several recommendations to the developer to ensure that CanZinc appropriately consults and adheres to the SARA throughout the life of the Project. For example, in its technical report, ECCC provides several recommendations related to ensuring that obligations under SARA are fully acknowledged and communicated to staff and contractors, and remain current through regular updates (PR#448). ECCC further recommends that these annual

updates be incorporated into the existing annual monitoring and reporting requirements of the Wildlife Monitoring and Mitigation Plan (PR#448 p22).

In its response to ECCC's recommendations regarding its obligations under the SARA, CanZinc advised that Section 2.3.2 of the updated WMMP will be revised to reflect the general prohibitions which protect migratory birds listed on SARA Schedule 1 or by COSEWIC<sup>6</sup>. In addition, Table 1 of the updated draft WMMP should reflect the current status of listed SARA species and annual reports should include any species status changes. CanZinc further states that if species at risk are encountered or affected by the Project, avoidance should be the main mitigation measure (PR#484 p42).

## 6.2 Review Board analysis and conclusions

Based on the analysis set out below, and having considered all of the evidence on the public record, the Review Board finds that the Project is likely to cause significant adverse impacts on wildlife and wildlife habitat. The following sections describe the Board's conclusions and reasons, and set out the measures required to mitigate the impacts.

### 6.2.1 Summary of Review Board findings

The Review Board finds that the Prairie Creek All Season Road Project (All Season Road or the Project) is likely to cause significant adverse impacts on wildlife and wildlife habitat. The Review Board's reasons for this determination are summarized as follows:

- The proposed All Season Road is located within Nahanni National Park Reserve (NNPR) and its construction, operation and closure over a 20-year period will degrade the ecological integrity of NNPR and its value as wildlife habitat.
- The proposed Project will have adverse impacts on species at risk listed under the federal *Species at Risk Act* including mountain caribou, boreal caribou, collared pika, bird species at risk and their respective critical habitats.
- The Project is likely to have adverse impacts on wildlife through direct habitat loss from road construction, direct mortality from vehicle collisions, disturbance and

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<sup>6</sup> COSEWIC is the Committee on the Status of Endangered Wildlife in Canada. COSEWIC is a group of academics, consultants and non-governmental organization biologists, and biologists from federal, provincial, and territorial governments that constitutes an arms-length advisory panel to the federal Minister of Environment and Climate Change Canada concerning the status of wildlife species at risk of extinction in Canada and the threats that they face.

displacement of wildlife during road operations, and through wildlife habitat fragmentation.

- The developer is unable to reasonably predict impacts on wildlife and wildlife habitat from the Project and identify appropriate mitigations due to a lack of baseline data on the presence or absence of key species, the location of critical habitat and the seasonal use of the Project area by wildlife.
- There is a high level of uncertainty in the effectiveness of the developer's proposed mitigations to limit impacts on wildlife.
- Increased hunting pressure on wildlife is likely to occur due to uncertainty in the effectiveness of access control methods.
- Requiring a Wildlife Management and Monitoring Plan (WMMP) under the regulatory framework of the *Wildlife Act* is essential to ensure that the developer's wildlife mitigations and commitments are implemented and effective.

The Review Board has recommended measures intended to prevent or reduce adverse impacts on wildlife so that they are no longer significant. The sections below describe the Review Board's analysis and conclusions. Section 6.3 sets out the Review Board's recommended measures and suggestions to prevent significant adverse impacts on wildlife and wildlife habitat from the Project.

### **6.2.2 The road will degrade the ecological integrity of the NNPR for wildlife**

The Review Board acknowledges that approximately half (84 km) of the All Season Road passes through the NNPR (see Figure 1-1). The Review Board understands that the NNPR exists to protect a nationally significant example of Canada's natural and cultural heritage and to ensure that the ecological integrity within the NNPR is retained for present and future generations. The Review Board accepts evidence from Parks Canada that the task of protecting ecological integrity in the park includes maintaining all of the naturally-occurring species and communities and the processes that sustain them (PR#452 p5).

Based on the evidence on the public record, the Review Board understands that the road will pass through the NNPR to supply a base metal mine with materials and to transport lead and zinc concentrate back through the park to market. The Review Board understands that surface access to the Prairie Creek Mine through the NNPR is allowed under the *Canada National Parks Act*. However, in the Review Board's opinion, construction and operation of the All Season Road to support a mine will degrade the ecological integrity of the NNPR and its value as important wildlife habitat along and adjacent to the road corridor.

The Review Board notes that protection of the ecological integrity of NNPR, including wildlife and wildlife habitat, is a key line of inquiry in this environmental assessment (PR#42 p27). The Review Board heard from parties, including Parks Canada, DFN and LKFN that protection of wildlife and wildlife habitat within the NNPR is important. The Review Board also heard from parties that the Project has the potential to have significant adverse impacts on the ecological integrity of the NNPR. The Review Board accepts that the duration of these adverse impacts on wildlife will continue for the life of the Project, estimated at approximately 20 years (including construction and operations). In the Board's view, these adverse impacts on wildlife and wildlife habitat are also adverse impacts on the ecological integrity of NNPR and will last for at least a generation.

### **6.2.3 The Project will adversely affect wildlife listed under both federal and territorial species at risk legislation**

The Board accepts evidence from Parks Canada, ECCC and GNWT that wildlife listed as species at risk under both federal and territorial<sup>7</sup> legislation are present along the entire length of the All Season Road, and in adjacent areas both within and outside of the NNPR.

The Review Board is aware of its legal responsibilities under Section 79 of the federal *Species at Risk Act*<sup>8</sup> (PR#448 p32), as described in Chapter 4 of this report. In addition, the Board accepts Parks Canada's prediction that the Project has the potential to cause significant adverse impacts on wildlife species at risk and their habitat. The Board has heard from parties that the Project has the potential for significant adverse impacts on northern mountain caribou, boreal caribou, collared pika and bird species at risk along and adjacent to the All Season Road<sup>9</sup>. The Review Board acknowledges commitments made by the developer (Appendix C, commitment #198) and within the WMMP to mitigate and reduce impacts on species at risk (PR#297).

The Review Board accepts parties' evidence and opinions, including Parks Canada, LKFN and DFN, that, even if the developer's commitments are fully implemented, there are likely to be significant adverse impacts from the Project on wildlife species at risk along the All Season Road (PR#546, PR#550, PR#549). The Review Board finds that the developer has

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<sup>7</sup> This section refers mainly to species listed under the federal SARA because collared pika, northern mountain caribou and many bird species at risk have not been assessed for consideration as species at risk under the territorial SARA

<sup>8</sup> *Species at Risk Act*, SC 2002, c 29 (SARA)

<sup>9</sup> Direct and indirect impacts from the project to these species are described in Section 6.1.

not proven that its mitigations to prevent impacts on species at risk will be effective. The Board therefore concludes that a cautious approach to preventing impacts on species at risk, as described in Chapter 4, is warranted because of their importance and vulnerability as recognized under legislation<sup>10</sup>.

#### **6.2.4 Parties predict significant adverse impacts on wildlife due to habitat loss, sensory disturbance, displacement and fragmentation**

##### ***Caribou***

The Review Board heard evidence from Parks Canada demonstrating the impacts of infrastructure such as resource roads on woodland caribou. This evidence included published articles on the indirect habitat loss and avoidance of human infrastructure by northern mountain caribou (i.e., the type of woodland caribou found in NNPR). Parks Canada also presented new collar information for northern mountain caribou that confirm their year-round presence in the Project area.

The Review Board heard that Parks Canada does not agree with the developer's predicted impacts on northern mountain caribou because the developer's conclusions are based on incorrect and outdated information (PR#456 pp4-5). Parks Canada presented evidence at the public hearing that clearly demonstrated the presence of caribou crossing the portion of the All Season Road that passes through the NNPR<sup>11</sup>. The Review Board accepts that northern mountain caribou are present in the Project area and agrees that the impacts from the Project on caribou are likely greater than those predicted by the developer. The Review Board agrees with Parks Canada, DFN and LKFN that this Project has the potential to cause significant adverse impacts on northern mountain caribou due to habitat loss and fragmentation, sensory disturbance and direct mortality from vehicle collisions and harvesting.

Parks Canada's recommendation to prevent potentially significant adverse impacts on woodland caribou is as follows (PR#456 p6):

CZN shall develop a systematic monitoring program to address potential impacts on the Northern Mountain Population of Woodland Caribou from the all season road. This monitoring program must include annual aerial surveys to provide a population index

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<sup>10</sup> See Chapter 4 for details about the Board's precautionary approach.

<sup>11</sup> This evidence is described fully in Section 6.1.3 of this report.

and composition during rut and additional seasonal ungulate surveys as required. Track and scat surveys or the use of a camera trap design could also be implemented.

The monitoring program needs to demonstrate how the resulting data will be incorporated into adaptive management (i.e., define thresholds and actions) and must be developed in collaboration with (and approved by) Parks Canada during the regulatory phase, should the Project proceed to that phase. Further mitigations may be required, such as timing windows or identified sensitive areas with limitations on use. Parks Canada supports an adaptive management approach based on the results of the monitoring program. Until notified otherwise by Parks Canada, CZN shall provide annual monitoring updates to Parks Canada to ensure that appropriate management responses/mitigation adjustments can be implemented. These responses/mitigation adjustments must be approved by Parks Canada.

The program implemented by Selwyn-Chihong Mining Ltd. could provide an example (minimum of annual rut and winter surveys).

The Review Board understands that Parks Canada's recommendation is in its entirety supported by both DFN and LKFN in their closing arguments. LKFN suggests the addition of a requirement for local resource monitors from affected First Nations. CanZinc disagrees with the magnitude of Parks Canada's predicted Project impacts on caribou and the scale of monitoring proposed, and believes the recommendation is unnecessary. The Review Board agrees with Parks Canada, DFN and LKFN that the developer has underestimated its impact predictions and significance determination regarding impacts on caribou. As such, the Board finds that effects monitoring, along with mitigations through an adaptive management framework, is necessary to mitigate Project-related impacts on caribou. Without monitoring and adaptive management, the Board concludes that significant adverse impact will likely occur.

### ***Collared pika***

The Review Board understands that collared pikas live in talus slopes along portions of the proposed All Season Road, including around potential borrow pit locations. The Review Board heard evidence from Parks Canada that the construction of portions of the All Season Road and some borrow pits will occur in these talus slopes. Both GNWT and Parks Canada state that there is considerable uncertainty in the abundance, distribution and patch occupancy of collared pika in the talus slopes along the road. As a result, parties expressed uncertainty about CanZinc's predicted impacts. In the Review Board's opinion, the developer has not met the burden of proof to convince the Board that the Project will not cause significant adverse impacts on collared pika. The Board accepts information from Parks Canada that there is insufficient evidence provided by the developer to prove that the Project will not result in direct habitat loss and direct mortality to collared pikas in



these talus slopes. The Board accepts that additional indirect impacts including sensory disturbance from noise and habitat fragmentation to pikas are also likely. The Review Board concurs with Parks Canada that potential significant adverse impacts, both direct and indirect, on collared pika are likely.

Parks Canada's recommendations to prevent significant adverse impacts on collared pika are as follows (PR#546 p7 and Appendix D recommendation #3-5)<sup>12</sup>:

#3

The proposed all season road alignment, and proposed borrow sources, from approximately KP 12 - 39, shall be surveyed to determine species presence, distribution and relative abundance of Collared Pika.

- Survey methodology shall use recognized and standard methods
- Survey methods and overall sampling design shall be developed in collaboration with, and approved by, Parks Canada.

The necessary field surveys shall be conducted to gather this information prior to permits or licences being issued, should the Project proceed to the regulatory phase.

# 4

Based on collection of baseline information outlined in Measure 3, CZN shall provide an updated effects assessment on Collared Pika. This assessment shall identify specific mitigations that will be implemented.

CZN shall provide the updated effects assessment prior to permits or licences being issued, should the Project proceed to the regulatory phase.

# 5

CZN shall develop a systematic monitoring program to address potential impacts on Collared Pika from the all season road. The monitoring program needs to demonstrate how the resulting data will be incorporated into adaptive management (i.e., define thresholds and actions) and shall be developed in collaboration with (and approved by) Parks Canada during the regulatory phase, should the Project proceed to that phase. The baseline information outlined in the Measure 3 can be used to inform the extent and design of the required program. Until notified otherwise by Parks Canada, CZN shall provide annual monitoring updates to Parks Canada to ensure that appropriate management responses/mitigation adjustments can be implemented.

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<sup>12</sup> underline emphasis was present in original text

These responses/mitigation adjustments must be approved by Parks Canada.

The Review Board acknowledges that CanZinc: 1) has modified its commitment #25 to provide for collaboration with Parks Canada on a baseline survey for collared pika to address recommendation #3, 2) does not support the updated effects assessment in recommendation #4, and 3) is open to the monitoring described in recommendation #5. In addition, CanZinc believes the requirements requested by Parks Canada are too broad and not necessary (PR#553 p6). Based on its review of the evidence, however, the Review Board finds that the commitments from the developer are not adequate to prevent significant adverse impacts on collared pika. The Review Board therefore recommends measures for monitoring and mitigation through an adaptive management framework. In the Board's view, these measures will prevent significant adverse impacts that are otherwise likely to occur.

### **Birds**

The Review Board heard evidence from Parks Canada and ECCC, both of which described the potential for impacts from the Project on birds, including migratory birds, forest birds, bird species at risk, and waterfowl. The Board understands that potential impacts from road and borrow pit construction and operation include both direct impacts on nesting and breeding areas as well as indirect impacts from noise and other sensory disturbance. The Board concurs with Parks Canada and ECCC that there are likely to be adverse impacts on migratory birds from the construction and operation of the All Season Road.

The Board understands that in Parks Canada's view, there is insufficient baseline data on birds, including species at risk, in the Project area to determine whether significant adverse impacts are likely. Parks Canada's detailed recommendations #6, #7 and #8 suggest baseline information collection, and monitoring and mitigation through systematic adaptive management (Pr#452 p22-23) (Appendix B). The Board accepts Parks Canada's conclusion that additional baseline information is required in order to identify bird and bird species at risk presence during critical lifecycle periods along the road in order to identify potential Project impacts on birds and identify appropriate mitigation. The Board finds that, in the absence of measures, significant adverse impacts from the Project on bird species at risk are likely.

#### **6.2.5 Inadequate baseline data to make confident predictions**

The Board heard evidence from several parties, including Parks Canada, DFN and LKFN, that the developer did not provide sufficient baseline information to validate its effects assessment predictions for a number of wildlife species, including northern mountain

caribou, collared pika, and birds (including forest bird communities, waterfowl, migratory birds and bird species at risk) (PR#448 p24, PR#452 p22-23).

Parks Canada, in particular, repeatedly stated that it did not have enough information to determine the significance of impacts on these wildlife species in the Project area (PR#4521 p22-23). This position was supported by both DFN and LKFN. In the Board's view, it is the developer's responsibility to provide sufficient evidence to verify the presence or absence of wildlife species in the Project area, reasonably predict Project impacts on those species, and propose mitigations so that impacts are not significant.

The onus is on the developer to persuade the Board that the Project will not have a significant impact on wildlife and wildlife habitat<sup>13</sup>. In the Board's view, the developer has not met this burden of proof, in part because it has not sufficiently studied and described baseline conditions for wildlife species. The Board finds the developer's lack of baseline information to be of particular concern for wildlife species at risk and for wildlife species within the NNPR.

In the absence of sufficient proof from the developer that impacts can be adequately mitigated for wildlife species affected by the Project, the Review Board has taken a precautionary approach in determining how the Project should proceed. The Board finds that, in the absence of baseline information to validate impact predictions, significant adverse impacts from the Project on wildlife are likely.

#### **6.2.6 There is uncertainty in the effectiveness of mitigations and commitments to reduce impacts on wildlife**

The Review Board acknowledges the commitments made by the developer to mitigate impacts on wildlife (PR#553 p17-52), including mitigations set out in CanZinc's draft Wildlife Mitigation and Monitoring Plan (PR#297). The Board notes the request by the GNWT to include all wildlife mitigation commitments in the scope of development for this environmental assessment. In the Review Board's opinion, however, commitments to mitigate impacts on wildlife are more appropriately captured in the WMMP, provided the WMMP is approved and enforced by wildlife regulators.

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<sup>13</sup> See Chapter 4 for details regarding the burden of proof.

The GNWT and ECCC have made several recommendations to reduce predicted impacts on wildlife, but concluded that as long as the developer updates and implements its commitments, significant adverse impacts on wildlife are not likely. Conversely, LKFN and DFN expressed uncertainty about the implementation of wildlife commitments and their effectiveness. Considering the number (49), complexity, and vague language of many of the developer's commitments, the Board does not share the GNWT and ECCC's faith that these alone will ensure that significant adverse impacts on wildlife will be prevented.

Dehcho First Nations expressed concern that mitigations to reduce impacts on caribou are spread through several documents on the public record, including the WMMP, commitments table, and responses to information requests. The Board agrees that this creates uncertainty as to what specific mitigation actions the developer has actually committed to undertake. The Review Board further accepts DFN's argument that mitigations and commitments to reduce impacts on wildlife need to be consolidated and clearly set out because of the regulatory complexity affecting the Project and in order to ensure clarity for all affected parties in the future.

The Review Board agrees with GNWT and other parties that a robust and systematic adaptive management framework is required to test impact predictions, monitor changes in the environment, and adjust mitigations to protect the environment if unforeseen circumstances arise or if the impacts differ from those predicted in the EA (PR#551, p6, PR#549 p23, PR#546 p4-9). Due to uncertainty in the likelihood and severity of impacts from the Project on wildlife, the Board concludes that without systematic adaptive management, significant adverse impacts are likely.

#### **6.2.7 There is uncertainty in the effectiveness of access control mitigations to limit hunting**

Parties, including DFN, LKFN, NBDB, Parks Canada and GNWT (PR#549, PR#550, PR#548, PR#200, PR#551), advised the Review Board that the All Season Road has the potential to enable new access to the Project area by hunters, which could result in direct mortality to wildlife from hunting. In particular, Nahanni Butte Dene Band stated that there could be impacts on wildlife from hunters from outside the region using the road for hunting (PR#548 p4). The Review Board agrees with parties that the new All Season Road is likely to attract hunters interested in harvesting wildlife along the road corridor. In addition, the Review Board believes that the new All Season Road has the potential to open up a large region surrounding the new road to hunters with all-terrain vehicles and snow machines. Evidence from parties describing the impacts from increased harvesting pressure on wildlife due to new access is discussed in Chapter 7: Traditional Harvesting. The Review

Board acknowledges methods proposed by the developer to control access for non-mine traffic and hunters from outside the region that are not from Nahanni Butte. These are described in detail in Chapter 5.

The Review Board accepts evidence from the developer that even though it cannot legally prevent hunters from travelling along the road, its proposed access control techniques may act as a partial deterrent to hunter access. In the Review Board's opinion, however, determined hunters may still be able to gain access despite barriers and obstacles and may use the road for hunting. As described in the Chapter 5, opportunities for hunters to access the road are likely greatest when the Liard River is ice-covered. The Review Board finds that there is uncertainty in the effectiveness of the various access control mitigations intended to restrict access for hunters, and that direct mortality to wildlife from hunting may occur if the access control mitigations are not effective. This contributes to the board's overall conclusion that a WWMP and other measures are needed to prevent significant adverse impacts.

#### **6.2.8 Requiring a WMMP under the *Wildlife Act* is essential to ensure that wildlife mitigations and commitments are kept**

GNWT-ENR is responsible for implementing and enforcing the *NWT Wildlife Act* on territorial lands. Subsection 95(1) of the *Wildlife Act* allows the Minister of ENR to require that a WMMP be produced by developers of existing or proposed developments that may result in significant disturbance or harm to wildlife, or cause substantial damage to wildlife habitat. The Board understands that one specific condition in determining the need for a WMMP is whether a Project could "result in a significant disturbance to big game or other prescribed wildlife"<sup>14</sup>.

The developer submitted its draft WMMP to the public record in September 2016 (PR#297). In its closing arguments, CanZinc submitted a final commitments table that included commitments to update its WMMP with mitigations made during the course of this environmental assessment (PR#553). The Board understands that the developer will update its WMMP according to its commitments, including #198 - #203, as described in its closing arguments (PR#553 p24). The Board is also confident that the developer will update its WMMP with wildlife mitigations described throughout the EA by CanZinc and its consultants based on a commitment made during the technical sessions (PR#232 p165,

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<sup>14</sup> *Wildlife Act* S.N.W.T. 2013 c30 in force November 28, 2014

Commitment #60 in Appendix C). The Board notes that GNWT appears to accept the developer's promise to update and implement its WMMP with mitigations to reduce impacts on wildlife. The Board heard GNWT's conclusion that significant adverse impacts on wildlife and wildlife habitat are not likely, but that this conclusion depends on the developer following through with its WMMP commitment (PR#551 p8). To ensure this happens, GNWT also recommended that the Board include CanZinc's commitments in the scope of development.<sup>15</sup>

The Board heard evidence from parties, including Parks Canada, DFN and LKFN that the Project is likely to have significant adverse impacts on big game species including caribou, in particular due to disturbance and displacement impacts from construction and use of the road. Caribou are a defined big game species in Schedule A of the *Wildlife General Regulations* under the *Wildlife Act*<sup>16</sup>. Evidence on the record indicates that boreal caribou inhabit the portion of the road on territorial land east of km 125, and mountain caribou are found on GNWT lands in the area of km 0 to 17 of the All Season Road (as well as in the vicinity of the section of road in NNPR).

Based on the evidence submitted by parties, the Board concludes that the Project is likely to result in significant adverse impacts on big game species including caribou. In addition, the Board finds that the Project will substantially alter and destroy wildlife habitat for boreal caribou in particular. Since the threshold for habitat disturbance for boreal caribou is near the limit as defined in the 2012 federal Boreal Caribou Recovery Strategy, the Board concludes that the Project is also likely to pose a threat of serious harm to caribou.

The Board does not agree with GNWT's finding that there will be no significant adverse impacts on big game and other wildlife. The Board finds that the evidence regarding impacts on wildlife submitted by parties including Parks Canada, DFN and LKFN to be more compelling. Although Parks Canada did not make submissions in relation to impacts on wildlife outside of NNPR, the Board finds evidence from Aboriginal groups to be particularly strong for impacts on wildlife outside of the NNPR, because wildlife are required for food and are integral to the way of life of Aboriginal communities. The Review

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<sup>15</sup> See Section 2.1.2 for the Review Board's consideration of GNWT's recommended changes to the scope of development.

<sup>16</sup> *Wildlife General Regulations*, Schedule A, November 28, 2014 p12.

Board therefore concludes that a Wildlife Management and Monitoring Plan<sup>17</sup> under the statutory framework of Section 95 of the *Wildlife Act* is necessary.

At the public hearings, the Review Board heard evidence that in the absence of a WMMP under Section 95 of the *Wildlife Act*, GNWT cannot enforce the mitigations and commitments made by the developer to reduce adverse impacts on wildlife (PR#528 168-170). The Board's findings of Project impacts on wildlife rely to a large extent on the developer's commitments to protect wildlife and the ability of a regulatory authority to enforce those commitments. Parks Canada has the regulatory authority to enforce mitigations and commitments in the WMMP within the NNPR. The Review Board, however, is not confident that the mitigations and commitments in the WMMP will be enforced on territorial lands unless those mitigations and commitments are under the regulatory authority of the *Wildlife Act*.

The Review Board heard evidence from GNWT in its closing arguments proposing that wildlife mitigation commitments made by the developer during the analytical phase of the EA be included in the scope of development (PR#551 p8). In the Board's view, however, changing the scope of development is not an appropriate solution (see Chapter 2, Section 2.1.2). Since the approach recommended by GNWT is unworkable, the Review Board views a s.95 WMMP as essential to ensuring that the mitigation committed to by the developer will be implemented and effective.

### **6.2.9 Conclusion**

Considering the evidence on the public record, including arguments from the developer and parties, and the precautionary approach that has informed the Review Board in its deliberations (see Chapter 4), the Board concludes that the construction and operation of the All Season Road will likely cause significant adverse impacts on wildlife and wildlife habitat. The Board's reasons for this finding include the road's location within NNPR and the potential adverse impacts on wildlife species at risk inside and outside NNPR. The Board finds that baseline information is insufficient to confidently predict Project impacts

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<sup>17</sup> CanZinc named its draft plan a Wildlife Mitigation and Monitoring Plan and parties also used this wording. The Review Board notes that the wording used in section 95 of the *Wildlife Act* is Wildlife Management and Monitoring Plan and this is the terminology the Board is using, but the Board views the terms as being interchangeable and both meaning essentially the same thing.



and that the developer has not demonstrated that the proposed mitigations will reliably prevent significant adverse impacts on wildlife and wildlife habitat.

The Board does not agree with GNWT's finding that there will be no significant adverse impacts on big game and other wildlife. The Review Board has therefore set out measures intended to prevent or reduce adverse impacts on wildlife so that they are no longer significant.

### **6.3 Measures and suggestions**

In order to prevent significant adverse impacts on wildlife and wildlife habitat from construction, operation and closure of the All Season Road, the Review Board recommends implementation of the following suite of measures. These measures combine the collection of baseline information with mitigations developed through systematic wildlife monitoring and adaptive management as described below.

#### **Measure 6-1**

In the Board's view, insufficient baseline information provided by the developer has resulted in uncertainty and lack of confidence in impact predictions and the potential significance of impacts on wildlife and wildlife habitat. Without more complete baseline information and corresponding mitigation, the Board concludes that significant adverse impacts on wildlife are likely. Commitments related to the Board's finding of significant adverse impacts are included in the following measures.

Measure 6-2 requires the developer to incorporate all wildlife commitments into its WMMP under the regulatory authority of the *Wildlife Act*. In the Board's view, requiring that the WMMP contains developer commitments and is regulated under Section 95 of the *Wildlife Act* ensures that these commitments to mitigate impacts on wildlife and wildlife habitat will be implemented and enforced.

## **Measure 6-1: Wildlife Management**

### **6-1, Part 1: Wildlife baseline information collection, monitoring, mitigation and adaptive management program**

In order to reduce adverse impacts on wildlife and wildlife habitat so they are no longer significant, the developer will collect additional wildlife baseline information to be integrated with mitigation, focused monitoring, and a systematic approach to adaptive management.

In order to accomplish this, CanZinc will:

- i. collect baseline data as described in Part 2 of this measure;
- ii. monitor wildlife and wildlife habitat during construction and operations as described in Part 3;
- iii. incorporate Traditional Knowledge in developing and implementing a monitoring program; and,
- iv. develop and implement an adaptive management framework to manage impacts on wildlife.

### **6-1, Part 2: Collection of baseline wildlife information for caribou, collared pika and bird species at risk that occur in the area**

The purpose of this baseline information collection is to confirm the presence or absence of listed wildlife species in the Project area, their population size, seasons of use and important habitat for species described below in the All Season Road corridor. In order to support Part 1, the developer will:

- a) submit a baseline survey plan for review and approval to Parks Canada within the NNPR and to GNWT on territorial lands;
- b) conduct baseline surveys for northern mountain caribou, boreal caribou, collared pika, and bird species at risk;
- c) use recognized methods and standards approved by Parks Canada within NNPR, by GNWT on territorial lands, and by ECCC for species at risk;
- d) conduct surveys at the direction and approval of Parks Canada within NNPR and of the GNWT on territorial lands;
- e) complete surveys prior to road construction;

- f) share its baseline wildlife information with Aboriginal organizations, including NBDB, LKFN and DFN; and,
- g) present the results of its baseline information collection with Aboriginal organizations, including NBDB, LKFN and DFN, in a culturally-appropriate way.

### **6- 1, Part 3: Wildlife monitoring programs**

In order to reduce adverse impacts on wildlife so they are no longer significant, the developer will prepare and implement a systematic monitoring program(s) for wildlife that may be affected by the Project.

The developer will:

- a) submit monitoring program(s) for review and approval to Parks Canada within the NNPR and GNWT on territorial lands;
- b) focus on monitoring of northern mountain caribou, boreal caribou, collared pika, and bird species at risk;
- c) use recognized methods and standards approved by Parks Canada within NNPR, by GNWT on territorial lands, and by ECCC for species at risk;
- d) conduct monitoring through all phases of the Project;
- e) formalize monitoring programs within the Wildlife Management and Mitigation Plan (Measure 6-2);
- f) provide annual monitoring reports to Parks Canada, GNWT, ECCC, NBDB, LKFN and DFN;
- g) share its wildlife monitoring data with Aboriginal organizations including NBDB, LKFN and DFN; and,
- h) present the results of its wildlife monitoring programs to Aboriginal organizations, including NBDB, LKFN and DFN, in a culturally appropriate way.

### **Measure 6-2**

Measure 6-2 builds on the developer's commitment to update its draft WMMP with mitigation described in the commitments table and throughout this report in order to reduce impacts on wildlife and wildlife habitat so that they are no longer significant. The measure requires a systematic adaptive management framework as part of the WMMP.

## **Measure 6-2: Wildlife Management and Monitoring Plan (WMMP)**

### **6-2, Part 1: GNWT to require a WMMP**

In order to reduce adverse impacts on wildlife and wildlife habitat so they are no longer significant, GNWT will require the developer to prepare and implement a Wildlife Management and Monitoring Plan. The GNWT will :

- a) require that the developer prepare a WMMP under the legal authority of Section 95(1) of the *Wildlife Act* for portions of the Project in its jurisdiction; and
- b) include opportunity for public review of and comment on the final WMMP prior to construction and on updates to the WMMP throughout the life of the Project.

### **6-2, Part 2: Parks Canada to require a WMMP**

In order to reduce adverse impacts on wildlife and wildlife habitat so they are no longer significant, Parks Canada will require the developer to prepare and implement a Wildlife Management and Monitoring Plan. Parks Canada will:

- a) require that the developer prepare a WMMP as a condition of an authorization for the portions of the road in its jurisdiction; and
- b) include opportunity for public review of and comment on the final WMMP prior to construction and on updates to the WMMP throughout the life of the Project.

### **6-2, Part 3: Developer to prepare and implement a WMMP**

The developer will:

- a) update its draft WMMP to include all commitments and mitigations agreed to or recommended by its consultants throughout the EA;
- b) develop an adaptive management framework that links the results of monitoring with adjustments to mitigations as part of the WMMP that satisfies the requirements set out in Appendix B of this report;
- c) describe how the monitoring data is linked with adaptive management in the Traffic Control and Management Plan;
- d) submit its updated WMMP to the wildlife regulators described in Parts 1 and 2 for review and approval prior to construction; and
- e) prepare and submit an annual report to wildlife regulators on the effectiveness of

the WMMP that includes a description of how the adaptive management framework was used to address Project impacts.

### **Suggestion 6-1**

#### **Suggestion 6-1: Regulator collaboration**

Wildlife regulators should work together to ensure the WMMP is consistent for the entire All Season Road.

### **Measure 6-3**

The following measure is required to mitigate significant adverse impacts resulting from direct mortality to wildlife from vehicle collisions by both mine and non-mine traffic along the All Season Road. This measure is linked to the Traffic Control Mitigation and Management Plan in measure 5-2 in Chapter 5.

#### **Measure 6-3: Reducing the risk of vehicle collisions with wildlife**

In order to reduce the likelihood of significant impacts on wildlife from collisions with vehicles along the road, the developer will identify and communicate wildlife caution zones to road users. The details of this approach will be incorporated into the developer's WMMP (referred to in Measure 6-2) and will include:

- a) a description of how wildlife information from drivers will be collected and recorded to inform the selection of wildlife crossing areas;
- b) a detailed system for identifying wildlife (specifically big game as defined in the *Wildlife Act*) caution zones and marking them along the road (such as where sightings or collisions have occurred or where Traditional Knowledge identifies trails);
- c) use of a remote camera trap system to identify wildlife road crossing areas and identify non-mine related traffic;
- d) annual reporting of wildlife sightings by drivers that includes vehicle collisions with wildlife, locations of signage for wildlife caution zones and whether they were modified based on operational experience;

- e) annual reporting to regulators of remote camera log results, locations of primary wildlife crossings and how wildlife caution zones were modified based on monitoring results (if applicable); and,
- f) annual reporting to regulators on road use by non-mine vehicles using data from remote camera logs.

The GNWT will regulate this measure on territorial lands and Parks Canada will regulate this measure within the NNPR. Reporting will be included in the WMMP annual report.

## 7. Traditional harvesting

### *Summary of Review Board findings*

The Review Board finds that the Prairie Creek All Season Road Project (All Season Road or the Project) is likely to cause adverse impacts on traditional harvesting for the following reasons:

- Traditional harvesting occurs in the Project area and the new All Season Road will increase access by harvesters from outside the region.
- The developer has underestimated the impacts from increased access on traditional harvesting pressure, areas and patterns.
- Traditional harvesting depends on sustainable wildlife populations, and increased access by hunters, combined with other Project-related impacts on wildlife, could affect the number of animals available to for traditional harvesting.
- There is considerable uncertainty about the effectiveness of proposed mitigations to control access.

The Review Board concludes that increased access is likely to change harvest areas, pressure and patterns, leading to potential impacts on traditional harvesting activities. The Review Board has therefore recommended measures in chapters 5 and 6 to manage access (Chapter 5, Measure 5-2) and mitigate significant adverse impacts on wildlife (Chapter 6, Measures 6-1 to 6-3). This chapter includes four suggestions intended to strengthen and complement developer commitments.

### *Organization of this chapter*

In Section 7.1 below, the Review Board has provided readers with a more thorough and detailed summary of the evidence than it has in other environmental assessments. This is intended to allow readers to see firsthand the range and degree of uncertainties identified throughout the environmental assessment (as indicated above). This level of detail was necessary because these uncertainties presented a particular challenge for impact



predictions and decision making<sup>1</sup>, and are a relevant part of the Review Board's consideration of the evidence in this section.

In section 7.2, the Review Board presents its analysis and conclusions on traditional harvesting. The Review Board's suggestions are outlined in section 7.3.

## **7.1 Evidence from parties and the developer**

This section summarizes the evidence on the public record related to impacts on traditional harvesting including: information presented by the developer in its Developer's Assessment Report (DAR) and DAR Addendum submissions, parties' submissions through information requests, technical reports and closing arguments (including developer responses), and evidence heard at the technical sessions and public hearings. This chapter addresses impacts from increased access and harvest pressure, harvest areas and patterns, and considers the topics of harvest monitoring and traditional land use.

This chapter will focus on impacts on traditional harvesting activities only, while Chapter 6 discusses impacts on traditionally-harvested wildlife. The Review Board considered the impacts on traditionally-harvested wildlife described in the previous chapter in its assessment of impacts on traditional harvesting activities.

### **7.1.1 Baseline information**

In its DAR, CanZinc provided an effects assessment focussed on eight traditionally-harvested wildlife species. Table 7-1 shows the typical harvesting season for each species, using information provided by the developer in Appendix E of its DAR Addendum (PR#102 pp88-89). In its DAR Addendum, the developer stated that lynx, fox, muskrat and river otter have also traditionally been trapped in the Project area (PR#102\_p86). Chapter 6 of this report describes the location of big game, such as caribou, moose and Dall's sheep.

In its DAR Addendum, the developer relied on several sources for harvesting information in and around the Project area, including:

- public sources, such as the 2004 Draft Land Use Options Atlas (PR#102 p88; PDF p335);

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<sup>1</sup> See Chapter 4 for further discussion.

- community consultation with Nahanni Butte Dene Band (NBDB) members (PR#102 p83); and
- NBDB’s Addendum to the April 2009 Document: Traditional Knowledge Assessment of the Prairie Creek Mine Operation (Traditional Knowledge Assessment Addendum) (PR#18)

**Table 7-1: Harvest seasons for traditionally-harvested wildlife**

Traditionally-harvested wildlife	Typical harvest seasons
Boreal caribou	Throughout the year
Northern mountain caribou	<i>No information provided by developer</i>
Dall’s sheep	Snow-free seasons  An overlap in non-resident hunts and subsistence hunts from July 15 to October 31 (PR#55 p 106)
Moose	Throughout the year (predominantly mid-August to mid-October, mid-November to spring)
Wolverine	Nov. 1 to April 15
Grey wolf	Aug. 15 to May 31
Marten	Nov. 1 to March 15
Beaver	Oct. 15 to May 15

The developer suggested that harvesting occurs in the following areas near the Project (PR#102 p141):

- boreal caribou range, east of the Nahanni Range;
- the Polje area west of Tetcela River;
- wetlands along Silent Hills;
- boreal forest east of the Mackenzie Mountains;
- Nahanni Range and Grainger Gap (Dall’s sheep and boreal caribou);
- Tetcela River, Fishtrap Creek and Bluefish Creek valleys (trapping, winter moose hunting and harvesting of migratory birds);
- within the Grainger River watershed (moose, boreal caribou and trapping);
- Yohin Lake and Netla River areas (for trapping) (PR#102 p86); and
- Prairie Creek (PR#18 p4).

In the DAR Addendum, the developer stated that hunting and trapping is currently concentrated near Nahanni Butte and along existing roads and rivers (PR#102 p141). According to the developer, traditional occupancy is low or negligible in the Project area,

except near the Project's intersection with the Liard River (PR#102 p141). Aboriginal people have the right to harvest both within and outside the Nahanni National Park Reserve (NNPR). Non-Aboriginal people may only harvest wildlife in the Project area outside of the NNPR.

The record shows that members of the NBDB actively use the proposed Project area for traditional harvesting (PR#18; PR#33 p3; PR#102 p83; PR#275; PR#276), including harvesting. The Review Board also heard directly from Nahanni Butte community members during the cultural technical sessions in July 2016. Figure 7-1 shows an elder from Nahanni Butte Dene Band sharing Traditional Knowledge at the cultural technical session in Nahanni Butte. During these sessions, community harvester Earl Hope provided a statement about his harvest activity in the area (PR#275 p7):

This past winter, caribou were spotted at the Liard River - right where the road is going to go. The spot where caribou were seen was near Swan Point along the river where the road will cross the Liard river...this is the first time I have seen them there, I'm asking you to stay away from that area as it's an important trail for moose and caribou.



**Figure 7-1: An elder speaks at the cultural technical session, July 4, 2016**  
(PR#275 p9)

During the cultural technical session in Fort Simpson, members of the Liidlii Kué First Nation (LKFN) stated that they have traditionally used parts of the Project area for harvesting and continue to use the Project area for sustenance (PR#276). At the cultural technical session, Hilda Tsetso shared the following about LKFN's use of the Project area for traditional harvesting activities (PR#276 p7/8):

Nahanni Butte people are not the only ones that harvest out in that area. We harvest from the Ram plateau and all the way along the rivers, to the Yukon border and where the river goes into the mountain and we meet people from Nahanni Butte there like Angus and Raymond Konisenta and spend time with them sharing stories.

That area where the road goes into the mountains is a traditional harvesting area for us.... When the road is put in place. it's our refrigerator, it's how we sustain ourselves...

### **7.1.2 Project interactions with traditional harvesting**

In its DAR (PR#55) and Appendix E of its DAR Addendum (PR#102), the developer assessed the effects of the All Season Road on traditionally-harvested wildlife through: changes to harvest pressure, harvest areas, harvest patterns and increased access.

According to the developer, impacts on each species would depend on the species' behaviour and abundance along the road (PR#102 p128).

The developer predicted that all season access would provide an overall economic and cultural benefit to NBDB (PR#55 p163). The following quote from the DAR Addendum provides the developer's rationale for this position (PR#102 p147):

The proposed all season road provides harvester access from late spring to fall. Spring and fall are periods of change-over between ice and barge crossing of the Liard River. There will be short periods of time when river crossings will not be possible. These periods will be shorter still for local harvesters with their own water craft and vehicles, some of which might be left on the west bank. Therefore, the proposed Project will extend the hunting season, notably for the culturally important fall hunt.

In the developer's opinion, "the current level of hunting along and near the proposed project is considered low due to current access restrictions" and a low number of hunters in Nahanni Butte (PR#102 p89). The developer stated that trapping is low because there is only one cabin in the Project area and few trappers from Nahanni Butte (PR#102 p89). In general, the developer believes that the Project will have positive residual effects on traditional harvesting activities (PR#55 p163).

In its DAR Addendum, the developer made predictions about how traditionally-harvested species would be affected by harvest pressure, harvest areas, harvest patterns and change in access. The developer stated that the overall impacts on traditionally-harvested wildlife from access, changes to harvest areas and harvest patterns, would be moderate and require specific management measures or plans for mitigation (PR#102 p13). The developer predicted the impacts on traditionally-harvested wildlife species from changes to harvest

pressure would be low and would not require specific management measures or plans for mitigation (PR#102 p13).

The developer’s impact predictions are summarized in Table 7-2 below. In its DAR Addendum, the developer considered cumulative impacts on wildlife species from the Project in combination with the Prairie Creek Mine and Winter Road (PR#102 p250). Residual adverse impacts on moose were predicted as a result of cumulative impacts from hunting and vehicle collisions along the Liard Highway (PR#102 p251-252). The developer stated that cumulative impacts on traditionally-harvested species will be reversible after Project closure (PR#102 p143).

**Table 7-2: Summary of impacts on traditionally-harvested wildlife**

Pathways of effect	Harvested wildlife species							
	Boreal Caribou	Northern Mountain Caribou	Moose	Dall’s Sheep	Wolverine	Grey Wolf	Marten	Beaver
Increased harvest pressure	low	low	low	low	low	low	low	low
Traditionally -harvested areas	mod	mod	mod	mod	mod	mod	mod	mod
Harvest patterns	mod	mod	mod	mod	mod	mod	mod	mod
Access	mod	mod	mod	mod	mod	mod	mod	mod

### 7.1.3 Impacts from increased access

In its DAR Addendum, the developer predicted that impacts on traditionally-harvested wildlife from increased access would be moderate (PR#102 p146). In its DAR, the developer stated that “control of access by non-resident hunters is a key issue” (PR#55 p166). The developer stated that access is expected to “increase traditional land use in the area”, and that year-round access would encourage harvest, thus providing enhanced economic and cultural value to the NBDB (PR#55 pp11, 163).

Mitigations for impacts on traditionally-harvested wildlife from increased access were not provided in the DAR Addendum as the developer considered the impacts to be beneficial (PR#102 p145). The developer acknowledged that “year-round road access will allow harvesting of other species that have previously been limited (e.g., northern mountain caribou, moose, Dall’s sheep)” (PR#55 p163-164). Several access control measures that

were proposed to mitigate impacts from harvest pressure, such as limiting access on the Liard River barge, were mentioned.

The developer's engagement records with NBDB showed the community of Nahanni Butte was concerned about "the potential for access by non-Indigenous hunters and a consequent decline in moose numbers, the main subsistence item of the NDDDB (PR#162 p1). In its Traditional Knowledge Assessment Addendum, NBDB also expressed concerned about the Project creating access to woodland caribou over-wintering habitat. NBDB "expressed concern about use of the road by outside hunters, particularly their access to woodland caribou in the lowland area and possible overharvesting" (PR#18 p4). According to the Traditional Knowledge Assessment Addendum, NBDB was "very concerned that increased access to this area by outside people using the haul road for winter hunting activities may affect wildlife populations" (PR#18 p4).

During the cultural technical session in Fort Simpson, LKFN community members said they were concerned about the impacts that increased access may have on caribou, moose, fish and beaver (PR#276 p11).

In its technical report, the GNWT indicated that there were not likely to be significant adverse impacts on boreal caribou from public access to territorial lands (PR#455 p13). The GNWT's reasons for this conclusion were that (PR#455 p16-17):

- The road north of the Liard River will not be accessible to highway vehicles during shoulder seasons (times when the river is freezing and thawing, approximately during November, and mid-April to mid-May);
- The private barge being operated by the developer could limit its vehicle allowance to those involved with the Project, during seasons of open water. Most hunting seasons are open in the summer, and only two months (December and January) would be accessible for moose and woodland caribou;
- Bag limits for Dall's sheep, mountain goat, woodland caribou, moose and bison are sufficient; and,

GNWT further acknowledged the developer's commitment to monitor, educate and report on harvest pressure and promote First Nations reporting of harvest (PR#355 p16). In its technical report, the GNWT stated that despite the low risk of increased harvest mortality, harvest monitoring would still be needed (PR#455 p13).

In its technical report, Dehcho First Nations (DFN) argued that increased access to the Project area would cause adverse impacts on harvested species. In particular, DFN was concerned with "access management," and that through access, the Project has "the potential to affect harvestable wildlife abundance and distribution, and change harvesting

pressure and harvesting areas” (PR#459 p24). DFN advised that “local members are best positioned to help observe, record, and report any activities that are unfavorable to the local community” (PR#459 p 24).

In its closing arguments, NBDB also recognized the potential for outside harvesters to have an impact in the area (PR#548 p2). However, NBDB concluded that it “support[s] the all season road as [NBDB members] see no negative impacts that cannot be easily managed” (PR#548 p2). NBDB also supports the benefits that new access would create to maintain its traditional lifestyle for future generations (PR#548 p3).

During the hearing, the developer reaffirmed its view that the potential for significant adverse impacts on woodland caribou is low. The developer confirmed its operational mitigations, including having employees radio and record caribou sightings as part of a journey management system, and giving caribou the right of way along the road (PR#528 pp15-17)<sup>2</sup>.

During the hearing, and in response to a request from the GNWT, the developer committed to “routing the Liard River winter crossing completely through the territorial land surface lease on the north shore of the Liard River” (PR#532 p3). The developer stated that leases for the barge crossing and staging areas on either side of the river will give it the right to deny access to unauthorized people, and that it will exercise that right.

In its closing arguments, the developer clarified that (PR#553 p1-2):

we intend to engage NBDB members to undertake lease activities on our behalf. The reasons for this were to indicate to the NBDB that we intend to uphold our commitment to them to engage their members in the project, as much as possible, and to have personnel that would be the most motivated to restrict unauthorized access.

The developer also confirmed its intentions to task environmental monitors with access control duties, and these monitors would be the developer’s own employees (PR#528 p51).

In its closing argument, the developer described several additional obstacles facing hunters, including (PR#553 p3):

- the need to cross the Liard River;

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<sup>2</sup> See Chapter 6 on wildlife in this Report for more detail regarding the journey management system.



- the need to pass checkpoint staff and environmental monitors;
- the need to navigate around mine trucks; and that
- seasonal periods would restrict access by ice bridge.

The developer concluded that “[w]e are convinced that the proposed access controls and low hunting opportunities will not be appealing to hunters, and so there will not be a significant increase in hunting pressure” (PR#553 PDF p3).

#### **7.1.4 Impacts from increased harvest pressure**

In its DAR Addendum, the developer predicted that impacts on traditionally-harvested wildlife from changes in harvest pressure would be low (PR#102 p154). The developer had a moderate level of confidence in its prediction because of a slow increasing trend of residents engaged in hunting and fishing, and a decreasing trend in trapping (PR#102 p154).

During the first round of information requests, Parks Canada disagreed with the developer’s prediction about harvest pressure (PR#200 p37) and requested that the developer explain its methodology (PR#200 p37). The developer responded by outlining its effects assessment methods (PR#186 p4-5, 24), which showed that impacts on harvested wildlife were predicted “overall” or together, rather than by species. The developer stated the approach “can be problematic, as potential effects may differ among wildlife” (PR#186 p4-5, 24).

At the public hearing, LKFN expressed concern that without limiting access, there will be increased hunting of moose, and cited increased levels of moose harvest by outsiders observed off of the Liard Highway (PR#528 p191). LKFN described harvesters from other regions travelling to the Dehcho to hunt woodland caribou because of the harvesting ban on barren ground caribou in other areas of the Northwest Territories, stating that (PR#528 pp32-33):

We’ve heard from our people and other people that, with the caribou bans in the other jurisdictions, that has forced harvesters... to come to our region and hunt our resources. We have noticed a decline in moose. We’ve noticed a decline in caribou.

Mitigations proposed by the developer to limit impacts from increased harvest pressure include (PR#102 p152):

- existing NNPR Regulations, and *Wildlife Act* Regulations that manage harvest activities of non-Indigenous people;

- controlling access at the proposed Liard River barge crossing;
- controlling access using a checkpoint manned by NBDB members; and
- prohibiting employees and contractors from harvesting.

### 7.1.5 Harvest monitoring

In its technical report, the GNWT recommended the developer either support NBDB in developing a harvest monitoring program “to ensure that a conservation concern does not arise as a result of the road,” or expand existing monitoring programs to collect harvest information (PR#455 p17 recommendation 4). The GNWT further recommended that the developer “consider designing and implementing a trail camera study along the Territorial Lands [...] to confirm the effectiveness of mitigations to deter public access on the road” (PR#455 p22). Similarly, DFN recommended that remote cameras be installed and that the developer work with NBDB to patrol the access road during harvesting seasons (PR#459 p 24).

During the hearing, the GNWT discussed constraints to harvest monitoring. It said that legally, as an enforcement agency, the GNWT is constrained to laws on wastage under the *Northwest Territories Hunting Regulation*; wastage law provides one of the only opportunities for wildlife officers to investigate harvest offences (PR#528 p175). The GNWT also clarified that it currently has no enforcement capabilities for mitigations within the *Wildlife Mitigation and Monitoring Plan* (WMMP) unless determined by the Minister under Section 95 of the *Wildlife Act* (PR#528 p168).<sup>3</sup> In its closing arguments, the GNWT stated it was “satisfied with Canadian Zinc’s commitment to provide support for monitoring patterns and levels of harvest” (PR#551 p6).

In its response to technical reports, the developer agreed to the GNWT’s recommendation to support NBDB in harvest monitoring to track and report on patterns and levels of harvest associated with the road (PR#484 p2). The developer plans to have this information collected at the proposed checkpoint (PR#484 p2).

In response to recommendations regarding trail cameras, the developer said it would consider the use of remote cameras during shoulder seasons when environmental

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<sup>3</sup> The *Wildlife Act* refers to a Wildlife Management and Monitoring Plan. It appears that the words mitigation or management are used more or less interchangeably in discussions about a WMMP for the Project.

monitors, haul traffic and maintenance crews would not be on the road to spot animals (PR#484 p3).

In its technical report response, the developer informed DFN that it had committed to hire NBDB members as environmental monitors along the road who will be tasked with observing and recording caribou sightings as well as monitoring non-mine road use activity (PR#484 p27). The Review Board later heard at the Fort Simpson public hearing that the developer had provided two environmental monitoring courses through the Mine Training Society, and if necessary, would provide additional programs in the future (PR#528 p39).

In its closing arguments, the developer acknowledged that a priority issue for the NBDB is how the access road would enable hunters from outside the region to access the area and increase hunting pressure (PR#553 p1). The developer accepted the GNWT's recommendation to expand on existing environmental monitoring programs under the WMMP to include formal collection and reporting of harvest monitoring. The developer accepted this recommendation on the condition that existing environmental monitors would be undertaking this task and that data collection and reporting requirements could be refined further in the regulatory process (commitment #173, #198, #207).

### **7.1.6 Traditional land use**

At the community hearings in Nahanni Butte, the NBDB informed the Review Board that a traditional land use agreement was being negotiated between the community and the developer (PR#521 p95). The NBDB requested that a traditional land use agreement be a condition of Project approval. In its closing argument, NBDB recommended that the Review Board require a fully negotiated and executed traditional land use agreement to be in place prior to construction of the Project (PR#548 p2).

In its closing arguments, the developer acknowledged that it intends to complete a traditional land use agreement with the Nahanni Butte Dene Band (PR#553 p6).

## **7.2 Review Board analysis and conclusions**

### **7.2.1 Summary of Review Board findings**

The Review Board finds that the Prairie Creek All Season Road Project (All Season Road or the Project) is likely to cause adverse impacts on traditional harvesting for the following reasons:

- Traditional harvesting occurs in the Project area and the new All Season Road will increase access by harvesters from outside the region.
- The developer has underestimated the impacts from increased access on traditional harvesting pressure, areas and patterns.
- Traditional harvesting depends on sustainable wildlife populations, and increased access by hunters, combined with other Project-related impacts on wildlife, could affect the number of animals available to for traditional harvesting.
- There is considerable uncertainty about the effectiveness of proposed mitigations to control access.

The Review Board concludes that increased access is likely to change harvest areas, pressure, and patterns and lead to potential impacts on traditional harvesting activities. The Review Board has therefore recommended measures in chapters 5 and 6 to manage access (Chapter 5, Measure 5-2) and mitigate significant adverse impacts on wildlife (Chapter 6, Measures 6-1 to 6-3). The following sections describe the Review Board's analysis, conclusions, and four suggestions intended to strengthen and complement the developer's commitments.

### **7.2.2 Traditional harvesting occurs in the Project area**

Paragraphs 115(1)(b) and (c) of the *Mackenzie Valley Resource Management Act* (MVRMA or the Act) requires the Review Board's process to have regard for the protection of social, cultural and economic well-being of residents and communities of the Mackenzie Valley, as well as have regard for the importance of conservation to the well-being and way of life of Aboriginal people who use the Mackenzie Valley and to whom Section 35 of the *Constitution Act, 1982* applies.

The record shows that the Project is located in an area where potentially-affected Aboriginal groups harvest as part of their social, economic and cultural well-being. Throughout the environmental assessment, DFN, LKFN, and particularly NBDB told the Review Board that they actively use the Project area to maintain their way of life and well-being through hunting, trapping and fishing (PR#18; PR#27; PR#33 p3; PR#150; PR#102 p83-89; PR#275; PR#276).

The Review Board accepts that the Project area has traditionally been used for subsistence harvesting and other cultural activities. The Review Board heard from community members that the "...area where the road goes into the mountains is a traditional harvesting area for us...it's our refrigerator" (PR#276 p7). Community members also told the Board that the Project area is where people meet on the land to transmit culture: "[w]e

meet people from Nahanni Butte there...and spend time with them sharing stories” (PR#275 p8). The Review Board considered these perspectives from community members as well as the confidential records provided in NBDB’s *Traditional Knowledge Assessment of the Prairie Creek Mine Operation*, and the Traditional Knowledge Assessment Addendum (PR#18).

The Review Board finds that traditional harvesting has been practiced and continues to be practiced in the Project area, and recognizes that this traditional harvesting is important to local Aboriginal people for economic, social and cultural reasons.

### **7.2.3 Impacts from increased access**

#### ***Beneficial impacts from increased access***

The Review Board understands and agrees with the developer’s position that the Project could have a positive impact on harvest activities. The developer predicted that year-round access would encourage harvest, thus providing enhanced economic and cultural value to NBDB (PR#55 p163). Parties such as NBDB suggested that this access will benefit traditional and cultural activities. For example, the Review Board heard that access would allow for NBDB to consider building a youth camp at Grainger Gap along the All Season Road (PR#548 p3). The Review Board acknowledges and respects the ways that access can provide social, cultural and economic benefits for communities.

#### ***Adverse impacts from increased access***

The proposed Project will increase access to traditional harvesting areas. The Review Board accepts the developer’s prediction that new access is expected to “...increase traditional land use in the area” (PR#55 p11). The Review Board observes that without increased access, traditional harvesting activities in the Project area are not likely to face significant changes. New access is likely to be the primary pathway affecting harvest activities.

After hearing from parties, the Review Board is concerned that increased access will increase harvest pressure and affect harvest areas and patterns. The Review Board heard concerns from LKFN at the hearing, where they explained why harvesters from outside the Dehcho region are likely to adversely affect traditionally-harvested wildlife (PR#528 p32-33):

We've heard from our people and other people that, with the caribou bans in the other jurisdictions, that has forced harvesters... to come to our region and hunt our resources. We have noticed a decline in moose. We've noticed a decline in caribou.

The Review Board listened to all parties' concerns about the adverse effects from increased access. From initial scoping through to its closing arguments, NBDB stressed that there "...could be an impact to harvest pressure from people outside the region" (PR#33; PR#548 p4). NBDB cited concerns about "outsider" access to woodland caribou in particular (PR#18 p4). The developer has acknowledged that a priority issue for the NBDB has been the access road enabling hunters from other regions of the NWT and elsewhere to access the area and increase hunting pressure (PR#553 p1).

The Review Board observes that the Project creates access for the harvest of previously inaccessible populations and subpopulations of mountain woodland caribou, as well as other harvested species that live within and outside NNPR.<sup>4</sup>

The Review Board expects that the traditional activities of NDBD and other harvesters from the Dehcho will be enhanced from increased access, as harvest areas become more accessible. The Review Board also finds that the Project is likely to adversely affect their harvesting activities, as it will likely increase non-Aboriginal hunting access and possibly Aboriginal harvesting by residents from other regions of the NWT and elsewhere.

#### **7.2.4 Developer's predictions underestimate impacts on harvesting**

The Review Board disagrees with the developer's prediction that the overall significance of impacts from increasing access will be low, and believes that the developer underestimated impacts on traditional harvesting for the following reasons:

- The developer estimated the overall significance of impacts on harvested wildlife without distinguishing between species. The Review Board observes that different harvested species within the Project area provide different economic, social and cultural values to harvesters, which is why the Review Board requested an effects assessment on "harvest pressure by species" in the ToR (PR#42 p18). Based on current trends, the Review Board believes that different harvested species (for example, those hunted and those trapped) will be affected differently, but this is not recognized in any of the developer's predictions.

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<sup>4</sup> Further evidence and analysis regarding wildlife and habitat, including in relation to harvested species, is in Chapter 6.

- Based on the time periods assessed by the developer, the Review Board believes that the combination of harvested wildlife impacts occurring over all four seasons throughout the life of the Project was underestimated.
- The developer has not demonstrated an acceptable level of knowledge regarding the location of furbearers (PR#102 p55) or big game within the Project area to the extent that satisfied parties<sup>5</sup>. According to the developer, impacts on each species would vary based on abundance along the road (PR#102 p128).

The Review Board is not confident in the developer's predictions, which provide a low level of certainty for decision-making about the impacts of the Project on harvest activity. The evidence from NBDB's confidential Traditional Knowledge Assessment, cultural technical sessions in Nahanni Butte and Fort Simpson, hearing testimony and closing arguments, provide compelling evidence to suggest that impacts on traditional harvesting activities and the potential for adverse impacts on those activities were underestimated by the developer.

#### **7.2.5 Traditional harvesting depends on sustainable populations of wildlife**

In Chapter 6 of this report, the Review Board concluded that the Project is likely to cause significant adverse impacts on wildlife, including traditionally-harvested species. The Review Board acknowledges that potentially-affected Aboriginal groups rely on traditionally-harvested wildlife for sustenance and traditional activities. The Review Board recognizes that impacts on traditional activities are influenced by impacts on wildlife species from Project activities.

For example, DFN argued that impacts on wildlife numbers and locations (as detailed in Chapter 6) from disturbance have the potential to interact with pressures from harvest and changes to harvest areas. The Review Board accepts DFN's view that the Project has "...the potential to affect harvestable wildlife abundance and distribution, and change harvesting pressure and harvesting areas" (PR#459 p24). The developer has identified that impacts on harvest areas will be greatest during the construction period (PR#102 pp43-44). The Review Board observes that significant changes to the locations and quantities of traditionally-harvested species, particularly during construction, could adversely affect harvest activities of NBDB and other Dehcho harvesters that rely on centuries old Traditional Knowledge and trails.

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<sup>5</sup> see Chapter 6 for more details



The Review Board observes that the benefits that increased access provides for traditional activities may be short-lived if wildlife populations and harvest pressure from outsiders become unsustainable from the combined effects of Project activities and overharvesting. The Review Board finds that increased access, in combination with all other Project impacts on wildlife, may result in combined effects on wildlife that could compromise sustainable traditional harvesting activities for NBDB and for other Dehcho harvesters<sup>6</sup>.

### **7.2.6 Uncertainties in mitigations to control access**

The Review Board recognizes that the developer has made commitments to report on harvest pressure (Appendix C, commitment #198) and monitor harvest (Appendix C, commitment #207). The Review Board acknowledges the developer's mitigations for impacts from increased access, such as the security checkpoint and environmental monitors, access control at the leased parcels, limiting use of the Liard River barge crossing, the no hunting policy, and the consideration of using trail cameras. The Review Board considered the developer's closing position about the physical and man-made "obstacles" to harvest in the Project area (PR#533 p2).

The Review Board heard parties' concerns regarding the effectiveness of these proposed mitigations. DFN described outstanding concerns specific to access management and related effects on harvest pressure and harvest patterns, stating that "[a] number of questions and concerns remain outstanding regarding access management... including safety issues, the potential to affect harvestable wildlife abundance and distribution, and changes to harvesting pressure and harvest areas" (PR#549 p17).

Based on the evidence, the developer has not persuaded parties or the Review Board that access mitigations will prevent adverse impacts on traditional harvesting activities. The Review Board's views regarding the effectiveness of access control mitigations are further detailed in Chapter 5 (Human safety) and Chapter 6 (Wildlife and wildlife habitat) of this report. The Review Board believes that it would be helpful for the developer to monitor the effectiveness of access control mitigations, with a specific concern for harvest activities, to better understand Project impacts on traditional harvesting.

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<sup>6</sup> See Chapter 6 for a discussion of Project impacts on wildlife.

### 7.2.7 Traditional harvesting rights

The traditional harvesting of wildlife is a fundamental activity and cornerstone to the well-being and way of life of Aboriginal people in the Mackenzie Valley region of the NWT. Paragraphs 115(1)(b) and (c) of the MVRMA require the Review Board to have regard for the importance of conservation to the well-being and way of life of Aboriginal people who use the Mackenzie Valley and whom Section 35 of the *Constitution Act, 1982* applies.

The Review Board observes that new access is one of the main pathways of Project impacts on traditional harvesting, and recommends measures to mitigate those impacts by requiring the developer to manage access in order to control harvest pressure, and to adaptively manage access control mitigations to ensure they are effective (Measure 5-2). While these measures mitigate impacts from the Project on traditional harvesting, the Review Board is also legally required to protect the rights of Aboriginal people to harvest wildlife under both Section 35 of the *Constitution Act* and section 115 of the MVRMA.

The Review Board is mindful of the recent Supreme Court federal appeal decision, *Clyde River (Hamlet) vs. Petroleum Geo-Services Ltd.*, 2017 SCC 40, that clarifies obligations of regulators specific to traditional resource use and Aboriginal rights. This decision makes it clear that the impacts of development on traditional resources used by Aboriginal rights holders should also be addressed through environmental impact assessment by a tribunal such as the Review Board. Accordingly, the Review Board has given consideration in its environmental assessment to impacts on the rights of Aboriginal people to harvest wildlife, not just the impacts of the Project on wildlife.

The Review Board has addressed its duty to have regard for the importance of conservation to the well-being of Aboriginal people by imposing measures to reduce impacts from the Project on traditional harvesting in the Project area.

### 7.2.8 Conclusion

Based on the analysis above, and having considered all evidence and argument on the public record, the Review Board concludes that increased access is likely to change harvest pressure, patterns and areas, leading to potential adverse impacts on traditional harvesting activities. The result of increased non-Aboriginal hunting access and possible harvesting by residents of other regions of the NWT and elsewhere, in combination with increased harvesting by Dehcho residents, and the potential impacts on wildlife described in Chapter 6, is likely to result in increased mortality of harvested species. The Review Board's views

on the effectiveness of proposed access control mitigations to limit harvest are considered in Chapter 6 on wildlife (see Section 6.2.7).

Access management measures are prescribed in Chapter 5 of this report. The Review Board concludes that these measures are necessary to prevent impacts on traditional harvesting that may result from the combined impacts from Project activities and overharvesting. Through the Traffic Management Plan and the Wildlife Management and Monitoring Plan, wildlife management authorities and local communities can mitigate these impacts and implement adaptive management to protect Aboriginal harvesting.

### 7.3 Suggestions

Measures described in chapters 5 and 6 will mitigate potential adverse impacts on traditional harvesting during construction, operation, and closure and reclamation of the Project. In addition, the Review Board has made suggestions that build on existing commitments and mitigations proposed by the developer. The following suggestions will enable the developer to assess the effectiveness of its access control mitigations toward maintaining sustainable harvest in the Project area. The suggestions are meant to complement the harvest monitoring commitment already made by the developer (Appendix C, commitment #207).

#### Suggestion 7-1

##### **Suggestion 7-1: Harvest monitoring program (for regulators)**

In order to mitigate potential adverse impacts of new access on traditional harvesting, wildlife management authorities should work with communities and harvesters to develop and implement a harvest monitoring program. The program should:

- i. identify value-based objectives for successful harvest monitoring with measurable and achievable goals to meet objectives;
- ii. identify pre-construction harvest information that can be used for comparison over time;
- iii. implement monitoring activities specific to understanding harvest activities using methods that meet the needs of local communities and wildlife management authorities;
- iv. track and report on harvest patterns and pressures during the life of the Project in order to identify adverse trends; and,
- v. recommend adaptive mitigations to reverse any adverse trends through the Traffic Control Mitigation and Management Plan or the Wildlife Management and

Monitoring Plan.

**Suggestion 7-2**

**Suggestion 7-2: Harvest monitoring program (for the developer)**

In order to mitigate potential adverse impacts of new access on traditional harvesting, the developer should support and cooperate with wildlife management authorities and potentially-affected Aboriginal communities to implement the harvest monitoring program.

**Suggestion 7-3**

**Suggestion 7-3: Examples of harvest monitoring programs**

The Review Board suggests that the developer, local communities and wildlife management authorities consider existing community-based harvest monitoring programs, including the Inuvialuit Settlement Region Community-based Monitoring Program and Tlicho Check Station Reports, for suggestions on harvest monitoring program design.

**Suggestion 7-4**

**Suggestion 7-4: Education about objectives**

The Review Board suggests that the developer, local communities and wildlife management authorities develop outreach and educational activities and materials to inform road users about the objectives of any harvest monitoring program.

## 8. Water quality and quantity

### *Summary of Review Board findings*

The Review Board finds that the Prairie Creek All Season Road Project (All Season Road or the Project) is likely to cause significant adverse impacts on water quality and quantity. The Review Board finds that significant adverse impacts are likely for the following reasons:

- Lack of sufficient baseline hydrology data may result in inadequate crossing design and significant adverse impacts on water quality, and therefore on fish and fish habitat<sup>1</sup>, from impacts such as flooding, erosion, and sedimentation.
- Major stream crossings requiring bridges, numerous crossings requiring culverts, and the Sundog diversion are located in Nahanni National Park Reserve (NNPR). Impacts at these locations would affect the ecological integrity of the park.
- Canadian Zinc Corp. has not demonstrated how its proposed monitoring programs will be linked to adaptive management to reliably contribute to the mitigation of impacts.
- Spills of concentrate, diesel, or other chemicals resulting from accidents or malfunctions are likely to have impacts on water quality.<sup>2</sup>
- If permafrost thaw occurs, there are likely to be impacts on water quality and quantity from changes to drainage and hydrology.<sup>3</sup>

Taken together, and in consideration of the Board's precautionary approach to dealing with uncertainty<sup>4</sup> in this EA (as outlined in Chapter 4), these reasons have led the Board to conclude that, without additional mitigation measures, significant adverse impacts on water are likely. The Review Board finds that significant adverse impacts can be avoided through robust baseline, mitigation, monitoring, and adaptive management measures that build on Canadian Zinc Corp. (CanZinc or the developer) commitments.

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<sup>1</sup> Impacts on fish and fish habitat, including traditionally-harvested fish and fish species at risk, from crossings are also discussed in Chapter 9.

<sup>2</sup> Chapter 5 focuses on human safety, but includes discussion about road design, operations, and the likelihood of accidents, which are relevant to impacts on water from spills.

<sup>3</sup> See Chapter 12 for more evidence and analysis related to permafrost.

<sup>4</sup> Specifically relevant here to the lack of sufficient hydrology baseline, lack of comparable examples of successful diversions, and lack of certainty about the road being designed and constructed to a high enough standard to prevent significant adverse impacts from accident-related spills.

## **Organization of this chapter**

In section 8.1 below, the Review Board has provided readers with a more thorough and detailed summary of the background evidence than it has in other environmental assessments reports. This is intended to allow readers to see firsthand the range and degree of uncertainties identified throughout the environmental assessment. These uncertainties present a particular challenge to impact predictions and decision making<sup>5</sup>, and are a relevant part of the Review Board's consideration of the evidence in this section.

In Section 8.2 the Review Board presents its analysis and conclusions in relation to impacts on water quality and quantity. The Review Board's recommended mitigation measure is outlined in Section 8.3.

### **8.1 Evidence from parties and the developer**

Based on information gathered from Canadian Zinc Corp. (CanZinc or the developer) and parties during the scoping phase of the environmental assessment (EA), the Review Board identified water quality and quantity as a subject of note for the Project EA in the Terms of Reference (ToR) (PR#42 p29). The ToR provided guidance to the developer on which pathways of impacts to consider, such as drainage patterns, hydrology, drinking water quality, erosion, glaciation, water withdrawal, and impacts of permafrost degradation (thawing). Impacts on water relate closely to the impacts on fish discussed in Chapter 9.

This section summarizes the evidence on the record from the Developer's Assessment Report (DAR) and DAR Addendum, technical sessions, information requests (IRs), and the hearing phase (technical reports, hearings, and closing arguments). For the Review Board's analysis and conclusions, see Section 8.2.

#### **8.1.1 Baseline information**

As described in the DAR, the proposed Project passes through seven surface water basins or physiographic zones and includes numerous stream crossings (PR#55 p72). In the DAR, CanZinc provided an overview of stream and crossing characteristics across the seven basins and included a table of creek crossings. It included a review of seasonal and annual flow based on the hydrometric station at Prairie Creek, where data is available from 1974-

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<sup>5</sup> See Chapter 4 for further discussion.

1990, as well as a regional analysis of peak flow using flow data from Prairie Creek, Flat River, and the South Nahanni River above Virginia Falls (PR#68 p2). In its DAR, CanZinc included a brief description of surface water quality and sediment quality in the area, as well as the results of surface water and sediment sampling and testing at some crossings (PR#55). CanZinc also included a discussion on groundwater in the area.

### **8.1.2 Impacts from erosion and sedimentation**

In relation to impacts on ecosystems in NNPR from the Project, CanZinc stated in its DAR that “[d]espite all efforts to control sediment release, there will likely be instances of unforeseen discharge” (PR#55 p224). The developer considered this more likely to occur during high runoff or flood conditions when there is already a high amount of sediment in the water (PR#55 p224).

CanZinc also discussed erosion and sediment control impacts on water quality in its DAR Addendum (PR#100 p66) and provided several predictions for related impacts during operations and construction (PR#100 p67). The developer acknowledged that construction and early operation are the times of greatest potential erosion and sedimentation, but noted that most of the streams are not fish-bearing. The developer indicated it will use standard mitigation techniques and will implement a Sediment and Erosion Control Plan. CanZinc also identified crossings as the greatest risk of sedimentation and stated that they will need to be suitably armoured. In the Sediment and Erosion Control Plan submitted with its DAR Addendum, CanZinc acknowledges that soil disturbance is required for the Project, but plan describes mitigation measures that can control sediment and erosion (PR#101 PDF p121). During the first round of IRs, there were numerous requests from parties for information related to erosion and sedimentation, in particular related to road design and mitigation measures (PR#200). In response to these IRs, CanZinc provided additional information on topics including the erosion and sediment control plan, special erosion protection areas, creek crossings, borrow pits near floodplains, erosion at meander bends, setback distances, TSS, instream work at the Liard crossing, and mitigation to prevent washouts (PR#200).

In response to an IR from Parks Canada, CanZinc explained that during dust control activities, it will only use enough water to wet the road, in order to avoid runoff that could contain sediment or cause erosion (PR#200 p33). In response to a concern about high water events and washouts in low areas of the road from GNWT, CanZinc noted that sections of road in floodplains will be designed to resist scour, although some erosion and sedimentation would be expected during 1 in 10 year or greater floods (PR#184 p1). Further discussion on flooding is in Section 8.1.6.



During the technical sessions, CanZinc made several commitments related to erosion and sedimentation, including implementing erosion and sediment control measures if rock or coarse materials are stockpiled within 100 meters of flowing watercourses, or if soil or fine material is stockpiled within 50 meters of flowing watercourses (PR#355 p2).

Environment and Climate Change Canada (ECCC) suggested that the sediment and erosion control plan should include specific details on the inspections proposed every 7 days following rain or melt events at erosion and sediment control locations, including turbidity measures (PR#230 p177).

In response to an undertaking (#22) from the technical sessions, CanZinc discussed end of winter activities related to erosion and sediment control, including use of water bars or berms to manage flow over disturbed soils, proactive use of erosion and sediment control leading into spring, and ensuring extra erosion control supplies are available at strategic locations (PR#250; PR#282 PDF p38).

During the second round of IRs, there were additional questions on dredging in the Liard river, blasting impacts on water flow, and sediment from landslides entering waterbodies (PR#320 p12, p25; PR#323 PDF p7). CanZinc responded that there will be no dredging at the Liard crossing, that blasting will occur in low flow or dry conditions, and that CanZinc will use silt fences as necessary (PR#323 PDF p7). CanZinc also committed to consider sediment influx into watercourses as part of the detailed terrain stability assessment (PR#320 p25).

Undertaking #7 from the public hearings requested that ECCC provide its opinion on whether the monitoring stations and data used by CanZinc for measuring peak and average flows would be sufficient for sediment and erosion control planning for the road (PR#532 p2). ECCC responded that more information would be helpful and that adaptive management and contingency measures will be important to ensure that erosion and sediment control measures are effective (PR#538 PDF p3).

CanZinc also provided a response to hearing undertaking #7, which was originally directed at ECCC. CanZinc pointed out that it is paying for the Prairie Creek gauge station operation and that the Sediment and Erosion Control Plan addresses different flow conditions and includes adaptive management and contingency plans (PR#553 PDF p49). CanZinc's position is that additional information would not have any value for developing sediment and erosion control mitigation (PR#553 PDF p49).

### 8.1.3 Total suspended solids and turbidity

Three parties commented on total suspended solids (TSS) and turbidity in technical reports and closing arguments (PR#448; PR#452; PR#544; PR#546; PR#550). In its technical report, ECCC concluded that CanZinc will need comprehensive baseline analyses of turbidity and TSS of stream and creek crossings prior to construction (PR#448 p12). ECCC suggested that regular water monitoring would show how well mitigations are working and that linear regression between TSS and turbidity would allow CanZinc to infer the TSS from turbidity. ECCC stated that CanZinc should compare turbidity results to predicted impacts and adjust mitigations as needed.

ECCC offered three recommendations to the Review Board in its technical report (PR#448 p11; Appendix D, ECCC recommendations #3.1-3.3). Recommendations #3.1 and #3.2 were that comprehensive TSS and turbidity monitoring should be completed, and that the baseline TSS and turbidity could be used to create a linear regression of the relationship, which would make future monitoring simpler. Recommendation #3.3 was for continued engagement with ECCC regarding monitoring. Parks Canada offered a similar recommendation in its technical report (PR#452 p35; Appendix D, Parks Canada recommendation #16).

In response, CanZinc agreed with the utility of TSS and turbidity monitoring and the value of a linear regression of the relationship between the two, but pointed out that there are limitations to establishing the linear regression relationship, including the level of field work involved (PR#484 p5). CanZinc suggested it could sample accessible and representative streams to create a linear regression that it can apply to other streams in the area. CanZinc suggested that this will be difficult prior to construction, and that it would be more effective for CanZinc to compare up- and downstream measurements before, during, and after construction.

At the public hearings, Parks Canada and ECCC reiterated the importance of having the relationship between TSS and turbidity established (PR#525 p164, 199). Parks Canada agreed with CanZinc's approach to use representative streams to establish this relationship.

In its closing arguments, ECCC and Parks Canada acknowledged that CanZinc has agreed to address all three recommendations it made regarding TSS and turbidity, but noted that the baseline analysis of turbidity and TSS should be completed prior to and during construction (PR#544 p4; PR#546 p12). ECCC noted that the method for this baseline data collection and monitoring can be finalized during the regulatory phase, and therefore ECCC

has no outstanding concerns during the EA. Liidlii Kué First Nation (LKFN) indicated in its closing arguments that it remains concerned about significant adverse impacts on water (PR#550 p2) and supports ECCC's recommendations that the Review Board ensure baseline studies on TSS and turbidity are completed prior to construction (PR#550 p3; Appendix D, LKFN recommendations #4 and #5). CanZinc did not respond to parties' closing argument comments on the timing of the TSS and turbidity baseline work (PR#553).

#### **8.1.4 Impacts from altered surface drainage patterns**

In the DAR and DAR Addendum, CanZinc stated that the road embankments may act as snow fences in winter, but that, where drainage patterns are perpendicular, meltwater will be channeled under the road using culverts, and as a result there will be no significant impact on drainage patterns (PR#55 p242, PR#100 p65).

There were numerous party questions around surface drainage in the analytical phase of the EA. In response to a Canadian Parks and Wilderness Society IR on groundwater and karst groundwater flow in the area, CanZinc responded that groundwater flow patterns will follow surface water patterns (PR#200 p31). In response to first round IRs from Dehcho First Nation (DFN) and from Parks Canada Agency (Parks Canada) about culverts and drainage, CanZinc responded that it had already committed to geotechnical and hydrological investigation prior to final designs of crossings and that it will consider the need for additional culverts during detailed design (PR#200 p 25-26).

During the technical sessions, Parks Canada pointed out that even with culverts, characteristics like water quality, temperature, and velocity can all be affected, and that there is research showing that the Permitted Winter Road has permanently altered moisture regimes and groundwater compared to un-cleared areas (PR#232 p203). In a second round IR, Parks Canada asked for a draft inspection and monitoring plan, and CanZinc replied that sufficient information is currently on the record for this stage of the Project (PR#320 p17). For example, during the first round of IRs, CanZinc provided information on inspection and maintenance plans in response to Parks Canada, including that a qualified person will visually inspect bridges and major culverts at least once a year and that a qualified person under the guidance of a qualified engineer will complete a detailed inspection at least once every three years (PR#200 p27). In the commitments table CanZinc provided as part of the second round of IRs, CanZinc committed to developing an inspection and monitoring plan for drainage patterns, in order to maintain natural drainage and inform adaptive management (PR#355 p16).

In response to an undertaking (#22) from the technical sessions, CanZinc discussed end of winter activities related to drainage and surface water control, including pullback of snowfills and re-establishment of natural drainage paths, focusing activities on well drained soils and avoiding poor soils, and continuing to monitor conditions into spring (PR#250; PR#282 p38).

Another technical session undertaking (#18) requested that Parks Canada provide information on why it is important to restore natural drainage patterns at closure and what aspects may be particularly important (PR#250). In response, Parks Canada pointed out that changes to drainage could affect water quality, temperature, and flow, which could in turn affect wildlife habitat (PR#262 PDF p3). Parks Canada considers restoring natural drainage patterns necessary to maintain the ecological integrity of the area and ineffective restoration can result in ponding or permafrost thaw, which will have further impacts on vegetation and wildlife habitat. According to Parks Canada, "[r]estoration of natural drainage requires small scale features to maintain natural flow rates, water quality, temperature and infiltration, consistent with existing gradients, sub-bed and retention of existing aquatic habitat in the project area" (PR#262 PDF p4).

### **8.1.5 Impacts from permafrost thaw**

The main discussion of impacts on permafrost and associated impacts on the surrounding environment (including water), see Chapter 12: Permafrost. This section provides a very brief summary in relation to impacts on drainage and flow of water.

In its DAR, CanZinc stated that the road alignment and crossings were selected to avoid terrain and permafrost issues (PR#55 p243). CanZinc included an assessment of potential impacts of permafrost thaw on water quality and quantity in its DAR Addendum and stated that permafrost thaw may change local flow patterns primarily in flat boggy areas with poorly defined flow paths (PR#100 p66). In its DAR Addendum, CanZinc indicated that permafrost thaw may result in some settling and water ponding, but that the water would percolate through the road base or travel to the nearest culvert, and overall impacts from permafrost change along the length of the road during construction and operation would have low significance.

In terms of potential interactions of permafrost with water quality and quantity, parties raised several questions during the analytical phase of the Project. For example, in the first round of IRs, GNWT pointed out that snow along road sides can lead to permafrost thaw and water ponding (PR#200 p20 ). In response to DFN IRs, CanZinc commented that the need for additional culverts to reduce ponding of water along embankments would be

assessed during detailed design and that insulation at culvert location will be based on site-specific conditions (PR#200 p25; PR188 PDF p2).

### **8.1.6 Flooding, overland flow, channel movement, and icing**

In its DAR, CanZinc identified the Liard River crossing as having high risk of flooding, and 20.65 kilometres of the All Season Road as having moderate risk of flooding (PR#55 p11). In its DAR addendum, CanZinc pointed out that floods are not typically sudden, although there is some potential for flash flood conditions along the road (PR#100 p50). CanZinc stated that it will suspend hauling if there are concerns about flooding, and that it will inspect the road following intense rainfall or flood events. As a result, CanZinc concluded that flooding is not a significant potential cause of accidents<sup>6</sup> and spills that could impact water.

In Appendix 2 of its DAR, CanZinc discusses the potential for flooding or overland flow in more detail (PR#129 p65). Flooding could occur at stream crossings, in low lying road areas, and at the Liard River crossing. Flooding has the potential to damage the road, bridge foundations, and crossing structures. Overland flow could cause water to back up at culverts or result in water flowing in unanticipated directions. This could cause erosion, or could exacerbate or cause slope instabilities.

In the DAR, CanZinc described examples of mitigation related to flooding, which included: providing design flood level and flow computations for major crossings, completing preliminary designs for major crossing structures, and using culverts to maintain natural drainage patterns and flows (PR#55 p242). In Appendix F of its DAR Addendum CanZinc discussed the potential for bridges or the road to be affected by channel movement or avulsions<sup>7</sup> (PR#99 p2). CanZinc assessed the potential for streams to create or move to new channels by examining air photos for some locations. For other locations CanZinc assumed that poorly vegetated terrain is more likely to experience meanders or channel movement. CanZinc stated that the road alignment is routed to avoid potential overrun and debris risks, where possible.

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<sup>6</sup> In addition to direct relevance for water, the information on flooding and other topics presented in this section is also relevant as a factor that could contribute to accidents and malfunctions, with implications for impacts on people (human safety, discussed in Chapter 5) and the environment (e.g., water).

<sup>7</sup> Risk in this context is considered to be the result of likelihood and consequence of an event.

<sup>7</sup> An avulsion is when a stream suddenly abandons its current channel and moves to or forms a new channel. In this section "channel movement" is used to mean the same thing.

In response to a first round IR about erosion risks at meander bends, CanZinc discussed the erosion along Prairie Creek and Funeral Creek during high water events in 2006 and 2007 (PR#188 PDF p71). CanZinc explained that these sections were not armoured properly to prevent erosion at the time. CanZinc considered the risks at Prairie Creek and Funeral Creek to be addressed following rebuilding of the road, and noted that Tetcela and Polje Creeks appear to be relatively stable in their channels.

In response to an IR from the GNWT, CanZinc explained that there are five locations where the approaches to the bridge are lower than the bridge height and agreed that these locations could be affected by 1 in 10-year flood events or greater (PR#184 p1). CanZinc advised that these locations will be armoured and that it may use larger rock to prevent scour. CanZinc expects some eroding or displacement of fine gravel material on the surface during 1 in 10-year and greater water flow events. At the technical sessions, CanZinc further clarified that two of the locations where the road is low (Casket Creek at km 6.2 and a tributary to Sundog Creek at km 39.8 (PR#237 p219) will be protected so water can flow overtop during high flow events, without damaging the road.

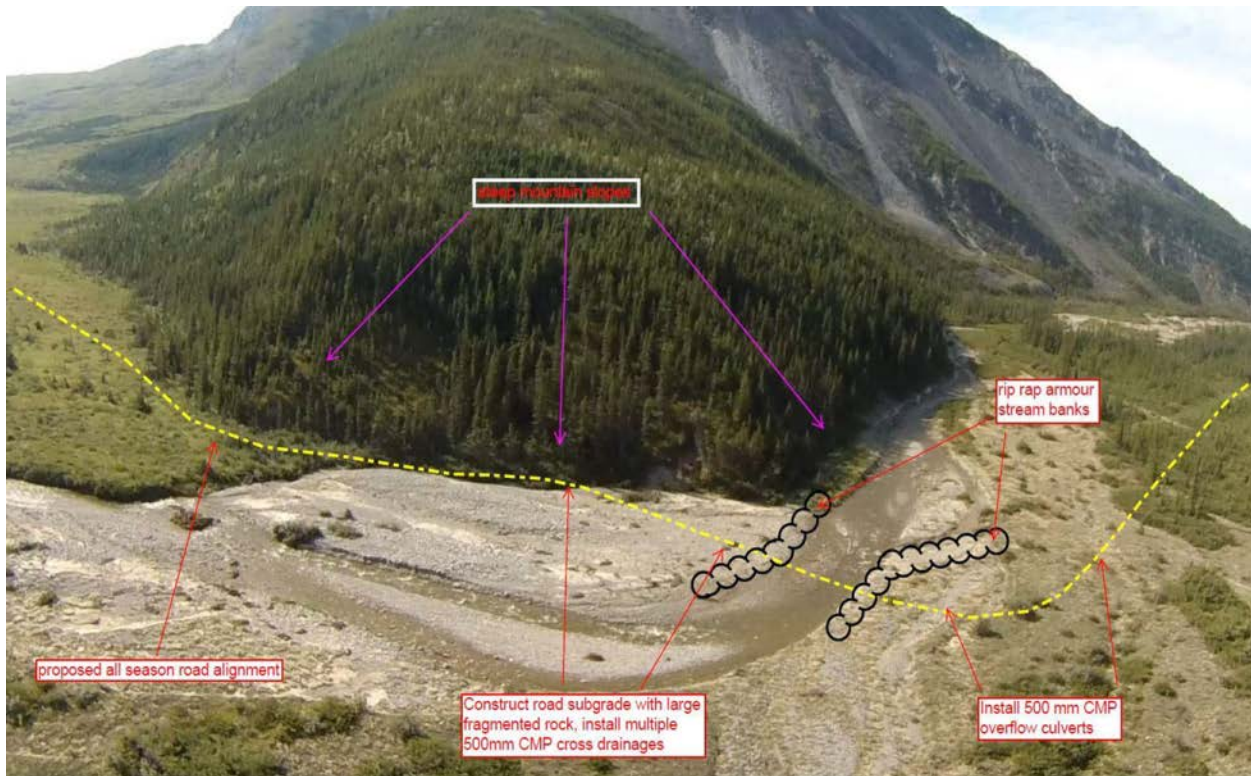
During IRs and at the technical sessions, questions were raised about the road design standard and potential impacts on the road and watercourse crossings in relation to peak flow estimates, debris, ice jams, channel movement, floods, borrow pits in floodplains, and water flowing over the road (PR#237; PR#282; PR#277; PR#200 p28; PR#188 PDF p57). In response, CanZinc provided additional details on major watercourse crossings and described mitigation for protecting bridge structures. The developer confirmed that the design standard for stream crossings is to have at least one meter between the bridge deck and 100-year flood level waters and that abutments will be suitably armoured (PR#237 p52). CanZinc explained that it considered icing or ice jam issues and identified concerns at only one crossing (at km 23.4), where the bridge design is already several metres above the water flood levels. CanZinc explained that the hydraulic design is currently based on the stream crossing abutments not encroaching into the stream (PR#237 p53). CanZinc also committed to construct bridge crossings to span the active floodplain (2-year flood levels) at a minimum and to model requirements for large floods during detailed design (PR#237 p201).

In the response to undertaking #11 from the technical sessions, CanZinc provided a list of major crossings ranked by risks from events such as channel movement, debris flows, and ice jamming (PR#250; PR#282 p42). In response to another undertaking (#36), CanZinc indicated that it has considered how flooding, overland flow, landslides, ground movement, seismic activity, and avalanches will interact with road operations and potential accidents



and malfunctions. CanZinc clarified that impacts on people from accidents were not considered directly in the assessment (PR#282 p85).

At the Nahanni Butte cultural technical session, community members described concerns about flash flooding and spring flooding washing out the road, particular in the vicinity of Grainger Gap, which is known to flood regularly (PR#277 p6). Figure 8-1 shows the Grainger Gap crossing. In fall 2016, CanZinc held a community meeting with Nahanni Butte where it discussed the issue of flooding at Grainger Gap and explained that the river had to be crossed somewhere. CanZinc stated at the community meeting that it chose a location with bedrock on one side and plans to place culverts in the alluvium on the other side (PR#326).



**Figure 8-1: Grainger gap crossing**  
(PR#101 p32)

### 8.1.7 Impacts from stream crossings

In its DAR, CanZinc provided an overview of watercourse characteristics and planned stream crossings. In response to a Review Board IR, CanZinc provided additional descriptions for major stream crossings (PR188 PDF p57). During the analytical and hearing phases of the EA, the Review Board heard from the developer that crossings are the



greatest risk for erosion and sedimentation (PR#100 p66). Parties had questions and concerns about in-stream work at crossings, erosion at meander bends, and high water events leading to road washouts (PR#184; PR#200).

The Review Board heard from Parks Canada that the mitigation measures CanZinc described in its DAR and DAR Addendum would minimize but not eliminate impacts on water quality at crossings (PR#200 p32) and that even with culverts in place, there could be impacts on water (PR#355 p16). CanZinc agreed to consider the need for additional culverts (PR#200 p25) and made a variety of commitments regarding crossings, including (Appendix C, commitments #70, #71, #72, #73, #93, #94, #95, #156, and #158):

- avoiding perched culverts;
- carefully placing and sizing culverts in areas with slope instabilities;
- ensuring relevant up and downslope culverts on switchbacks are installed;
- carefully placing culverts to avoid ponding;
- inspecting bridges and major culverts;
- developing an inspection and monitoring plan;
- cleaning ditches and culverts after high water events;
- completing geotechnical and hydrotechnical investigations prior to final design; and,
- installing sediment and erosion control measures.

Parks Canada recommended in an IR that monitoring of construction impacts at stream crossings include pH, dissolved oxygen, and conductivity, similar to parameters measured on territorial roads, and requested a detailed monitoring plan for long-term impacts during operations (PR#200 p32). In response, CanZinc suggested that monitoring at crossings should include only turbidity and TSS using 2 upstream and 2 downstream reference points.

In response to a second round IR from the Review Board, CanZinc reiterated a commitment to develop and implement an inspection and monitoring plan for all stream crossing structures within the Road Construction and Maintenance Plan and the Sediment and Erosion Control Plan (PR#350 p8; PR#355 p17). CanZinc suggested that the key aspects of monitoring stream crossings would be changes to channel position, erosion at structures, and adaptive management.

In an IR related to CanZinc's proposed mitigation measures and the need for monitoring at stream crossings, Parks Canada suggested that "...applying [CanZinc's proposed] practices will minimize but not eliminate reductions in water quality at crossing installation sites" (PR200 p32). Similarly, in another IR Parks Canada expressed concern regarding stream

crossings, which it considers are located at “...higher risk areas regarding roadway failure, safety, and spill risk” (PR#200 p27). Figure 8-2 shows a section of Sundog Creek downstream of the proposed diversion, and illustrates the complexity of geomorphically-active streams.



**Figure 8-2: Sundog Creek downstream of the proposed diversion**  
(PR#123 PDF p27)

### **8.1.8 Impacts from spills**

The developer and parties acknowledged the relationship between accidents and spills. For information and analysis regarding the risk of and contributing factors to accidents, see Chapter 5.

In its DAR, CanZinc identified spills and leaks as potential pathways of contamination and described spill planning and preparedness (PR#55 p192). Spills could include concentrate, fuel, reagents, chemicals, or acid. With regard to spills, CanZinc pointed out that:

- in winter the clean-up should be easier;
- surface water contamination should be visible and can be cleaned up downstream; and,
- some locations along the road are permeable, such as karst areas and floodplains.

In its DAR Addendum, the developer stated that spills will have a short-term risk to water quality, until they are cleaned up (PR#100 p66-67). CanZinc predicted that the significance of spills would be high, depending on the location, and noted that the maximum response time for spill response teams to travel to the site of a spill would be three hours. The Review Board also heard from CanZinc that there are stretches of road where the slopes are steep enough that if a vehicle leaves the road, a winch would be required to recover vehicles and spill response would be by foot (PR#200; PR#524).

Spills and spill response were common topics of discussion by parties during the EA. During the first and second rounds of IRs, there were numerous questions around the risk of spills, developing a spill contingency plan, and worst case scenarios (PR#200, PR#320). In technical reports, at the hearings, and in closing arguments, the Review Board heard evidence from Indigenous and Northern Affairs Canada (INAC), Parks Canada, DFN, LKFN, and NBDB about spills.

The Review Board heard from parties, particularly DFN and LKFN, that they are concerned that the Project will, based on current design, result in significant adverse impacts on people and cause spills, as a result of accidents<sup>8</sup> and malfunctions (PR#549 p5; PR#550 p5). DFN concluded that the best way to protect water resources from spills is to reduce the potential for accidents leading to spills (PR#459 p4). As a result, DFN expressed concern with the stretches of 4 m wide road, particularly where there are hills and poor lines of sight. DFN identified two road design manuals for mine haul roads. Using a calculation in those manuals (based on the number of lanes and width of vehicles travelling the road), DFN concluded that the minimum running surface for a single lane road with 2.6 m wide vehicles is 5m (PR#459 p4). DFN acknowledged that 4 m wide stretches may be acceptable for short distances with good line of sight. DFN recommended that the road alignment should be expanded from 4 m to 5 m where there are steep hills or line-of-sight is poor (PR#459 p5).

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<sup>8</sup> For information and analysis regarding the risk of and contributing factors to accidents, see Chapter 5.

The NBDB closing arguments indicated that NBDB knows there is potential for spills to contaminate water, but that NBDB believes CanZinc will build and operate the Project in a safe manner (PR#548 p4).

Parks Canada recommended a measure to the Review Board to prevent potentially significant impacts on the environment from spills (PR#452 p45; Appendix D, Parks Canada recommendation #26). The recommendation was to require that the Spill Contingency and Response Plan be informed by the updated risk assessment and updated road design and operations plan.

During the public hearings, CanZinc committed to form an independent technical review panel for road design and risk assessment (to help minimize accidents and associated spills) and noted that the Spill Response Plan will be updated prior to construction to reflect the updated risk assessment and detailed design (Appendix C, commitment #221).

#### **8.1.9 Impacts from grey and brown water disposal at camps**

In its DAR, the developer stated that grey and brown water from construction camps will either be removed to a treatment plant or disposed of using soak-away sumps (PR#55 p243). CanZinc also stated it will use only biodegradable, phosphate-free detergents at camps. CanZinc did not provide an effects assessment with criteria and did not predict significance.

Parks Canada asked a number of questions during the analytical phase of the EA. In its technical report, Parks Canada stated that compounds from sewage and greywater can migrate into surface water and negatively affect aquatic life and concluded that CanZinc must design a septic system and disposal field for grey water disposal, specifically to breakdown grease, fats, bacteria, and detergents (PR#452 p40).

Parks Canada recommended four measures to the Review Board “to prevent potentially significant adverse effects on the environment from improperly treated grey water and sewage from camps associated with the construction phase of the proposed all season road” (PR#452 p41; Appendix D, Parks Canada recommendations #22 to #25). Recommendations #22 and #23 recommended that all grey water in NNPR be treated using a septic system, and for CanZinc to provide a grey water management plan. Recommendation #24 was for CanZinc to store all brown water in holding tanks to be removed and treated elsewhere. If CanZinc decided to treat brown water on site at the camps in NNPR, recommendation #25 was that a sewage management plan must be

completed for the development, management, and decommissioning of the sewage treatment system at each location.

In response to technical reports, CanZinc agreed to implement Parks Canada's recommendations #22 and #23, so long as CanZinc can treat grey water by simple filtration (PR#484 p20). In response to Parks Canada's recommendations #24 and #25, CanZinc responded that it will either remove the brown water to a suitable facility, or treat the brown water on site and dispose of it after treatment. CanZinc indicated that in its opinion, on-site treatment and disposal is unlikely to affect surface water or shallow ground water in the area. CanZinc indicated that it is not opposed to most of the requirements in recommendation #25, if on-site treatment is selected.<sup>9</sup>

In its closing arguments, Parks Canada indicated that it is not satisfied with two aspects of CanZinc's commitments. Parks Canada indicated that greywater should be treated and disposed of through a septic tank and disposal field and, if CanZinc indicated if it treats brown water onsite, it must be disposed of in a properly designed effluent disposal field.

In response to Parks Canada's remaining concerns in closing arguments, CanZinc stated that these concerns were simply differences in language or level of detail, and that both grey and brown water will be disposed of in a disposal field (PR#553 PDF p14).

#### **8.1.10 Impacts on water from acid rock drainage and metal leaching**

CanZinc stated in its DAR Addendum that the likelihood of acid-generating rock is low, and that borrows with acid-generating material would be avoided (PR#101 p41). CanZinc did not provide an effects assessment with criteria and predicted significance.

In second round IR, Parks Canada noted that metal leaching and acid rock drainage have the potential to affect water quality, as well as vegetation and wildlife (PR#320 p16). In response to a first round IR from ECCC, CanZinc stated that there has been no indication of acid rock drainage potential or metal leaching potential during borrow site sampling (PR#200 p16). CanZinc has committed to acid rock and metal leach testing during detailed design and stated that it will not use borrow from locations with positive results (PR#355 p7); however, for borrow pits with marginal acid rock drainage potential or metal leaching

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<sup>9</sup> CanZinc's commitments in relation to the issues described in this paragraph are commitments #219 and #220 (listed in Appendix C).



potential, CanZinc will either not use the material, or will use it following mitigation measures a professional geochemist identifies (PR#355 p7; PR#320 p16).

In its technical report, ECCC noted that “...metal leaching does not only occur when there are acidic conditions, but can also occur in a neutral pH condition” (PR#448 p9). ECCC pointed out that the results of CanZinc’s testing will inform the assessment of potential impacts on water quality, which should consider either baseline data or follow the CCME water quality guidelines for the protection of aquatic life. ECCC offered four recommendations to the Review Board related to acid rock drainage and metal leaching (PR#448 p9).<sup>10</sup> Recommendations #1.1-1.3 were that all representative borrow material units should be sampled and tested at all borrow sources to identify any acid rock drainage or metal leaching potential, overseen by a qualified professional geochemist. Recommendation #1.4 was that any borrow units with marginal potential for acid rock drainage or metal leaching should be avoided. In Parks Canada’s technical report, Parks stated that it “...supports ECCC’s conclusion, rationale and recommendations related to borrow sources potential for acid rock drainage and metal leaching” (PR452 p50).

In response to the technical reports, CanZinc indicated that it mostly agrees with these recommendations and provided a commitment: “[a]ny borrow with a positive identification of ARD/ML potential will not be used” and “remaining borrows will be used subject to mitigation procedures that may be defined by a professional ARD/ML geochemist” (PR#484 p4).

In closing arguments, ECCC reiterated its technical report recommendations, and pointed out that while CanZinc has agreed to address recommendations #1.1-1.3 above, but has not agreed to address recommendation #1.4 (PR#544 p2). ECCC restated that all borrow material with marginal acid rock drainage or metal leaching potential should be avoided because if this material is exposed, it becomes difficult to mitigate and prevent adverse impacts on water (PR#544 p2). ECCC concluded that if CanZinc agrees to avoid borrow material with marginal acid rock drainage and metal leaching potential, ECCC will no longer have concerns regarding acid rock drainage and metal leaching. LKFN indicated in its closing arguments that it supports ECCC’s recommendations on water quality (PR#550 p3; Appendix D, LKFN recommendation #4).

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<sup>10</sup> See Appendix D of this Report of EA, ECCC recommendations #1.1-1.4.

In its closing arguments, CanZinc clarified that it did not agree to ECCC's recommendation #1.4, above, because the term marginal is subject to interpretation (PR#553 p3). CanZinc pointed out that the difference between a borrow source with no significant acid rock drainage or metal leaching potential and marginal potential is unclear. As a result, CanZinc has revised its commitment #125 (Appendix C) to state that it will use "...sources of borrow material for construction only if these are considered to pose a low risk to the environment, as determined by a professional geochemist [...]" (PR#553 p3).

#### **8.1.11 Water quality monitoring**

GNWT, Parks Canada, and LKFN provided recommendations to the Review Board in relation to water quality monitoring in their technical reports and closing arguments (PR#452; PR#455; PR#550; PR#551; PR#546). In its technical report, GNWT acknowledged that CanZinc has agreed to work with stakeholders during the regulatory phase to develop water monitoring plans (PR#455 p27). GNWT agreed that details, including parameters and frequencies, can be determined during the regulatory phase. GNWT will work with CanZinc and other stakeholders. If CanZinc meets regulatory requirements and its commitments, GNWT believes significant adverse impacts related to water crossings are unlikely. GNWT recommended that the Review Board recognize CanZinc's commitments regarding a watercourse monitoring program as part of the scope of development<sup>11</sup> (Appendix D, GNWT recommendation #9) and echoed this recommendation in its closing arguments.

Parks Canada pointed out that CanZinc does not present details on how it will monitor waterbodies during construction and operation (PR#452 p34). Parks Canada recommended two measures to the Review Board regarding monitoring programs (PR#452 p35; Appendix D, Parks Canada recommendations #17 and #18). Recommendation #17 is for CanZinc to develop a short-term water quality monitoring program and recommendation #18 is for a long-term water quality monitoring program. The short-term program would apply to all crossings and the Sundog Creek diversion, while the long-term plan would be at a subset of crossing location and at the Sundog Creek diversion. Parks Canada described its expected frequency of monitoring, as well as what parameters should be measured.

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<sup>11</sup> See Section 2.1.2 for more information on the Review Board's response to GNWT's recommendations related to the scope of development.



In its closing arguments, Parks Canada stated that there (PR#546 p11):

...is potential for reductions in water quality where the project is in proximity to waterbodies from modified/altered surface and groundwater flows leading to channel modifications, increased susceptibility to erosion, siltation, and detrition of vegetation and habitat for fish and other wildlife

Parks Canada also registered ongoing concerns about monitoring the Sundog Creek diversion<sup>12</sup> (PR#546 p12):

The proponent assumes the system will behave the same as other parts of the creek, and that monitoring for long-term stability and hydraulic performance will be sufficient to detect issues with the [diversion]. However, without long term monitoring of ecologically meaningful parameters such as turbidity and TSS, they will not know if this assumption is correct.

Parks Canada concluded that unless CanZinc adds recommendations #17 and #18 as commitments, the Review Board should include them as measures in the Report of EA. Parks Canada suggests that these measures could be applied through an aquatic effects monitoring program, which will be reviewed and approved by Parks Canada as a permit condition (PR#546 p12).

CanZinc agreed to developing a program to monitor the short-term impacts of construction on water quality, but argued that some of the details were unnecessary and premature, and could be determined during the regulatory phase (PR#553 PDF p13). In response to Parks Canada's recommendation #18, CanZinc agreed to long-term monitoring of crossing sites and waterbodies, but disagreed with the level of detail at this stage of the Project (PR#484 p19).

In response to Parks Canada's concerns regarding Sundog Creek monitoring, CanZinc explained that it believes the Sundog Creek diversion does not need long-term monitoring because, after an adjustment period, "...the [diversion] behavior will be natural and the same as other parts of the creek" (PR#553 PDF p13). CanZinc has agreed to long-term monitoring of the stability and hydraulic performance of the diversion, and agrees it can continue the short-term water quality monitoring of the diversion until the monitoring

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<sup>12</sup> Parks Canada pointed out that CanZinc's commitments did not mention Sundog Creek, and CanZinc has indicated that it believes Sundog Creek should be excluded from long-term water quality monitoring (PR#546 p12).

shows there is no longer an impact (Appendix C, commitment #240). CanZinc also pointed out that it did not commit to developing a new aquatic effects monitoring program.

LKFN indicated in its closing arguments that it remains concerned about significant adverse impacts on water from a variety of sources and indicated that it supports ECCC's recommendations that the Review Board should require that affected First Nations, including LKFN, be involved in baseline studies and monitoring (PR#550 p3; Appendix D, LKFN recommendations #4 and #6)<sup>13</sup>. At the hearings DFN described its community-based water monitoring program and suggested that there could be a role for Nahanni Butte or LKFN members to be involved in monitoring the road through that program (PR#525 p229).

### **8.1.12 Importance of clean water to communities**

At the community hearing in Nahanni Butte, an Elder spoke of the importance of water and expressed their desire to see that it is protected (PR#519 p90). Similarly, in Fort Simpson, a Nahanni Butte community member expressed a desire to make sure that water is still fresh and clean in 15 or 20 years (PR#525 p239). In its closing arguments, Nahanni Butte Dene Band acknowledged the risk of water contamination, but indicated that it believes CanZinc will construct and operate the road in a safe manner (PR#548 p4).

## **8.2 Review Board analysis and conclusions**

### **8.2.1 Summary of Review Board findings**

The Review Board finds that the Prairie Creek All Season Road Project (All Season Road or the Project) is likely to cause significant adverse impacts on water quality and quantity. The Review Board finds that significant adverse impacts are likely for the following reasons:

- Lack of sufficient baseline hydrology data may result in inadequate crossing design and significant adverse impacts on water quality, and therefore on fish and fish habitat<sup>14</sup>, from impacts such as flooding, erosion, and sedimentation.

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<sup>13</sup> For more on community involvement in monitoring, see Chapter 15.

<sup>14</sup> Impacts on fish and fish habitat, including traditionally-harvested fish and fish species at risk, from crossings are also discussed in Chapter 9.

- Major stream crossings requiring bridges, numerous crossings requiring culverts, and the Sundog diversion are located in Nahanni National Park Reserve (NNPR). Impacts at these locations would affect the ecological integrity of the park.
- Canadian Zinc Corp. has not demonstrated how its proposed monitoring programs will be linked to adaptive management to reliably contribute to the mitigation of impacts.
- Spills of concentrate, diesel, or other chemicals resulting from accidents or malfunctions are likely to have impacts on water quality.<sup>15</sup>
- If permafrost thaw occurs, there are likely to be impacts on water quality and quantity from changes to drainage and hydrology.<sup>16</sup>

Taken together, and in consideration of the Board's precautionary approach to dealing with uncertainty<sup>17</sup> in this EA (as outlined in Chapter 4), these reasons have led the Board to conclude that, without additional mitigation measures, significant adverse impacts on water are likely. The Review Board finds that significant adverse impacts can be avoided through robust baseline, mitigation, monitoring, and adaptive management measures that build on Canadian Zinc Corp. (CanZinc or the developer) commitments.

The following sections describe the reasons for these findings.<sup>18</sup> The Review Board's measures and suggestions are described in Section 8.3.

### **8.2.2 Limited hydrology data used to calculate average and peak flow**

The Review Board understands the Project will include (PR#350 PDF p67):

- 112 minor stream crossings;
- 17 major stream crossings (9 bridges, 1 barge, 119 culverts);
- other culverts to maintain surface water drainage and reduce ponding; and,
- the Sundog Creek diversion.

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<sup>15</sup> Chapter 5 focuses on human safety, but includes discussion about road design, operations, and the likelihood of accidents, which are relevant to impacts on water from spills.

<sup>16</sup> See Chapter 12 for more evidence and analysis related to permafrost.

<sup>17</sup> Specifically relevant here to the lack of sufficient hydrology baseline, lack of comparable examples of successful diversions, and lack of certainty about the road being designed and constructed to a high enough standard to prevent significant adverse impacts from accident-related spills.

<sup>18</sup> Please see Chapter 9 on fish and fish habitat for other topics and measures related to the Sundog Creek diversion.

The Review Board heard from CanZinc that crossings (and the Sundog Creek diversion) will be designed to withstand 1 in 100-year flood events (PR#55 p79). In its DAR, CanZinc estimated average flow for watercourses in the seven water basins or physiographic zones crossed by the Project using data from only one hydrology station on Prairie Creek (located at the most westerly end of the alignment) (PR#55 p73, 79). In undertaking #7 from the public hearings, ECCC was asked whether the stations and data used by CanZinc for measuring peak and average flows was sufficient for sediment and erosion control planning for the road (PR#532 p2). ECCC indicated that more information “...would likely be helpful for the design and implementation of the sediment and erosion control plan...” and that adaptive management and contingency measures would be important (PR#538 PDF p3).

In its technical report, Parks Canada stated that while CanZinc only used a single hydraulic model based on regional peak flow data, completing multiple hydrotechnical calculations is standard in other jurisdictions (PR#452 p30-31). As a result, Parks Canada stated that there is not enough information to assess significance of impacts and requested at least one more model to increase confidence in the current hydraulic model; otherwise, there is increased risk that the diversion channel will not withstand 100-year floods, which could result in significant impacts (PR#452 p31). Parks Canada provided one recommended measure to the Review Board in its technical report (PR#452 p32; Appendix D, Parks Canada recommendation #13) requesting that CanZinc conduct at least one supplementary hydrotechnical calculation for Sundog Creek during the regulatory phase.

In response to Parks Canada’s technical report recommendation, CanZinc stated that where there is no reliable alternative method, a single best model is standard (PR#484 PDF p59). At the public hearings, CanZinc briefly discussed the hydrograph<sup>19</sup> of Prairie Creek, explaining that it is the only Water Survey of Canada hydrograph in the area and that it believes it is representative of the other drainages in the area (PR#525 p134). CanZinc’s position is that the flow measurements from the Prairie Creek station and the two regional stations is sufficient to design and estimate flows at all other crossings (including Sundog Creek) (PR#553 PDF p49).

In closing arguments, CanZinc addressed undertaking #7 from the public hearing by saying that the Sediment and Erosion Control Plan addresses different flow conditions and includes adaptive management and contingency plans (PR#553 PDF p49). CanZinc’s

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<sup>19</sup> A graph of changes in water flow over time (e.g., hourly, daily, or at least seasonally).

position is that the flow measurements from the Prairie Creek station and the two regional stations are sufficient to design crossings along the road. In CanZinc's opinion "flow data from additional stations would be of no value whatsoever for the design or implementation of sediment and erosion control measures, and hence additional flow stations are not warranted or necessary" (PR#553 PDF p49).

The Board finds that using data from a single station on one creek is insufficient for predicting hydrological conditions and reliably designing watercourse crossings for peak flows or 1 in 100-year flood events. The Review Board notes that over the life of the Project (approximately 20 years), there is close to a 20% probability that a 1 in 100-year flood event will occur, and if peak flows have been underestimated, this percentage would increase. The Review Board also observes that peak and average flows may be influenced by climate change, which could change the magnitude and frequency of flood events and has not been explicitly considered in the developer's estimation of streamflow conditions during the EA. In the Review Board's view, these uncertainties could have been addressed through appropriate consideration of the hydrologic variability within the Project area and by applying additional conservatism to design criteria, where appropriate, but CanZinc did not adopt this approach.

The Review Board concludes that the developer does not have sufficient hydrological data to reasonably support its predictions that crossings have been adequately designed to avoid significant adverse impacts on water quality and quantity, and by extension on fish and fish habitat. This creates substantial uncertainty and, in the Review Board's opinion, the developer has not met its burden of proof in this instance. In the Review Board's view, if crossings are not designed to an appropriate standard, there are likely to be significant adverse impacts on water quality and quantity related to flooding, increased erosion, downstream sedimentation, deposition of sediments in the diversion, permafrost thaw, bridge failures, or road washouts.

### **8.2.3 Uncertainty in crossing design for active channels**

The Review Board is not convinced that the current road design adequately addresses the complexity of geomorphically active crossings that occupy broad gravel flats, such as Casket Creek (kilometer 6.2), Grainger River (kilometer 124.8) and Tributary of Grainger River preferred alignment option (kilometer 118.1). Figure 8-3 shows Casket Creek where the winter road crosses the broad gravel flats. These watercourses are 'braided' and may move or occupy multiple channels within the floodplain at different water levels or the primary channel may move over the life of the Project (PR#525 p14; PR#237 p99). The

Review Board considers the entire un-vegetated (or sparsely vegetated) floodplain to be part of this active system.



**Figure 8-3: Casket creek crossing (winter road alignment visible)**  
(PR#188 PDF p58)

If the crossings affect water depths or velocities (which will occur any time flow interacts with the crossing structure), sediment transport and channel morphology will likely be affected. In the Review Board's view, these changes can adversely affect both water quality (primarily water temperature and turbidity) and fish and fish habitat (including benthic invertebrates, riparian habitat, fish migration, etc.). The Review Board finds that these impacts would be intensified if the hydrology data used to calculate peak and average flows are inaccurate (as described above).



#### **8.2.4 Permafrost thaw will have impacts on drainage and hydrology**

The Review Board heard from parties that permafrost thaw has the potential to change hydrology and drainage patterns and cause icing or ponding of water (PR#451 p7; PR#294). Parks Canada pointed out that changes in hydrology as a result of permafrost thaw are a particular concern in some regions crossed by the Project, such as black spruce bog and alpine terrain (PR#294 p4), and could impact the ecological integrity of NNPR. The Review Board agrees that permafrost thaw has the potential to adversely affect water quality, and thereby the ecological integrity of the park and fish and fish habitat. For additional evidence and analysis related to Permafrost, see Chapter 12. The Review Board finds that the likely significant adverse impacts on permafrost described in Chapter 12 will result in likely significant impacts on water quality and quantity, particularly within NNPR.

#### **8.2.5 Acid rock drainage and metal leaching potential**

The Review Board notes that CanZinc has stated that borrow site sampling has not given any indication of acid rock drainage or metal leaching potential (PR#200 p16). CanZinc has agreed to testing all representative units in each borrow source location using acid-base accounting and metal leaching test methods (Appendix C, commitment #210). During the EA, the Review Board heard concerns from ECCC and LKFN regarding the impacts of acid rock drainage or metal leaching on the environment, particularly water (PR#320 p16 [PCA IR4]; PR#448 p9; PR#452 p50; PR#544 p2). CanZinc has committed that no borrow materials with positive acid rock drainage or metal leaching potential will be used on the road. However, the developer stated that material with low risk<sup>20</sup> to the environment may be used following the guidance of a professional geochemist (Appendix C, commitment #125). The Review Board heard from ECCC, with support from LKFN, that material with 'marginal' potential for acid rock drainage or metal leaching should not be used (PR#448 p9; PR#544 p2; PR#550 p3).

The Review Board agrees with parties that the use of borrow materials with marginal or low risk of acid rock drainage or metal leaching may have an adverse impact on water quality. In the Review Board's view, this is a potential long-term impact that is unacceptable in a National Park Reserve. Although there is some remaining uncertainty, this should be readily resolved through regulatory processes. The Review Board does not

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<sup>20</sup> The developer originally phrased this commitment referring to marginal acid rock drainage and metal leaching potential material being used following the guidance of a professional geochemist (PR#355 p7).



find that significant adverse impacts on the environment in relation to acid rock drainage and metal leaching are likely. The Board, therefore, provides a suggestion (8-2) rather than a measure on this specific topic.

### **8.2.6 Spills on the road will result in adverse impacts on water quality**

CanZinc has identified numerous mitigations to address spill concerns. However, in Chapter 5, the Review Board finds that the road is not adequately designed to minimize the risk of accidents and malfunctions, including spills.<sup>21</sup> In addition, the presence of non-mine traffic on this one-way industrial haul road is likely to result in increased accidents, and associated spills. Without additional mitigation, the Board has concluded that significant adverse impacts on water quality from accidents and spills of concentrate, diesel, or other chemicals are likely.

DFN and LKFN voiced concerns that the Project will, based on current design, result in accidents<sup>22</sup> and associated spills (PR#549 p5; PR#550 p5). CanZinc committed to create an independent technical review panel to inform road design. The Review Board's Measure 5-1 (Independent technical review panel) builds on this commitment and in the Board's view, this measure, together with CanZinc's commitments and the other measures in this report of EA, is needed to mitigate impacts on water from spills.

### **8.2.7 Impacts in Nahanni National Park Reserve would affect the ecological integrity of the park**

The Review Board observes that approximately half of the Project passes through the NNPR. There are seven major stream crossings requiring bridges or large diameter culverts along the portion of the road within the NNPR and numerous minor stream crossings using culverts (PR#350 PDF p67-70). In addition, the Sundog Creek diversion is located within the NNPR.

The Review Board finds that accident-related spills in the NNPR could affect the ecological integrity of areas of NNPR adjacent to and downstream of the Project. The Review Board

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<sup>21</sup> See also Chapter 5 for a discussion of the likelihood of and contributing factors to accidents and malfunctions. In addition to impacts on people from traffic accidents, impacts on water and the environment from spills is a major concern related to accidents and malfunctions.

<sup>22</sup> See also Chapter 5.

considers that a higher standard of protection is appropriate when considering the significance of impacts from the Project on components of the NNPR. In addition, the first 17 kilometres of the road nearest the mine have some of the steepest grades and the highest risk category of the entire road, and are immediately adjacent to fast flowing streams. Although outside the NNPR, this section of the road is upstream of the Nahanni River and a portion of the NNPR designated as a World Heritage Site. Any spill along this stretch of road or the road in NNPR could result in significant adverse impacts on the environment, including the ecological integrity of areas of NNPR adjacent to the Project and downstream.

In its technical report, Parks Canada advised the Review Board that one of the objectives of the NNPR Naha Dehé Management Plan is to ensure the waters of Naha Dehé are high quality and unimpaired by activities inside and outside park boundaries (PR#452 p6). Moreover, the Management Plan's ecological vision is to maintain a wilderness watershed in the Mackenzie Mountains where natural processes remain the dominant force shaping the park's ecosystem (PR#452 p6). The Review Board accepts that a key objective of the Management Plan is to protect water quality and believes that, considering the impacts described and analysis presented above, the Project is likely to have significant adverse impacts on water quality in the NNPR.

#### **8.2.8 Lack of a comprehensive monitoring and adaptive management framework**

Throughout the EA, parties discussed the need for and specifications of monitoring programs (PR#448; PR#455; PR#452; PR#544; PR#550; PR#546). For example, in its technical report, ECCC requested comprehensive baseline analysis of turbidity and TSS to be used in future monitoring (PR#448 p11). In its closing arguments, LKFN requested that this work be complete prior to construction (PR#550 p3). ECCC also recommended a measure related to monitoring erosion and sediment control (PR#544 p3), to which CanZinc responded that more discussion is required around such monitoring (PR#553 p8). Parks Canada recommended that CanZinc develop short-term and long-term water quality monitoring plans (PR#484 p19; PR#546 p12), and while CanZinc agreed to develop plans, it disagreed on the specific details (PR#484 p18; PR#553 PDF p13).

At the public hearing, CanZinc briefly reiterated planned mitigation to protect water quality, including management plans. These include avoiding borrow material with acid rock drainage and metal leaching potential, controlling erosion and sedimentation, placing of stockpiles away from water, and use of timing windows for construction (PR#525 p19). CanZinc pointed out that some of these mitigations continue into operations, including

monitoring and adaptive management. The Review Board recognizes that CanZinc has committed to the following water monitoring activities (Appendix C, commitments #55, #58, #93, #94, #211, #212, #217, #218, and #239):

- monitoring TSS, turbidity, pH, dissolved oxygen, and conductivity up and downstream if flood events occur at Casket Creek or other locations where flood water overtops the road;
- inspection and monitoring of bridges, culverts, and drainage patterns;
- installing water gauges and monitor lake levels where water is withdrawn;
- monitoring TSS and turbidity along the length of the Project;
- sediment and erosion control, including monitoring, during construction;
- developing a short-term water quality monitoring program;
- developing a long-term water quality monitoring program; and
- monitoring the morphology of the Sundog Creek diversion.

Despite the commitments CanZinc has made, the Review Board is not convinced that the monitoring plans will completely address the potential environmental impacts described by parties and summarized in this chapter. Of particular note are outstanding concerns from parties related to erosion and sediment control monitoring at crossings and monitoring of Sundog Creek (PR#544 p3; PR#546 p12). The Review Board observes that these concerns may have been raised in order to address uncertainties related to many of the impact predictions and mitigations described in Section 8.1, evidence related to impacts on water.

Because of the assumptions CanZinc made regarding peak and normal flows that subsequently informed design specifications for watercourse crossings and the Sundog Creek diversion, and the inherent uncertainty that these assumptions introduce, the Review Board expects that the developer would have proposed a comprehensive monitoring program rooted in the principles of and informing adaptive management. In the Review Board's view, such a monitoring program could help address some of the uncertainties related to stream crossings discussed above.

The Review Board finds that more comprehensive monitoring and a robust adaptive management system are required to address the uncertainties associated with impact predictions and crossing designs made based on insufficient baseline data. This is in large

part because the currently proposed monitoring plans are too broad, do not include a systematic adaptive management framework<sup>23</sup>, and because there is insufficient baseline data with which to compare monitoring results. In addition, the Review Board is concerned that CanZinc's commitments for water monitoring are spread out across many different commitments and plans, making them difficult to evaluate as a whole.

### 8.2.9 Conclusion

The Review Board is not convinced that watercourse crossings and the Sundog Creek diversion are designed to an acceptable standard, and that CanZinc has not met its burden of proof<sup>24</sup> in this regard. If watercourse crossings and the Sundog Creek diversion are not designed to an appropriate standard based on accurate hydrology data, impacts on water quality and quantity, from spills, flooding, increased erosion, downstream sedimentation, deposition of sediment in the diversion, permafrost thaw, bridge failures, or road washouts are likely. Moreover, if the road itself is not designed to an adequate standard, there will be an unacceptable risk of spills and associated impacts on water quality. The Review Board also remains concerned that CanZinc's water monitoring commitments are spread across numerous commitments and plans, making them difficult to evaluate as a whole.

Impacts on water quality are more likely to be significant within NNPR and in areas that support traditionally-harvested fish species or fish species at risk.<sup>25</sup> In the Review Board's view, it is important that traditional fisheries remain, and are seen to remain, uncontaminated, if they are to continue being used as traditional fisheries. Species at risk (and their habitat) also require a high level of protection and ecological integrity is an important value in the NNPR.

Due to uncertainties regarding the hydrology data used, combined with the high consequence of improper crossing and diversion design (such as impacts on NNPR and fish), the Review Board has taken a precautionary approach and concludes that significant impacts from the Project on water quality and quantity are likely.

The Review Board finds that, in combination with CanZinc's commitments and other measures in this Report of EA, significant adverse impacts can be avoided through

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<sup>23</sup> Please see Chapter 4 and Appendix B for more information on the Review Board's adaptive management considerations.

<sup>24</sup> Burden of proof is described in Chapter 4.

<sup>25</sup> Traditionally-harvested fish and fish species at risk are discussed in more detail in Chapter 9.

implementation of the measure below. Additional and complementary measures to reduce the risk of spills on the road are set out in Chapter 5. A measure related to permafrost thaw is set out in Chapter 12 and Measure 9-1 in Chapter 9 addresses monitoring of fish and fish habitat Sundog Creek.

### **8.3 Measure and suggestions**

In order to prevent significant adverse impacts on water quality and quantity from the Project, the Review Board recommends the following measure. In addition, the Review Board has provided two suggestions related to water quality and quantity for regulatory agencies.

#### **Measure 8-1**

The Review Board finds that the Project is likely to cause significant adverse impacts on water quality and quantity as a result of inadequate hydrology data, inadequately designed crossings, the sensitive location of the Project, and lack of systematic monitoring and adaptive management. The Review Board concludes that collection of baseline data, robust design and mitigation, comprehensive water monitoring, and adaptive management are required to prevent significant adverse impacts on water quality.

Measure 8-1 is designed to improve CanZinc's and regulators' understanding of hydrological conditions, build on CanZinc's commitments related to water monitoring, and incorporate adaptive management. This measure is intended to ensure that crossings are designed to an appropriate standard and that additional adaptive mitigation actions are taken based on the results of ongoing monitoring. This measure is focussed on crossings, but the baseline data collected for this measure in relation to Sundog Creek also contributes to Measure 9-1 and is needed to inform the design and operation of the Sundog Creek diversion channel.

#### **Measure 8-1 Water baseline data, mitigation, monitoring, and adaptive management**

##### **8-1, Part 1: Introduction**

To ensure that the road and crossings are designed to an appropriate standard, and constructed and operated in a manner that will be protective of the environment, CanZinc will:

- i. collect additional baseline data;

- ii. identify and implement appropriate mitigation to prevent significant adverse impacts;
- iii. combine monitoring programs and plans to coordinate water monitoring efforts; and
- iv. incorporate principles of adaptive management into road and crossing design and monitoring.

Parks Canada, Fisheries and Oceans Canada, and the Mackenzie Valley Land and Water Board will (within their respective jurisdictions) review and approve CanZinc's actions to ensure the requirements of this measure are satisfied.

### **8-1, Part 2: Baseline data**

CanZinc will collect baseline data necessary to enable the design, construction, and maintenance of watercourse crossings that are protective of the environment and inform future monitoring. CanZinc will install hydrometric stations and use the resulting data in its road and crossing designs. These stations will measure continuous streamflow data during the open water season and instantaneous flow measurements during the ice-covered period for a minimum of one year prior to construction of watercourse crossings. The stations will be established to:

- i. characterize spatial variability;
- ii. characterize variability in watershed size;
- iii. measure conditions at Sundog Creek and other key locations<sup>26</sup> (to be determined in consultation with regulators); and,
- iv. provide locations for ongoing monitoring during operations.

A minimum of one year of this data will be collected prior to the start of activities related to construction of watercourse crossings, and data collection will continue into construction (see Measure 8-1 part 4).

CanZinc will work with Parks Canada, Fisheries and Oceans Canada, and the Mackenzie Valley Land and Water Board to determine what, if any, other water baseline data is required prior to construction to inform mitigation, future monitoring, and adaptive management.

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<sup>26</sup> Such as Casket Creek (km 6.2), Grainger River (km 124.8), and the tributary of Grainger River preferred alignment option (km 118.1).

### **8-1, Part 3: Mitigate impacts on water quality**

CanZinc will use the baseline data collected, as well as any other relevant information and best management practices, to determine appropriate mitigation prior to construction and to revise detailed design plans for watercourse crossings.

The developer will share the baseline data with all relevant regulatory authorities and the independent panel (Measure 5-1) to facilitate Project review, permitting, and licensing.

### **8-1, Part 4: Monitoring**

CanZinc has identified many different plans, programs, and commitments for monitoring Project effects on water during construction and operation. CanZinc will amalgamate these plans, programs, and commitments, to the extent feasible and practical, so that water monitoring is consolidated and coordinated. The Review Board understands that for operational purposes, CanZinc may wish to keep certain aspects of water monitoring separate. The Review Board encourages the developer to consolidate where it can, in order to simplify the number of plans to create and report on. The Review Board considers that this may be relevant to the following commitments (Appendix C): #55, #93, #94, #211, #212, #217, #218, and #239, among others.

Regarding ongoing monitoring at hydrometric stations, Parks Canada and the Mackenzie Valley Land and Water Board will review and approve monitoring plans, through the water licenses, and determine if and when ongoing monitoring can be phased out.

### **8-1, Part 5: Adaptive management**

As part of the water monitoring program(s), CanZinc will establish and implement an adaptive management framework that satisfies the requirements of Appendix B. This will include thresholds and actions that will be developed and adapted using all available baseline information, effects monitoring results, and Traditional Knowledge and will consider ways to coordinate or compliment Aboriginal monitoring initiatives (see Measure 15-4).

### **Suggestion 8-1**

The Review Board notes that the Project is located across numerous jurisdictions and that there are multiple regulatory agencies that will be responsible for regulating water, and



related values such as fish. Combined with the numerous plans and programs CanZinc has committed to, the Review Board acknowledges the demanding requirements to develop multiple programs and report to multiple regulators. As a result, the Review Board offers the following suggestion to regulatory agencies regarding water monitoring.

**Suggestion 8-1: Regulator coordination for water monitoring**

The Project crosses a number of jurisdictional boundaries and that water will be regulated by several different government agencies, including Parks Canada, Fisheries and Oceans Canada, and the Mackenzie Valley Land and Water Board. The Review Board encourages all regulators involved in the review and approval of the Project to work collaboratively to minimize duplication of monitoring and reporting requirements and develop consistency between monitoring program components. The Review Board also recommends to regulatory agencies that many aspects of Measure 8-1 could be incorporated into an aquatic effects monitoring program.

**Suggestion 8-2**

The Review Board acknowledges parties' remaining concerns about the potential for impacts from the use of borrow materials with marginal or low risk of acid rock drainage or metal leaching potential. The Review Board offers the following suggestion to regulatory agencies.

**Suggestion 8-2: Acid rock drainage and metal leaching**

The Review Board suggests that Parks Canada and the Mackenzie Valley Land and Water Board enforce strict acid rock drainage and metal leaching conditions to minimize any potential impacts on water quality or fish from acid rock drainage or metal leaching.

## 9. Fish and fish habitat

### *Summary of Review Board findings*

The Review Board finds that the Sundog Creek diversion is likely to cause significant adverse impacts on fish and fish habitat. The Review Board's reasons for this determination are summarized as follows:

- Parties have provided evidence that the Sundog Creek diversion will adversely affect fish and fish habitat through direct loss of habitat, sedimentation, impacts on benthic macroinvertebrate populations, and potential stranding of fish.
- The Review Board remains unconvinced that impacts on fish and fish habitat in Sundog Creek have been accurately predicted and will be reliably mitigated through design and planned mitigations. This uncertainty stems from a lack of site-specific baseline information for Sundog Creek and a lack of real world comparable examples of successful diversions similar to the Sundog Creek diversion.
- The developer has not proposed a systematic effects monitoring program to help address this uncertainty and mitigate unforeseen impacts using adaptive management.<sup>1</sup> The Sundog Creek diversion is located within the Nahanni National Park Reserve. In the opinion of the Review Board, and as described in Chapter 4, impacts are more likely to be significant if they occur in a National Park Reserve, which is created to provide the highest level of environmental protection possible under Canadian federal law.

The importance and sensitivity of the environment in the Nahanni National Park Reserve (NNPR), combined with evidence of impacts and persistent uncertainty about mitigations, leads the Review Board to conclude that there are significant impacts that require additional mitigation measures.

### *Organization of this chapter*

In Section 9.1, the Review Board has provided readers with a more thorough summary of the evidence than it has in other environmental assessments. This is intended to allow readers to see firsthand the range and degree of uncertainties identified throughout the

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<sup>1</sup> See Chapter 4 for the Review Board's general considerations related to lack of certainty, burden of proof, the precautionary approach, and adaptive management.

environmental assessment. These uncertainties presented a particular challenge to impact predictions and decision making,<sup>2</sup> and are a relevant part of the Review Board's consideration of the evidence in this section.

In Section 9.2 the Review Board presents its analysis and conclusions in relation to impacts on fish and fish habitat. The Review Board's recommended measure is outlined in Section 9.3

## **9.1 Evidence from the technical analysis phase**

Fish and aquatic habitat was identified as a subject of note for this environmental assessment (EA) in the Terms of Reference (ToR), based on information from the developer and parties gathered during the scoping phase (PR#42 p30). The ToR provided guidance to the developer on which potential impacts to consider, including impact pathways and impacts on specific components of fish and aquatic habitat. Effects on fish and aquatic habitat<sup>3</sup> were also raised within the context of effects on traditional harvesting and traditionally harvested species, a key line of inquiry, in this EA.

This section summarizes the evidence on the record from the Developer's Assessment Report (DAR) and DAR Addendum, technical and cultural sessions, information requests (IRs), and the hearing phase (technical reports, hearings, and closing arguments). For the Review Board's analysis and conclusions, see Section 9.2.

### **9.1.1 Baseline information**

The Developer's Assessment Report for this EA included baseline information on fish and aquatic habitat from previous field studies (1981, 1994, 2001, 2006, 2008 and 2009), that were carried out for and summarized in the DAR for EA0809-02 (Prairie Creek Mine and Winter Road) (PR#55 p98). CanZinc conducted airborne reconnaissance surveys in 2014 in order to characterize fish habitat at proposed water crossings along the proposed All Season Road alignment. At locations identified as potentially fish bearing, CanZinc followed up with ground-based habitat assessments in September 2014 (PR#55 p102).

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<sup>2</sup> See Chapter 4 for further discussion.

<sup>3</sup> Including habitat for things fish eat, such as benthic macroinvertebrates, and other aquatic life. In this chapter, the Review Board's focus is on fish, but the terms "fish habitat" and "aquatic habitat" are used interchangeably.

The proposed All Season Road alignment crosses or runs parallel to Prairie Creek (KM 0-6.6), Fast Creek (KM 6.6-7.5), Funeral Creek (KM 7.5-17), Sundog Creek (KM 17-39.6), the Grainger River (KM 122.5-126.3), the Liard River (KM 160-174) (PR#90 pp28/63), and various other creeks.

Information from the developer and a confidential Traditional Knowledge report<sup>4</sup> indicate that a number of fish species use the streams and rivers in the Project area for a variety of life cycle requirements. For example, Prairie Creek is reported to have low densities of bull trout, slimy sculpin, Arctic grayling, burbot, and white sucker. CanZinc believes that Funeral Creek provides important spawning and rearing habitat for bull trout. Arctic grayling and slimy sculpin have been observed in Sundog Creek, although CanZinc believes that due to the lack of overwintering habitat, this area is likely used mainly for migration and rearing purposes (PR#90 pp29-63). Figure 9-1 shows an arctic grayling.



**Figure 9-1: Arctic grayling**  
PR#506 p4)

Traditional Knowledge indicates that traditional harvesting of several fish species including grayling, bull trout, inconnu, river trout, and jackfish has taken place along the length of and in the area of the proposed All Season Road (PR#18), including Prairie Creek,

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<sup>4</sup> This report was submitted to the Review Board during EA0809-02 under confidential cover from Nahanni Butte Dene Band because it contains confidential Traditional Knowledge. Throughout EA0809-02 and EA1415-01, the report has been available for review at the Review Board office in person if the party can provide valid justification for why it requires this information. Several parties did so and viewed the report.

Fishtrap Creek, the Grainger River and the Tetcela River (PR#90 p4). Figure 9-2 shows Fishtrap Creek.



**Figure 9-2: Fishtrap Creek**  
(PR#90 p14)



### 9.1.2 Project interactions and impact predictions

The ToR identified the following pathways of effects on fish and aquatic habitat (PR#42 p30)<sup>5</sup>:

- alteration or loss of fish habitat due to development activities during all Project phases;
- effects of proposed watercourse crossings, diversions<sup>6</sup>, and temporary vehicle crossing methods;
- disruption of sensitive life stages or habitat including loss of substrate habitat and known sensitive or important sites;
- effects on riparian areas;
- effects on locations and species of particular importance to subsistence harvesters:
- changes in water quality or quantity;
- blockages to movement or habitat fragmentation;
- blasting;
- dredging or disposal of sediments;
- water withdrawal;
- increased pressure on fishing resources as a result of improved access;
- reclamation of instream and riparian work areas during construction and operations; and
- noise (included in the ToR as a separate subject of note).

Through the course of the EA, the discussions regarding effects pathways on fish and aquatic habitat focussed primarily on key areas and time periods (such as the construction phase or annual flood events) and, especially, the Sundog Creek diversion.

The following sections describe the evidence and argument presented by parties and the developer during the course of the EA. Where possible and appropriate, parties'

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<sup>5</sup> Additional topics to consider from the ToR included: the estimated time to redevelop habitat; standards or guidelines related to watercourse crossings and diversions that would be applied; relevant policies, management plans or other measures to protect or enhance fish and aquatic habitat, including timing restrictions, protected areas or regulations; effects on sensitive or important areas or habitat; contaminant levels in harvested species that could be changed by the All Season Road, if applicable; potential effects on fish health; and, criteria for evaluating the success of mitigation or reclamation measures, indicating when and how this evaluation would be conducted.

<sup>6</sup> In this Report of EA, the term "diversion" is used to refer to the Sundog Creek diversion and realignment is used to refer to changes to the alignment of the road itself.

recommendations have been summarized. Appendix D contains a complete list, and verbatim text, of recommendations.

### **9.1.3 Impacts from alteration or loss of habitat**

In the DAR addendum, CanZinc outlined the potential effects on fish populations as a result of the Sundog Creek diversion and due to road-related sedimentation and consequent smothering of spawning habitat and benthic invertebrate assemblages (PR#90 p62). CanZinc characterized the significance of potential effects to fish populations due to the diversion of Sundog Creek as “low” based on the rationale that the diversion will result in no net loss of habitat. Other characteristics described by CanZinc for this pathway of effects included: low likelihood, small geographic range (2x 50m sections), 25 year duration, low magnitude (because flow will be redirected into an historic channel), high reversibility, and low uncertainty.

Parks Canada Agency (Parks Canada) requested more information regarding potential habitat loss due to the Sundog Creek diversion in the first round of information requests. Parks Canada argued that the diversion might result in impacts on fish habitat in two ways not identified by CanZinc. The first is by forcing fish to occupy habitat of lower productivity, since the diversion channel will likely have lower populations of benthic invertebrates. The second is through lower structural stability, as the diversion channel will not have had time to stabilize before being used by fish (PR#200 p10). Parks Canada predicts that these disturbances may persist for “up to three years as the stream channels are colonized by benthic macroinvertebrates from upstream non-disturbed areas and the channel stabilizes and more closely approximates upstream, non-disturbed areas” (PR#200 p10). Through the second round of information requests, CanZinc and Parks Canada continued to debate the potential impacts of the Sundog diversion on benthic invertebrate populations, but did not come to a resolution (PR#368).

Parks Canada also pointed out that, contrary to CanZinc’s initial prediction that only a small area of fish habitat will be lost because of the diversion, habitat will be affected by the establishment of sections of the All Season Road within or immediately adjacent to the floodplain. This loss will be associated with the need to stabilize portions of this road with extensive areas of rip rap and other engineering methods (PR#200 p10). CanZinc indicated that it would defer to the Department of Fisheries and Oceans’ (DFO) determination on net habitat loss or gain (PR#200 p10). CanZinc submitted a habitat offsetting memo (PR#426) late in the technical analysis phase that provided more detail regarding the types and quantities of aquatic habitat expected to be lost or affected during the Project. Parties were given the chance to respond to this memo through a supplement to their technical reports.



A main point of concern for parties in the hearing phase was the need for and ability to adequately offset any habitat loss or alteration because of the Project. DFO and Parks Canada are regulators for fish and fish habitat in the NNPR and indicated that the amount, type and ecological significance of habitat that will be affected by the Project remain unclear (PR#452 p37; PR#449 p6). With regard to temporary habitat loss, CanZinc and DFO have different views about the need for offsetting. For example, loss of ephemeral habitat in Sundog Creek, which is used only infrequently by fish, has been described by the developer as “not result(ing) in any serious harm to fish, nor any changes to aquatic function, or integrity” (PR#353 p5). However, DFO’s position is that “ephemeral habitat that is only available for brief periods is very common in northern environments, providing important migration, spawning, rearing or foraging habitat” (PR#449 p6).

In their technical reports, DFO and Parks Canada made recommendations (PR#449 and PR#452) to CanZinc to address these issues including:

- providing a complete list of all impacts on fish and fish habitat via a summary table of habitat loss, alteration and gains (DFO);
- submitting a Request for Ruling and/or apply for a *Fisheries Act* Authorization for their Project so that offsetting and monitoring plans can be reviewed in more detail (DFO);
- continue working with DFO and Aboriginal groups to identify suitable offsetting opportunities (DFO)
- offset or compensate for the short term habitat losses and reductions in fish habitat incurred by the rerouting of a portion of Sundog Creek. Any offsetting or compensation plans must be approved by Parks Canada (PC)

CanZinc’s response to technical reports indicated that it will submit an application for a *Fisheries Act* Authorization, which will include details specific to offsetting and associated monitoring plans (PR#484 p55). CanZinc also made a commitment (#233, Appendix C) to apply for a *Fisheries Act* Authorization to address these concerns.

In closing arguments, DFO reiterated its recommendations from its technical report. CanZinc did not respond directly to DFO’s recommendations in its closing argument, but “appreciates the closing comments from DFO” and “looks forward to further discussions during the regulatory phase” (PR#553 p4). CanZinc agreed with Parks Canada’s recommendation that offsetting is required, and indicated that this offsetting would be authorized by DFO (PR#553 pp14-52).

#### 9.1.4 Impacts from diversion of Sundog Creek

In the DAR, CanZinc stated that the Sundog Creek diversion will result in no changes to flow (PR#55 p242). CanZinc provided additional information on the Sundog Creek diversion in its DAR Addendum (PR#100 p62). The developer indicated that it will maintain the diversion for the life of the road and then leave it in place and allow the channel to evolve naturally. CanZinc will design the new channel to have comparable dimensions and be deeper at armoured locations to create pool habitat (PR#100 p62).

In its DAR Addendum, CanZinc indicated it will place excavated material in the original channel to prevent water from flowing into it. Given that channel locations change naturally over time and Sundog Creek has low productivity for fish, CanZinc suggests in its DAR Addendum that "...changes in channel dimensions are not particularly significant in terms of impacts" (PR#100 p65).

Following its DAR Addendum, CanZinc described the diversion in more detail. The diversion will be from kilometre 35.5 to 36.9 (PR#178 PDF p4). The diversion will typically be approximately 20-25 meters wide and 1.5 metres deep. CanZinc stated that 100-year flood levels would be contained in the 1.5 meters deep channel and that both up- and downstream of the diversion, where the road encroaches on the creek, the road embankment will be armoured and the north side of the channel excavated to provide sufficient room for the road (PR#178 PDF p5). Figure 9-3 and Figure 9-4 show the existing channel and the location of the proposed Sundog Creek diversion.



**Figure 9-3: Sundog Creek upstream end of proposed diversion, July 2014**  
(PR#359 p2)

During the first round of IRs, Fisheries and Oceans Canada (DFO) noted that “without a more complete hydrological description of the proposed Sundog Creek [diversion]... the Developer’s position cannot be verified. There is also the potential for concerns regarding the stability of the proposed [diversion] in a highly dynamic system.” DFO went on to request a hydrological assessment of the diversion, the frequency of expected repairs, and strategy for managing total suspended solids (TSS) in the diversion (PR#200 p12). In its response, CanZinc indicated that it is not aware of any examples of similar diversions.

In response to a DFN request directed at DFO to provide an example of a similar creek diversion, DFO responded that it is not aware of any comparable diversions (PR#365).



**Figure 9-4: Sundog Creek middle of proposed diversion, July 2014**  
(PR#359 p3)

Parties expressed concern over the design of and mitigation measures for the Sundog Creek diversion. During second round IRs, Parks Canada stated that it "...fundamentally disagrees with the developer's view that 'the realigned channel is expected to be in balance with its hydrology and sediment inputs'" (PR#323 PDF p10). DFO and Parks Canada discussed need to consider and mitigate for a period of "channel readjustment" to allow the alluvial sediments in the newly created channel to saturate, thus ensuring sufficient flow rates for fish passage and allowing for re-establishment of a healthy benthic community (PR#449 p12; PR#452 p38; PR#525 p109). DFO and Parks Canada also argued for the need to account for the dynamic variability of Sundog Creek in the road and diversion channel designs (PR#449 p12; PR#452 p31; PR#525 p163). DFN and DFO described the current lack of information on design components, construction techniques, and planned mitigations (PR#449 p8; PR#459 p9). Parks Canada and DFO also outlined the need for specific mitigations to protect Arctic grayling and Arctic grayling habitat (PR#449 p12; PR#452 p11).



Based on these concerns, parties made a number of recommendations in order to ensure that the Sundog Creek diversion will not cause significant adverse effects on fish or fish habitat, including:

- consider the possibility of a channel readjustment phase and develop a plan to mitigate these potential adverse impacts (From DFO; PR#449 p12);
- implement all available best management practices in the design of the proposed constructed channel to avoid and mitigate serious harm to fish because of the diversion. This includes, but is not limited to, appropriate design of the new channel to facilitate fish passage at both high and low flows for Arctic Grayling and any other species of fish that may use Sundog Creek at all relevant life stages (From DFO; PR#449 p12);
- implement natural channel design principles into the proposed constructed channel (From DFO; PR#449 p8);
- include mitigations for impacts on Arctic Grayling during construction of kilometers 25 to 32 of the proposed All Season Road (From Parks Canada; PR#452 p11);
- submit hydrographs, modelling, and detailed designs of the existing channel and the proposed channel during the regulatory phase (From DFO; PR#449 p8);
- provide at least one supplementary hydrotechnical calculation for Sundog Creek to support its hydraulic model (Parks Canada PR#449 p32);
- offset or compensate for the short-term habitat losses and reductions in fish habitat as a result of the diversion (PR#449 p39); and,
- submit a dewatering plan that incorporates all best management practices, if pumping is required during the diversion channel construction (From DFO; PR#449 p466 p13).

During the hearing, DFN raised concerns that CanZinc has not proposed plans to monitor fish passage itself in the Sundog Creek diversion. CanZinc's response was that "the key factor for the grayling to get through is velocity... that's why our focus has been on the flow regimes that we are going to have in the future, because that's what the fish will need" (PR#525 p37). DFN expressed uncertainty about how CanZinc could adequately describe effects on Arctic Grayling migration habitat, or the lack thereof, without monitoring the fish themselves (PR#525 p44).

In its response to concerns regarding the possibility of a channel readjustment phase, CanZinc reiterated that it "does not anticipate any sort of adjustment period in shallow subsurface flows that would be detectible or which would warrant a mitigation plan". Furthermore, the proposed design of the new channel would provide channel capacity, flow velocities, and habitat comparable to the existing channel (PR#484 p58). CanZinc

committed to implementing natural design principles such as boulders at regular intervals to mimic habitat from the existing channel into the new channel (#234, Appendix C). CanZinc predicted that the diversion channel, therefore, should result in no change to fish passage (PR#484 p54). Additionally, in response to Review Board staff questioning during the hearing, CanZinc confirmed that the diversion channel will be designed such that it can accommodate 100-year flood events and mimic existing conditions from the natural channel with respect to fish passage (PR#525 p74).

With respect to DFO and Parks Canada's request for hydrographs, modelling and detailed design for the existing and proposed channels, CanZinc responded that it has already supplied the required information to DFO, but would re-submit the information during the regulatory process (PR#484 p57). During the hearing, DFO indicated that the information was not sufficient and that it would require additional information during the regulatory phase, including how long the creek is dry during the year (PR#525 p133). CanZinc and DFO agreed to an undertaking (#5) to "discuss hydrograph modelling use for Sundog Creek and submit a written response based on these discussions" (PR#532 p2). In response to this undertaking, DFO submitted a summary of meetings between DFO and CanZinc indicating that air photos for Sundog Creek and Prairie Creek hydrographs would be provided to DFO during the regulatory phase (PR#538 p6).

In closing arguments, DFN carried forward some of the concerns brought forward by Parks Canada and DFO outlined above. Specifically, DFN identified that it had "outstanding concerns with potential significant adverse impacts on the benthic macroinvertebrate community and Arctic grayling due to the Sundog Creek diversion". Accordingly, it recommended five measures to the Board regarding the Sundog Creek diversion. These measures required that CanZinc continue to work with affected parties on the monitoring requirements of a *Fisheries Act* Authorization.<sup>7</sup> Additionally, DFN recommended that CanZinc should monitor ecological performance, using benthic macroinvertebrates as an indicator, and Arctic Grayling (PR#549 p21).

In closing arguments, DFO reiterated its recommendations from the technical report. CanZinc did not respond directly to DFO's recommendations in its closing argument, but "appreciates the closing comments from DFO" and "looks forward to further discussions during the regulatory phase" (PR#553 p4).

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<sup>7</sup> See Chapter 15 and measure 15-4 in relation to Aboriginal monitoring initiatives.

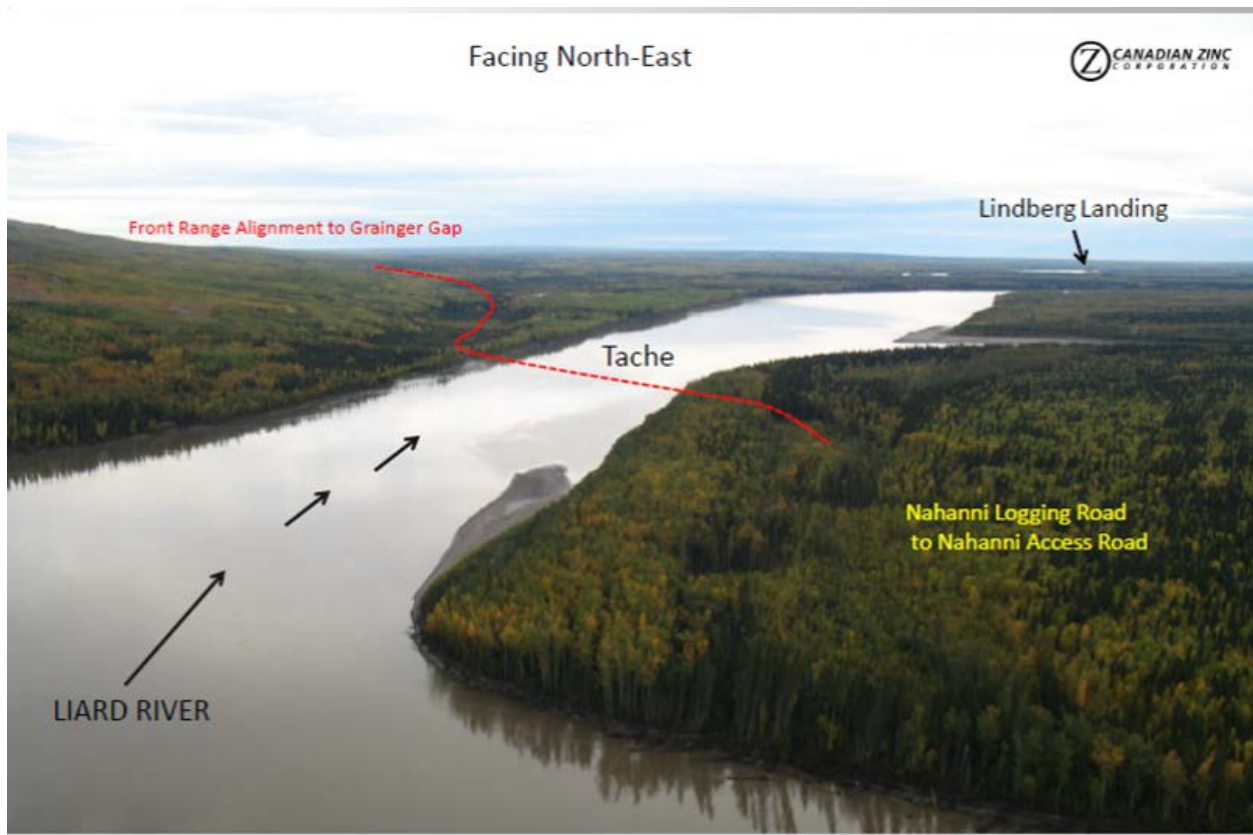
CanZinc did not respond to any of DFN's recommended measures for fish and fish habitat with respect to Sundog Creek. CanZinc agreed to Parks Canada's recommendation to compensate or offset any short term losses to habitat, although it expects that any offsetting or compensation plans must be approved by the DFO (PR#553 p9).

### **9.1.5 Impacts from dredging or disposal of sediments**

The issue of dredging or removal of sediments from watercourses was raised a number of times during the technical analysis phase of the EA. In the DAR, CanZinc stated that dredging may be required at the Liard River crossing (PR#90 p245; Figure 9-5). This created a concern for parties, including DFO and ECCC, since impacts from dredging (such as increased total suspended solids and associated impacts on water quality, fish and fish habitat) had not been assessed (PR#90 p28). With regard to the Liard River barge crossing location, CanZinc confirmed through the first round of information requests that dredging was not being considered (PR#200 p11).

With regard to the Sundog Creek diversion, an undertaking from the technical sessions required CanZinc to "provide the anticipated quantity and timing of sediment accumulation related to the Sundog Creek [diversion]" (PR#250 p4). In its response, CanZinc indicated that it did not expect sediment accumulation within the diversion channel. However, "in the unlikely event there is a localized sediment accumulation that could negatively affect the performance of the [diversion channel], limited removal might be contemplated during a period of no flow" and that any impacts on fish, fish habitat and aquatic life would be minimal (PR#287 p1). Parks Canada was not satisfied with this response, as it did not contain evidence that "an empirical modelling exercise was completed" (PR#371 p11).





**Figure 9-5: Liard River crossing photo**  
(PR#127 PDF p42)

### 9.1.6 Impacts on benthic communities

As described in Section 9.1.4, CanZinc predicted that the risk of the Sundog Creek diversion affecting benthic invertebrate assemblages is low, and that any potential effects would be short in duration. Parks Canada disagreed with the developer's conclusion, noting that it is unsubstantiated by baseline data and therefore impossible to test, and also provided evidence that re-colonization of the new diversion channel could take months to years (PR#452 p38). Parks Canada argued that measures are required to "prevent potentially significant temporary adverse impacts in the rerouted section of Sundog Creek to the benthic community upon which other taxa, including fish, rely" (PR#452 p38). In the hearing, Parks Canada further stated that "benthic communities are a key link in the energy transfer in these systems" (PR#525 p167).

To deal with these concerns, Parks Canada recommended that the Review Board impose two measures:

- to require CanZinc to develop and deploy a program to monitor the duration of reductions in ecological performance in the diversion, using benthic macroinvertebrates as a biological indicator; and,
- to require CanZinc develop an adaptive management plan for benthic macroinvertebrates to address potential impacts from the diversion (PR#452 p38-39).

CanZinc responded that the costs of a study to determine potential effects of the Sundog Creek diversion on benthic invertebrates are unreasonably high, and the utility of such a study is low (PR#484 p88). CanZinc supported its position with the following assertions (PR#484 p88-89):

- Habitat for benthic invertebrates within this section of Sundog Creek diversion is poor due to nutrient poor conditions and periodic episodes of seasonal drying;
- The area of the diversion represents only a very small proportion of the total length of Sundog Creek; and,
- The area of the diversion is likely to contribute little to the downstream food supply, therefore having little impact on fish.

In its closing statement, Parks Canada reiterated its recommendations for measures to “prevent potentially significant adverse effects on the benthic community in the rerouted section of Sundog Creek” (PR#546 p13). The DFN supported these recommendations. In response to parties’ final recommendations regarding monitoring for potential effects on benthic macroinvertebrates, CanZinc reaffirmed its position that no significant adverse impacts on macroinvertebrates as a result of the Project are predicted, and therefore no measures are justified (PR#553 p9).

### **9.1.7 Impacts from fish stranding**

The DAR states that the overall significance of the potential impact to fish populations due to habitat fragmentation and barriers to movement will be low. This is due largely due to the small geographic area of the proposed impact (that is, only associated with fish-bearing water crossings) and the planned mitigation measures including clear span bridges and proper installation and maintenance of culverts. Effects on fish due to habitat fragmentation are predicted to be highly reversible once watercourse crossing structures are removed following the road operations period (PR#90 p62).

In IR round 1, DFO raised concerns that the creation of large amounts of pool habitat from the Sundog creek diversion or reductions in the total number of days of flow per year in the

creek may increase the risk of stranding for Arctic grayling or slimy sculpin (PR#200 p13). CanZinc's response indicated that pool habitat would not be deliberately altered within the diversion channel, but that "where pool habitat is modified elsewhere, similar pool habitat will be maintained (in terms of depth, flow velocity and days of flow), so there will be no net change in stranding potential compared to baseline" (PR#200 p13).

DFO's technical report described two possible ways that fish could be stranded in the Sundog Creek diversion. Both mechanisms follow from the fact that Sundog Creek is a braided and dynamic system featuring coarse and permeable substrate with surface and subsurface flow. During high flows, subsurface or groundwater inputs may cause a small amount of water to surface in the old channel. During low flow periods, the water in the new channel may not be sufficient to fully saturate the alluvial sediments and flow may "go to ground" for a period of time (PR#449 p12).

To prevent stranding of fish, DFO recommended that the developer incorporate a barrier to upstream fish passage (e.g., steps) into its designs. The barrier would be located downstream of the Sundog Diversion and upstream of the offsetting pool proposed at the approximate location of km 36.9. DFO also recommended that CanZinc should consider the possibility of a channel readjustment phase and develop a plan to mitigate these potential adverse effects (PR#449 p12).

In response to DFO's technical report recommendations, CanZinc reiterated that it does not anticipate any sort of adjustment period in shallow subsurface flows that would be detectable or warrant a mitigation plan (PR#484 p2). CanZinc did not provide an explicit response to DFO's recommendation regarding stranding. It did, however, state that "the new channel will aim to provide channel capacity, velocities and habitat comparable to that which currently exists, and as such, there should be no change in terms of fish passage" (PR#484 pp54-94).

### **9.1.8 Impacts on habitat effectiveness for fish**

CanZinc noted that sedimentation could affect spawning or rearing habitat downstream of a spill site and road-related sedimentation could reduce the biomass of dietary items (that is, benthic invertebrates) for smaller fish (PR#90 p62). CanZinc predicted that effects on fish habitat (including spawning habitat and benthic invertebrate assemblages, which are an important source of food for some fish) because of sedimentation will be low in overall significance (PR#90 p62).

The Review Board acknowledges the general concern noted by Nahanni Butte Dene Band, that: “[a]ny type of contamination could affect fish populations in the river and make this area less suitable for occupation and harvesting purposes” (PR#18 p4). In addition, in its closing argument, LKFN indicated that it remains concerned that the Project “will have significant adverse impacts on the arctic grayling and trout in fish-bearing streams” (PR#550 p4).

The Review Board also understands that the Project has the potential to affect bull trout habitat in Funeral Creek and Prairie Creek, and possibly Fishtrap Creek and Casket Creek. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) has ranked bull trout as a species of Special Concern. In its DAR, CanZinc stated that “[t]he most likely risk to bull trout stocks is related to a major spill of concentrate, sulphuric acid or fuel oils” (PR#90 p8) and “Bull trout embryos are easily smothered by silt (Montana 2015); therefore it will be important to minimize erosion from the road parallel to Funeral Creek in fall and spring when embryos are present and the creek isn't iced over” (PR#90 p9).

Parks Canada, DFO and CanZinc debated the issue of sedimentation (especially with respect to Sundog Creek) several times throughout the technical phase and DFN also raised concerns (PR#459 p9). Specific concerns included the possible causes of sedimentation events, their likelihood and frequency, effectiveness of proposed mitigation measures and the spatial extent of their effects (PR#371).

Final positions of parties related to Project impacts on habitat effectiveness were limited to the Sundog Creek diversion or effects on benthic invertebrate communities and are discussed in those sections. For more information related to impacts on fish habitat, see Sections 8.1.8 in (impacts from spills) and Section 8.1.2 (impacts from erosion and sedimentation), measures in Chapter 5 intended to minimize accidents related spills, and the measure about water quality monitoring and adaptive management in Chapter 8.

### **9.1.9 Impacts from blasting**

In its DAR, CanZinc predicts that the overall significance of effects on fish populations from blasting is low. Blasting is expected to occur near only one potentially fish-bearing location, and mitigation measures will be implemented to ensure that fish are either removed from the area or blast vibrations and instantaneous pressure changes remain below DFO guidelines (PR90#63).

In the first round of information requests, parties including DFO, DFN, Environment and Climate Change Canada (ECCC) and Parks Canada requested additional details about when

blasting was likely to occur, and if CanZinc had considered the potential indirect effects of blasting on fish and fish habitat, including changes to surface and shallow groundwater flow, and increased sedimentation (PR#200 pp2/70; PR#200 pp 29/70). CanZinc responded to these concerns by describing mitigation measures to reduce the likelihood of impacts. These included blasting only during dry periods, using silt fences as required, removing fish from blast zones if necessary, and blasting where the risk of altering ground and surface water flows is low due to rock type and other factors (PR#200 pp2/70; PR#200 pp29/70).

Blasting has the potential to affect fish and fish health in a variety of ways, including, as identified by CanZinc, damage to swim bladders causing injury or death (PR#90 p62). In its technical report, DFO made two recommendations to minimize the potential for significant adverse effects on fish as a result of blasting. The first is to use instantaneous pressure threshold limit of 50kPa; the second is to avoid blasting during sensitive spawning periods as per DFO NWT fish spawning timing windows (PR#449 p13). CanZinc committed to minimizing effects of blasting on fish by following timing windows and minimizing blast energy and following DFO guidance for blasting (PR#485 p5, Commitment #4, Appendix C).

#### **9.1.10 Impacts on riparian areas and littoral habitat**

Parties discussed impacts on riparian areas throughout the technical analysis phase of the EA, including the exact area of riparian habitat that will be lost or affected by the Project and the nature of these impacts. Part of this debate centered on how to calculate the area of riparian vegetation that will be lost or affected (PR#368 p3; PR#371 p9). This conversation revolved around how CanZinc defines important terms such as “floodplain” and “high water mark”, and if parties such as Parks Canada and DFO (the relevant regulators) agree with these definitions.

A secondary concern is whether or not the loss of riparian habitat would lead to a loss of ecological function (PR#371 p13). In a habitat offset memo that was submitted late in the EA process, CanZinc stated that (PR#426 p3):

Between km 0 and km 17, the all season road pre-exists and is permitted. However, in this area, it is anticipated that an additional 2.5 m of riparian area may have to be removed on average to make improvements to the existing road prism. In our opinion, the loss of riparian vegetation will result in negligible loss of ecological function, and therefore result in no serious harm to fish.

DFO noted, however, that if these road improvements are at or below the high water mark, they may cause serious harm to fish (PR#466 p14). DFO, therefore, made two

recommendations to prevent serious harm to fish because of effects on riparian areas. The first is for CanZinc to confirm if the riparian vegetation potentially affected by the Project from km 0 to 17 is above the high water mark; the second is for the developer to use standard best management practices for the removal of riparian vegetation (PR#466 p14).

In its response to technical reports, CanZinc confirmed that all vegetation to be removed from km 0-17 would be above the high water mark. It also reaffirmed its commitment that “disturbance of stream banks and riparian areas at stream crossings will be minimized” (PR#485 p6) and that it will “follow standard best management practices for the removal of riparian vegetation where practical and feasible” (PR#485 p31).

#### **9.1.11 Impacts from water withdrawal**

CanZinc proposes to withdraw water from some water bodies along the proposed All Season Road for the purposes of dust control and a small amount for potable water (PR#90 p245). CanZinc predicted no significant changes to water levels, as it will adhere to DFO’s *Water Withdrawal Protocol* (PR#90 p175). Parks Canada (PR#370 p10) and DFN (PR#200 p33) requested more information about the potential source locations and proposed pump rates and volumes through information requests, and CanZinc provided it.

In their technical reports, Parks Canada and DFO suggested that water withdrawal for dust suppression may affect littoral areas (PR#452 p33, PR#446 p9). CanZinc responded that “it is clear from a net positive water balance in the region during summer as well as runoff that the proposed extraction volumes will have no to negligible impact on lake volumes and littoral areas. The risks are insignificant” (PR#323 p9). Parks Canada did not dispute CanZinc’s argument with regard to “annual extraction volumes” but argued that there is still the potential for significant cumulative impacts over a number of years (PR#452 p33).

To address this issue, both Parks Canada and DFO recommended the installation of water gauges at the lakes from which water is to be withdrawn, including monitoring of lake level and recharge rates in their technical reports (PR#452 p33, PR#446 p9). DFO requested confirmation from CanZinc regarding the proposed water withdrawal rates, project phase and seasonal requirements, and cumulative anticipated water withdrawal and littoral losses over the life of the Project. DFO also requested additional information on littoral habitat and the potential formation of barriers to fish passage because of water withdrawal (PR#466 p9).

In their closing arguments, DFN and Parks Canada both argued that CanZinc’s conclusion that the risks associated with water withdrawal from dust suppression are insignificant is



flawed. DFN stated that “CZN has no data to conclude that the spring runoff will replenish all lakes to full capacity prior to the summer period” and that “they have no proposed monitoring to adequately monitor lake levels” (PR#549 p7). Parks Canada reasserted that “water withdrawal has the potential to impact water levels, which could affect the aquatic ecosystem, the riparian zone, and the species that depend on it” (PR#452 p10). Parks Canada further argued that that “CanZinc has not provided any data on recharge rates for the lakes in question, and to add to this uncertainty, future years may be complicated by climate change” (PR#452 p10).

To deal with this uncertainty and potential for impacts, both parties recommended that the Review Board impose two measures to prevent potentially significant adverse effects on lake volumes and the associated aquatic ecosystems (PR#549 p8; PR#452 p11). These measures would require CanZinc to install water gauge stations at lakes from which water will be withdrawn, monitor these lakes and adaptively manage any adverse effects associated with lowered lake levels because of water withdrawal. DFO reiterated its recommendations relevant to protecting riparian and littoral areas from the technical report and technical report supplement in its closing argument.

CanZinc did not respond explicitly to DFN’s recommended measures for fish and fish habitat with respect to riparian or littoral habitat or any of DFO’s recommendations from the technical report and technical report supplement. CanZinc “reluctantly agreed” to Parks Canada’s recommendations #14 and 15 and notes that this agreement will also extend to lakes that CanZinc proposes to use outside of the NNPR boundary (PR#553 p8).

#### **9.1.12 Watercourse crossing designs**

CanZinc proposes 18 major stream and 90 minor stream crossings for the All Season Road (PR#59 p56). Depending on the location, size and characteristics of the crossing, proposed crossing types include multi-span bridges, culverts, culvert arrays and an ice bridge and barge for the Liard River crossing (PR#59 p62; Figure 5-3; Figure 9-5). Several parties including the Dehcho First Nations (DFN) asserted that CanZinc should take adequate steps to mitigate the risk of hanging culverts (PR#200 p14). As described above, CanZinc predicted a low overall significance of effects on fish populations due to the Sundog Creek diversion (PR#90 p62). CanZinc did not assess the effects of proposed watercourse crossings to fish and fish habitat at other locations explicitly.

DFO’s technical report recognized the developer’s commitments to protect fish and fish habitat at watercourse crossings, including the use of timing windows, freshet monitoring and best practices for culvert installation. However, DFO observed that the full suite of



measures the developer intends to employ remains unclear due to the lack of detailed plans for sediment and erosion control and decommissioning of the water crossings (PR#449 p9). As such, DFO recommendations that:

- the developer implement all available best management practices to avoid, mitigate, or offset serious harm as defined in the *Fisheries Act* as a result of water crossing construction, operation, and decommissioning;
- an appropriate water crossing maintenance and monitoring plan be in place to ensure that barriers to fish passage do not form over time;
- CanZinc provide DFO with detailed engineering plans of all water crossings that are fish bearing, supported by measured or modeled stream flow data, for review prior to construction; and
- standard best practices are utilized for the design, construction, and decommissioning of the Liard River crossing.

CanZinc responded to these recommendations that detailed crossing designs will consider passage at both high and low flows, bank stabilization, timing windows as necessary and the installation and maintenance of sediment and erosion control measures. Moreover, CanZinc noted that it already provided a draft crossing maintenance and monitoring outline, which it considers to be sufficiently detailed for the EA (PR#484 p94).

See Chapter 8 for more detailed discussion and the Review Board's analysis and conclusions about to impacts related to water crossings.

### **9.1.13 Lack of clear and consistent terminology**

One of the issues addressed in DFO's technical report is CanZinc's use of inconsistent and non-standard (and therefore unclear) terminology. For example, CanZinc occasionally uses the terms "bankfull width" and "high water mark" interchangeably. However, these are actually two different things and, depending on which term is used, could result in different calculations of habitat loss (PR#466 p12). Additionally, CanZinc proposed habitat classification types to determine the requirement for offsetting which do not necessarily align with the DFO's definitions to determine offsetting requirements.

In order to address these problems, DFO made several recommendations regarding several issues, including using standard terminology provided in the Fisheries Protection Policy statement, and clarifying how habitat loss was calculated. CanZinc's response confirmed that it would apply the terminology as requested by DFO (PR#484 p53). The Review Board

notes that it would have been more helpful and efficient for everyone if CanZinc had used standard terminology consistent with DFO definitions throughout the EA.

## **9.2 Review Board analysis and conclusions**

The Review Board has considered all evidence and argument on the public record, including the information summarized above and the general considerations described in Chapter 4. Based on this evidence and the analysis set out below, the Review Board finds that the All Season Road, through the construction and operation of the Sundog Creek diversion, is likely to cause significant adverse impacts on fish and fish habitat. The following section describes the Board's reasons for these findings and conclusions.

### **9.2.1 Summary of Review Board findings**

The Review Board finds that the Sundog Creek diversion is likely to cause significant adverse impacts on fish and fish habitat. The Review Board's reasons for this determination are summarized as follows:

- Parties have provided evidence that the Sundog Creek diversion will adversely affect fish and fish habitat through direct loss of habitat, sedimentation, impacts on benthic macroinvertebrate populations, and potential stranding of fish.
- The Review Board remains unconvinced that impacts on fish and fish habitat in Sundog Creek have been accurately predicted and will be reliably mitigated through design and planned mitigations. This uncertainty stems from a lack of site-specific baseline information for Sundog Creek and a lack of real world comparable examples of successful diversions similar to the Sundog Creek diversion.
- The developer has not proposed a systematic effects monitoring program to help address this uncertainty and mitigate unforeseen impacts using adaptive management.<sup>8</sup> The Sundog Creek diversion is located within the Nahanni National Park Reserve. In the opinion of the Review Board, and as described in Chapter 4, impacts are more likely to be significant if they occur in a National Park Reserve, which is created to provide the highest level of environmental protection possible under Canadian federal law.

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<sup>8</sup> See Chapter 4 for the Review Board's general considerations related to lack of certainty, burden of proof, the precautionary approach, and adaptive management.

The importance and sensitivity of the environment in the Nahanni National Park Reserve (NNPR), combined with evidence of impacts and persistent uncertainty about mitigations, leads the Review Board to conclude that there are significant impacts that require additional mitigation measures.

The sections below set out the Review Board's analysis and conclusions in relation to these reasons. Section 9.3 describes the Review Board's recommended measure and suggestion to prevent significant adverse impacts on fish and fish habitat from of the Project.

### **9.2.2 Impacts on fish and fish habitat due to the Sundog Creek diversion**

The developer is proposing to divert water from Sundog Creek between km 35.5 to 36.95 into an adjacent historic channel (PR#426 p3). This 1.5 kilometre diversion is referred to as the Sundog Creek diversion. As described in detail in section 9.1.4, the proposed diversion is likely to result in a number of effects on fish and fish habitat including:

- direct loss of habitat as a result of the diversion (PR#200 p10);
- smothering of spawning habitat due to sedimentation (PR#459 p9);
- short term effects on benthic macroinvertebrate populations, which are source of food for fish (PR#368 p7; PR#452 p38); and
- stranding of fish due to changes in flow regime (PR#449 p12).

The Review Board notes that in relation to some of these concerns, parties and the developer have disagreed on the significance of these impacts. For example CanZinc consistently presented its opinion that the likelihood of any effects on the benthic macroinvertebrate community in Sundog Creek as a result of the diversion would be low and the duration short (PR#553 pp14-52). Parks Canada presented the alternative conclusion that the Sundog Creek diversion "will impact the short-term composition and abundance of the benthic macroinvertebrates community" and that "recovery of the benthic macroinvertebrate community composition in the [diversion channel] of Sundog Creek to a condition reflecting the upstream non-disturbed area may take multiple years" (PR#452 p38). The Dehcho First Nations supported Parks Canada's position on this issue (PR#549 p20).

Other examples of disagreements over potential effects highlighted above include:

- the exact area and ecological significance of habitat to be lost or affected by the Project, including the Sundog Creek diversion; and

- the potential effects of and mitigations required to prevent sedimentation in Sundog Creek.

The details about the amount and ecological significance of habitat to be lost or affected can be determined during the regulatory phase. However, the Review Board is of the opinion that lack of clarity surrounding these issues at this stage in the environmental assessment represents an unacceptable level of uncertainty regarding Project design and potential effects. Because of this uncertainty and due to the importance of preserving fish and fish habitat, and ecological integrity, within the NNPR, the Review Board accepts Parks Canada and DFN's arguments that a precautionary approach to effects mitigation and monitoring is warranted.

### **9.2.3 Uncertainty regarding diversion channel design and mitigations**

The Review Board acknowledges that CanZinc has made a number of commitments to reduce the likelihood of potential impacts as a result of the Sundog Creek diversion, including (Appendix C, commitments #233, 89, 234, 235, 240, 54, #233):

- applying for a *Fisheries Act* Authorization (accounting for aquatic habitat (below the high water mark) and under the planned footprint of the diversion berm);
- designing the diversion to provide similar hydraulic/sediment capacity to and mimic substrate characteristics of the original;
- using natural channel design principles and features;
- refining and updating the hydraulic model for the Sundog Creek diversion during detailed design;
- monitoring (that may lead to adaptive management) related to total suspended solids (TSS) and turbidity in the diversion, until it detects no further impacts; and
- "Monitoring channel morphology to confirm that the diversion channel is providing habitat similar to the current channel..."

However, several parties expressed concern about the Sundog Creek diversion. DFO contended that without a more complete hydrological description, it could not verify CanZinc's estimates on channel shape, size, and velocity (PR#200 P12). The GNWT pointed out that the diversion will need to take many factors into account, and that if any of these are miscalculated or underestimated, there is potential for water quality issues downstream (PR#320 p9). In its IR #6, Parks Canada stated that it "...fundamentally disagrees with the developer's view that 'the realigned channel is expected to be in balance with its hydrology and sediment inputs'..." (PR#323 PDF p10). In its technical report, Parks Canada also expressed concern that the developer's use of one hydraulic model for the

diversion increases the risk that the diversion might not withstand 100-year floods (PR#452 p31).

Despite CanZinc's commitments related to the Sundog Creek diversion, the Review Board remains unconvinced that effects on fish and fish habitat in Sundog Creek have been sufficiently considered, mitigated through design and planned mitigations, and reflected in monitoring plans. This is because the Review Board does not find the developer's predictions to be reliable, due to uncertainties resulting from 1) a lack of site-specific baseline information for Sundog Creek, 2) a lack of real world comparable examples of successful diversions similar to the Sundog Creek diversion.

In the *DAR Adequacy Review*, the Review Board determined that the baseline information for fish and fish habitat presented in the DAR was inadequate and did not meet the requirements of the *Terms of Reference* (PR#77 p33). Key pieces of baseline information that were missing from the DAR included:

- seasonal and life cycle movements and sensitive periods (ToR 5.1.5 item 3);
- habitat requirements for each life stage (ToR 5.1.5 item 4);
- known sensitive or important areas in terms of habitat type (e.g., spawning, overwintering, refugia, feeding), species, and timing of use (ToR 5.1.5 item 6); and,
- known issues with respect to health of harvested species (e.g., parasites, disease, condition) (ToR item 5.1.5 item 8).

CanZinc provided some additional baseline information in its DAR Addendum, however some baseline information was still lacking. For example, baseline information on fish and fish health, as per the ToR, was not provided. The Review Board requested this information again in the first round of information requests (PR#200 p8). CanZinc did not provide the requested information, with the rationale that because the likelihood of effects on fish or fish health was low, there was little utility in having baseline information against which to measure possible effects.

Parties to the EA also identified concerns regarding insufficient baseline information for some important issues related to fish and fish habitat. For example, recommendation 15 in the Liidlii Kué First Nation's closing argument requests "a measure that baseline studies are completed by the developer in advance of construction to quantify fish and fish habitat along the proposed alignment" (PR#550 p5). On several occasions, Parks Canada requested baseline information on benthic macroinvertebrates in Sundog Creek (PR#323, PR#371, PR#546), stating that "a qualitative and quantitative description of the existing macroinvertebrate community for the existing and [diverted] sections of Sundog creek" is

warranted so that potential effects from and recolonization following the channel diversion can be measured (PR#371 p12). Despite these numerous requests, CanZinc consistently chose to not provide or commit to providing this information.

Some other characteristics relevant to fish and fish habitat in Sundog Creek for which CanZinc has not provided any quantitative baseline information include: fish use and occupancy, benthic macroinvertebrate population information, sediment carrying capacity, water quality, and hydrologic data to support peak flow estimates and characterize normal streamflow conditions, including low flows.

This reluctance, on the part of the developer, to provide or collect necessary baseline information can also be seen for other valued ecosystem components, for example, as described in Chapters 6, 7, and 11. In summary, the Review Board and parties identified inadequate information, CanZinc was given multiple opportunities to provide better information or commitments to collect this information, but in many cases chose not to do so or provided responses that were less than comprehensive<sup>9</sup>.

During the technical sessions, Liidlíi Kué First Nation asked if CanZinc had completed any work to inform its predictions on the range of potential total suspended solids values that might be observed within the creek following diversion. CanZinc's response was "No, we have not done any quantitative assessment of the quantities" (PR#240 p99). Similarly, when asked if it had any basis for the assumption that removal of sediment from of the Sundog Creek diversion channel would be required every three to four years, CanZinc's response was "Not really, no. It's just an expectation of how we expect the system to behave" (PR#240 p112). In the Review Board's opinion, these responses suggest a lack of sound evidentiary basis for the developer's predictions and conclusions regarding impacts on Sundog Creek. Moreover, they cast doubt on the implementation and effectiveness of planned mitigations, as they appear to have not been consistently considered through the EA process.

The Review Board acknowledges that collecting site-specific baseline information for Sundog Creek will not, in and of itself, reduce the likelihood or magnitude of Project effects. However, the Review Board is of the opinion that this information is essential for developing channel design criteria that will be protective of fish and fish habitat throughout the life of the Project, and to inform monitoring and adaptive management. The

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<sup>9</sup> Also see Chapter 4 for a discussion of the overarching nature of these issues.



developer has provided evidence that Sundog Creek is a highly energetic, dynamic system with a large range of natural variability in flow regimes and associated sediment transport (PR#525 p14; PR#237 p99). Due largely to the dynamic nature of the river system and complexity of the surrounding terrain, the Review Board views the Sundog Creek diversion as a highly technical and potentially difficult engineering Project. The evolution of road and diversion channel design over the course of this EA supports this view (PR#528 p14-15).

Based on the information available to date (i.e., on the public record for this EA), the Review Board does not share the developer's optimism that it can recreate such a complex system, particularly without adequate baseline, including site-specific hydrology and channel morphology data. Indeed, the Review Board heard that neither the CanZinc nor DFO could provide a single example of a successful creek diversion similar to the one planned for Sundog Creek (PR#200 p12; PR#365)<sup>10</sup>. CanZinc has not collected any stream-specific hydrology data and instead relies on regional water stations, as described in Section 8.2.2. The developer has not demonstrated to the satisfaction of the Review Board that it can construct and maintain the Sundog Creek diversion in a way that does not result in significant adverse impacts on water quality and quantity, fish, and fish habitat. In other words, the developer has not met its burden of proof regarding the predicted impacts and proposed mitigations related to the Sundog Creek diversion.

#### **9.2.4 Lack of a comprehensive monitoring and adaptive management plan**

In light of the lack of site-specific baseline information and the real-world examples of successful diversions similar to Sundog Creek, the Review Board expects that a comprehensive monitoring framework rooted in the principles of adaptive management would have been proposed by the developer. This could support and strengthen the developers proposed mitigations by allowing CanZinc to identify, evaluate, and respond to unforeseen circumstances and impacts. However, the Board finds that the monitoring that CanZinc has proposed for Sundog Creek to date is problematic for the following reasons:

- CanZinc has not agreed to Parks Canada and DFN's recommendations (PR#546 p13 and PR#549 p12) to monitor benthic macroinvertebrate communities, which are an important source of food for fish in the Sundog Creek drainage (PR#452 p38).

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<sup>10</sup> When specifically asked for such precedents during the technical session, CanZinc's consultant stated that "[w]e don't have an example of a parallel relocation that worked. We, in the engineering literature, have examples of things that did not work" (PR#240 p142).

- CanZinc has not committed to monitor actual fish use and occupancy in the area, suggesting instead to only monitor flow characteristics as a proxy for fish use (PR#535 p33). DFN questioned the effectiveness of such a monitoring program in the public hearing (PR#525 p44).
- CanZinc has only committed to monitoring short term effects on water quality as a result of the diversion (PR#553 pp13/52) based on an unverified assumption that longer-term Project operations will not lead to any adverse effects. Parks Canada points out that “without long term monitoring of ecologically meaningful parameters (CanZinc) will not know if this assumption is correct” (PR#546 p12).
- CanZinc is only proposing to monitor things that it expects will change. This does not consider the possibility that some effects may have been either underestimated or not predicted by CanZinc in the EA. As described in Chapters 4 and 15, one of the goals of monitoring programs should be to test EA predictions, as well as to inform adaptive management to protect the environment in the event of unforeseen circumstances. Given the uncertainty in impact predictions described above, monitoring based only on things predicted to change is unlikely to be sufficient.
- Commitment #87 described inspections for the diversion channel’s stability as “less formal, casual inspections” (PR#553 pp26/52). This casual approach is in opposition to the systematic, comprehensive approach to adaptive management that parties have requested, and that the Review Board has confidence in, as described in Chapter 4 and Appendix B.

The developer has not provided comprehensive site-specific baseline information relevant to the design of the Sundog Creek diversion and there is large uncertainty in impact predictions and the effectiveness of mitigations to prevent adverse effects on fish and fish habitat. In the absence of comprehensive baseline information and successful real world examples of similar projects, rigorous monitoring and systematic adaptive management is required. However, CanZinc has not proposed such an approach.

### **9.2.5 Adverse impacts on fish and fish habitat within the NNPR are significant**

The *Canada National Parks Act* subsection 2(1) defines ecological integrity 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”. The Review Board considers that the proposed All Season Road may affect fish and fish habitat and ecological integrity within the NNPR adjacent to the project through:

- potential effects on benthic communities from the Sundog Creek diversion (benthic communities have been identified by Parks Canada as a “key link in energy transfer” and a source of food for fish (PR#525 p167));
- alterations to Sundog Creek channel morphology as a result of the diversion (the *Canada National Parks Act* includes “rates of change and supporting processes” in its definition of ecological integrity);
- habitat loss in the Sundog Creek floodplain due to encroachment of the road, the diversion berm and diversion channel (PR#426); and,
- the possibility of indirect effects of the diversion including sedimentation and the creation of barriers to fish passage.

As described in Chapter 4, the Project is located in an environmentally, socially and culturally important area. This importance is reflected, in part, by its inclusion within the Nahanni National Park Reserve. Subparagraph 8(2) of the *Canada National Parks Act* states that “Maintenance or restoration of ecological integrity, through the protection of natural resources and processes, shall be the first priority of the Minister when considering all aspects of the management of Parks”.

As described above, there are several ways the Project could affect the ecological integrity, in relation to fish and fish habitat, of areas of NNPR adjacent to the Project. Considering all of the evidence and analysis discussed above, and the purpose and value of the NNPR, the Review Board finds that there are likely significant adverse impacts on the environment, particularly on fish and fish habitat, from the Project, particularly the Sundog Creek diversion.

### **9.2.6 Conclusion**

Based on the analysis set out above, and having considered all evidence and argument on the public record, the Review Board concludes that the design, construction and operation of the Sundog Creek diversion is likely to lead to significant adverse effects on fish and fish habitat. This determination is rooted in a lack of: site-specific baseline information, real world examples of diversions in similar environments and comprehensive plans for monitoring and adaptive management. Together, these amount to a high degree of uncertainty in impact predictions and the effectiveness of mitigations. The Review Board further notes that the Sundog Creek diversion lies within the NNPR and that any adverse effects on fish and fish habitat within the NNPR because of the Project are likely to be significant. However, the Review Board finds that, in combination with CanZinc’s commitments and other measures in this Report of EA, significant adverse impacts can be avoided through implementation of the measure below.

## 9.3 Measures and Suggestions

### Measure 9-1

In order to prevent significant adverse impacts on fish and fish habitat from the Sundog Creek diversion, the Review Board recommends (building on the mitigations planned or committed to by CanZinc) the collection of baseline information to inform design and construction, and a comprehensive effects-monitoring and adaptive management plan for the Sundog Creek diversion. The baseline information required in Measure 8-1 will also contribute to Measure 9-1.

The Review Board is of the view that monitoring for project-related effects is essential. However, it acknowledges that if effects are not detected or are shown to be minimal, monitoring can be reduced or adjusted over time.

#### **Measure 9-1 – Effects mitigation, baseline data, monitoring, and adaptive management for the Sundog Creek diversion**

##### **9-1 Part 1: Introduction**

In order to prevent significant adverse impacts on fish and fish habitat, CanZinc will design, construct and operate the Sundog Creek diversion channel in a way that is protective of fish and fish habitat and ensures the ecological and hydraulic effectiveness of the diversion.

Toward this end, CanZinc will develop a Sundog Creek Diversion Plan to:

- a) Mitigate and minimize potential adverse effects on fish and fish habitat from the Sundog Creek diversion through appropriate and protective channel design, and by using all available best practices during construction and operation of the channel.
- b) Collect baseline data necessary to design, construct and maintain the diversion channel in a way that is protective of fish and fish habitat throughout the life of the Project.
- c) Monitor for project-related effects on physical and biological characteristics relevant to the maintenance of effective fish habitat and ecological integrity and to ensure that mitigations are operational and effective.
- d) Develop and implement an adaptive management framework for Project effects on fish and fish habitat and ecological integrity.

Parks Canada and DFO must review and approve this plan prior to the start of construction.

### **9-1 Part 2: Collect baseline information**

CanZinc will collect baseline data necessary to design, construct and operate the Sundog Creek diversion so that fish and fish habitat are protected through the life of the Project. This baseline information will also be used to verify EA predictions and inform adaptive management. Prior to commencement of construction of the Sundog Creek diversion, CanZinc will collect a minimum of one year of baseline data for both hydrological and ecological characteristics, including at a minimum, information on:

- i. benthic invertebrates;
- ii. aquatic vegetation;
- iii. fish use and occupancy;
- iv. channel morphology;
- v. flow characteristics;
- vi. water quality;
- vii. hydrology (as described in Measure 8-1); and
- viii. any other variables of concern as deemed appropriate by DFO or Parks Canada.

### **9-1 Part 3: Mitigate or minimize potential adverse effects**

CanZinc will use all available best management practices and all available baseline data (including data requirements in measure 8-1 and 9-1) to design and construct the Sundog Creek diversion channel to avoid and mitigate adverse effects on fish and fish habitat, including both ecological and hydrological considerations.

### **9-1 Part 4: Monitor Project effects**

CanZinc will develop and implement a monitoring plan to detect project-related effects on fish and fish habitat from the Sundog Creek diversion. Monitoring must consider both hydrological and ecological characteristics including, at a minimum:

- i. benthic invertebrates;
- ii. aquatic vegetation;
- iii. fish use and occupancy;
- iv. channel morphology;

- v. flow characteristics;
- vi. water quality;
- vii. hydrology ; and
- viii. any other variables of concern as deemed appropriate by DFO or Parks Canada.

Monitoring will consider both short and long-term effects of the diversion, and will incorporate appropriate flexibility such that monitoring requirements can be adjusted to reflect the Project stage, past monitoring results, and likely effects.

### **9-1, Part 5: Adaptive management of Project effects**

CanZinc will develop and implement an adaptive management framework for effects on fish and fish habitat from the Sundog Creek diversion that satisfies the requirements of Appendix B.

### **Suggestion 9-1**

The Review Board is aware that the effects from the Sundog Creek diversion channel are likely relevant to the mandates of both Parks Canada and DFO. The following measure is intended to encourage cooperation, coordination, and efficiency in the review and approval of the Sundog Creek Diversion Plan.

### **Suggestion 9-1: Regulatory collaboration**

All regulators involved in the review and approval of the Sundog Creek Diversion Plan should work collaboratively to minimize duplication of monitoring and reporting requirements and develop consistency between monitoring program components, to the greatest extent possible.

## 10. Culture and heritage

### *Summary of Review Board findings*

The Review Board finds that the Prairie Creek All Season Road Project (All Season Road or the Project) is likely to cause significant adverse impacts on cultural and heritage resources<sup>1</sup> for the following reasons:

- Potentially-affected Aboriginal groups have used and continue to use the Project area for traditional activities and remain concerned that Project activities will adversely affect heritage resources.<sup>2</sup>
- By failing to consider Traditional Knowledge from all potentially-affected Aboriginal groups, which was required by the *Terms of Reference* (PR#42), the developer failed to meet its burden of proof to convince the Board that Traditional Knowledge has been adequately considered and the project will not have a significant adverse impact on heritage resources.
- The Review Board is not confident that the developer's final commitments will ensure that CanZinc considers all relevant Traditional Knowledge and mitigates significant adverse impacts on heritage resources in the vicinity of the Project.

The Review Board observes that it is the developer's responsibility to consider Traditional Knowledge of all potentially-affected Aboriginal groups and to make commitments that are effective in mitigating significant adverse impacts. Parties expressed concern that the wording of CanZinc's commitments, coupled with the lack of Traditional Knowledge about the Project area from all groups using the area, would result in inadequate protection of heritage resources. The Review Board agrees, and concludes there are likely to be significant adverse impacts on heritage resources unless additional mitigation measures are required.

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<sup>1</sup> Heritage resources, as defined in Section 2 of the MVRMA, refers to "archaeological or historic sites, burial sites, artifacts and other objects of historical, cultural or religious significance, and historical or cultural records." Given the inclusive nature of this definition, this chapter will primarily refer to the term "heritage resources" from this point on.

<sup>2</sup> In this EA, the Review Board heard that Liidlii Kué First Nation, Dehcho First Nations, and particularly Nahanni Butte Dene Band have used the Project area for harvesting and other traditional activities, and continue to use the area.



The Review Board's analysis and conclusions in other chapters of this Report of EA also includes consideration of Traditional Knowledge, and several of the Board's recommended measures include explicit requirements for consideration and incorporation of Traditional Knowledge. The Board finds that relevant and available Traditional Knowledge from all potentially-affected Aboriginal groups needs to be considered by the developer with regard to project design and operations, monitoring, and adaptive management.

### **Organization of this chapter**

In Section 10.1, the Review Board has provided readers with a more thorough and detailed summary of the evidence than it has in other environmental assessments. This is intended to allow readers to see firsthand the range and degree of uncertainties identified throughout the environmental assessment. These uncertainties presented a particular challenge to impact predictions and decision making<sup>3</sup> and are a relevant part of the Review Board's consideration of the evidence in this section. Section 10.1 summarizes the evidence about heritage resources, including information from the developer and parties in relation to baseline information (form engagement and fieldwork) and predicted impacts on heritage resources.

In Section 10.2, the Review Board presents its analysis and conclusions. The Review Board's recommended measures are outlined in Section 10.3.

## **10.1 Evidence from parties and the developer**

Subsection 111(1) of the MVRMA defines 'impact on the environment' as including "any effect on the social and cultural environment or on heritage resources." In the *Terms of Reference* (ToR), the Review Board required the developer to describe the existing archaeological, paleontological and historic sites and resources, culturally important sites, burial sites, and heritage resource potential in the Project area (PR#42 p20). The Review Board required the developer to describe the effects that the development may have on (PR#42\_p32):

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

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<sup>3</sup> See Chapter 4 for further discussion.

- impacts on archaeological sites.

During scoping, both the Government of Northwest Territories (GNWT) and Parks Canada urged the developer to assess the potential for impacts on archaeological sites (PR#33 pA1-19). The Nahanni Butte Dene Band (NBDB) expressed specific concerns with respect to archaeological resources within the footprint of the Project (PR#18 p7). Parties were concerned with the developer's proposed approach of relying on existing baseline information from the Prairie Creek Mine and Winter Road Environmental Assessment (EA0809-002) to inform this EA.

Figure 10-1 shows elders from Nahanni Butte describing and documenting cultural values during the Cultural Impact Technical Session in Nahanni Butte.



**Figure 10-1: Elders at the cultural technical session in Nahanni Butte, July 4, 2016**  
(Review Board photo)

### 10.1.1 Baseline information

In its Developer's Assessment Report (DAR), the developer presented Traditional Knowledge and engagement activities, desktop studies, and field studies completed as part of the Prairie Creek Mine and Winter Road EA as baseline data for this Project (PR#55 p126-128). Most of the information the developer provided regarding culture and heritage resources is found in sections 5.2 and 5.3 of the DAR (PR#55), where the developer described Traditional Knowledge it learned from engagement with the NBDB during EA0809-002. The DAR describes Traditional Knowledge-based information about the many cultural uses and heritage resources in the Project area (PR#55 p126).<sup>4</sup>

The Review Board received a full copy of NBDB's 2009 *Traditional Knowledge Assessment of the Prairie Creek Mine Operation* under confidential cover<sup>5</sup>, which was completed for EA0809-002. In its Traditional Knowledge Assessment Addendum, completed for the All Season Road Project, NBDB recommended archaeological work at Wolverine Pass and Second Gap "before site damage might occur" (PR#18 p7). The developer had met with NBDB in July and August 2009, and agreed to undertake archaeological work in key areas for the previous environmental assessment EA0809-002 (PR#55 p126). NBDB identified the following key areas: the mountain passes, including the Second Gap in the Nahanni Range (Grainger Gap); Wolverine Pass; Silent Hills; and, the Tetcela River crossing (PR#55 p126).

On January 20, 2015, the developer met with NBDB Elders as part of engagement for the All Season Road Project. The Elders explained that permanent camps were not likely to be discovered, as travellers camped at random within the region, and used rivers for travel. If heritage or cultural resources were to be found, prime locations to investigate would be Wolverine Pass or Grainger Gap. The Elders also explained that the only known burial or cultural sites were several hundred metres upstream of the Project along the Liard River, although the exact location was not disclosed (PR#55 p127).

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<sup>4</sup> The select passages provided by the developer were modified by the developer to protect the confidentiality of NBDB's Traditional Knowledge (PR#55 p122).

<sup>5</sup> This report was submitted to the Review Board during EA0809-02 under confidential cover from Nahanni Butte Dene Band because it contains confidential Traditional Knowledge. It was available for review at the Review Board office, throughout that EA and EA1415-01, in person if the party can provide valid justification for why it requires this information.

The developer's engagement records show it met with Liidlii Kué First Nation (LKFN) on two dates, in January and November 2014. One of these meeting records was signed (PR#127). Later, LKFN wrote to the Review Board on February 12, 2016, saying that the developer had not consulted LKFN on the Project (PR#150). The developer responded by saying that it did consult, in January and November 2014. The developer stated it was willing to "continue to engage with LKFN regarding the proposed all season road project" and that it was "prepared to discuss outstanding issues, as well as business, employment and benefit aspirations" (PR#163 p1). In a letter to the Review Board in June 2016, LKFN stated it wanted to focus on concerns with the All Season Road Project at upcoming cultural technical sessions as part of the EA process (PR#221).

### **Fieldwork**

In September 2009, Points West Heritage Consulting Ltd. completed targeted field surveys for an Archaeological Impact Assessment (AIA) for the existing winter road alignment (PR#196). The AIA focused on key areas with potential for heritage resources: Grainger Gap, Wolverine Pass, and the Tetcela River (PR#196 pii). The report pointed out that fieldwork included a total of four NBDB members, however "the two people most familiar with the area were unavailable during the field program" (PR#196\_p4). No evidence of heritage resources was observed in the key areas (PR#196 pii). The report concluded that "(a)s long as the access road follows the existing cutline *and it remains a winter use road* [emphasis added], it is considered unlikely that there will be conflicts with archaeological deposits" (PR#196\_p16). Table 10-1 below lists the general locations of the high potential areas assessed by Points West Heritage for EA0809-02, along what is now referred to as the Permitted Winter Road<sup>6</sup> alignment.

The developer made a commitment during EA0809-002 to conduct further archaeological investigation along changes to the winter road alignment between the Liard River and Grainger Gap (PR#55 p127). In September 2012, Golder Associates completed a ground investigation in relation to this commitment. No heritage resources were found (PR#195). Table 10-1 below lists the areas assessed by Golder Associates along the Permitted Winter Road alignment. Several of the areas listed are labelled on Figure 1-1.

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<sup>6</sup> See section 1.2.2 and 1.2.3 for details regarding the difference between the Permitted Winter Road alignment (i.e. permitted after EA0809-002) and the proposed All Season Road alignment (the subject of this Report of EA).

**Table 10-1: Locations of archaeological investigations (EA0809-002)**

Archeological investigation	High potential areas	Landscape features
Golder Associates (2013)	Liard River to Grainger Gap (proposed winter road alignment)	Uplands and Mountain Passes
Points West Heritage Consulting Ltd. (2009)	Second Gap in the Nahanni Range (Grainger Gap)	
	Silent Hills (Wolverine Pass)	Waterbodies
Tetcela River		

Following receipt of the DAR, the Review Board advised the developer to complete an impact assessment for culture and heritage resources that followed the impact assessment process steps outlined in the ToR for this Project (PR#77 p40). In its DAR Addendum, the developer said that it did not believe that assessment was necessary as it had already provided the necessary baseline information during EA0809-002 and in its DAR (PR#100 p68). Parties disagreed that the work from the previous environmental assessment of the winter road adequately reflected potential impacts of the all season road (PR#200 p6).

### 10.1.2 Predictions

Based on the information in the DAR and DAR Addendum, the scope of development, and field studies from EA0809-002 that were provided by the developer (for example, PR#196 and PR#195), the following pathways may lead to impacts on heritage resources: activities such as digging, blasting rock, and clearing trees; and increasing the presence of non-locals in the area. Impacts on wildlife (see Chapter 6) and traditional harvesting (see Chapter 7) could also affect culture and the way-of-life of Aboriginal people.<sup>7</sup>

Following receipt of the DAR, the Review Board advised the developer to conduct an impact assessment for culture and heritage resources that followed the impact assessment process steps outlined in the ToR for this Project (PR#77 p40). In its DAR Addendum, the developer said that it did not believe that assessment was necessary as it had already provided the necessary baseline information during EA0809-002 and in its DAR (PR#100

<sup>7</sup> Section 115 of the *Mackenzie Valley Resource Management Act* (MVRMA or the Act) requires the EA process to have regard to the well-being and way of life of Aboriginal peoples.

p68). Parties disagreed that the work from the previous environmental assessment of the winter road adequately reflected potential impacts of the all season road (PR#200 p6).

### **Archaeological baseline**

During the first round of information requests (IRs), parties requested that the developer update its existing archaeological baseline information. Parties commented that existing work was “limited in scope and did not cover the expanded footprint” of the All Season Road (PR#200 p6). The GNWT and Parks Canada requested that an Archaeological Overview Assessment (AOA) and an AIA be completed (PR#200 p6)<sup>8</sup>.

The developer asserted that its proposed mitigation would be a more practical approach than an AOA or AIA (PR#200 p6). CanZinc later made an explicit commitment that “(a) brochure of photographs of heritage resources will be compiled and provided to contractors as part of the Road Construction and Maintenance Plan” (PR#355, Appendix C, Commitment #62). NBDB supported this (PR#172, PR#180).

During the technical session in Yellowknife, GNWT and Parks Canada stated that a lack of baseline data was limiting their abilities to make impact predictions. Parties explained how the potential for significant adverse impacts from the previously assessed winter road and the proposed All Season Road may vary because of alignment changes and because the nature of the construction and operations activities (and potential impacts) differs between seasons. The GNWT archaeologist summarized the issue by saying (PR#232\_p70):

(A)rchaeological impact assessments were conducted on segments of the winter road alignment that crossed territorial lands in 2009 and 2012. No archeological sites were found by those specific studies. But in light of... the significant route alignments for the all-season road, the addition of borrow sites, borrow access, construction camps, and other infrastructure sites, the areas assessed by those impact assessments now comprise only a small piece of the overall project footprint of the all-season road. So in the absence of proper pre-disturbance archeological studies, it's not possible to assess the significance of impacts on archeological sites by the all-season road project.

At the technical session, LKFN clarified that the all season road presents more significant socio-economic and environmental impacts than the approved winter road (PR#232 pp46-47). The following day, an undertaking stating “Canadian Zinc to follow up with LKFN

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<sup>8</sup> An AOA is primarily a desktop review, while an AIA involves more detailed field studies.



regarding the new design and consideration of Traditional Knowledge related to the new design” (PR#237 p27) was drafted but not agreed to by the developer, who nonetheless assured the Review Board of its intent to follow up with LKFN. Following the technical sessions, the developer committed to completing an AOA of the proposed All Season Road alignment (PR#257) that included local community members and a professional archaeologist (PR#355\_p1).

The developer completed the AOA on November 29, 2016. The AOA recommended a pre-construction AIA to focus on the infrastructure, and CanZinc made additional commitments within the AOA report (see Appendix C commitment #215) “to include Nahanni Butte Dene Band in ground-truthing during such an AIA, under the direction of a professional archeologist... [and] developing a Cultural Resource Protection Plan that includes providing pre-construction survey crews with a heritage resource booklet showing the range of heritage resources that might exist” (PR#379 p9). This plan recommended work stoppage in the event of a discovery. CanZinc stated that “the detailed design of the road and the AIA will be completed after permitting and before road construction... The AOA and AIA are not expected to alter the routing of the road” (PR#320 p5).

In its technical report, the GNWT said that a pre-construction AIA would mitigate any significant adverse impacts on heritage resources and made related recommendations, including conducting an AIA before construction along a 60 meter right of way (PR#455 p14). The developer agreed with the GNWT’s proposed timing, and clarified that the width of the right-of-way would be an average of 22 m and up to 40 m (PR#459 p1). The GNWT later confirmed that, “based on available evidence, GNWT concludes that significant adverse impacts on archaeological sites are not likely” (PR#511 p12). During the hearings, the developer said it is currently working with Parks Canada and the GNWT on matters of scope and content for the AIA (PR#528 p59).

### ***Spiritual sites***

The developer met with Elders and harvesters from the NBDB on January 20, 2015. During the meeting, the NBDB identified a burial site upstream of where the proposed Project crosses the Liard River. Further examination of maps determined that “the grave sites are several hundred metres upstream” of the proposed Liard crossing (PR#55 p268).

The developer predicted that there would be no impact to cultural or spiritual sites. The Board asked about whether increased access from outsiders and other Project activities could affect the burial site. In its response, the developer noted that the site is inaccessible to road vehicles and sufficiently far from the road, according to NBDB (PR#200 p6).



### 10.1.3 Incorporating Traditional Knowledge

LKFN repeatedly raised concerns throughout the process that its Traditional Knowledge and potential cultural impacts were not being considered adequately by CanZinc, and requested support for a Traditional Knowledge study (e.g., PR#242; #276 p9; PR#528 p31). The developer replied that it “understood that there were no cultural or Traditional Knowledge concerns from LKFN as there was no response to [the developer’s] enquiry” (PR#276 p8). CanZinc maintained this view throughout the process (e.g., PR#528 p38; p54), and did not respond to LKFN’s closing statement. At the public hearing (PR#528) and in its closing arguments (PR#550 pp6-7), LKFN asserted that the Project was likely to cause significant adverse impacts on heritage resources.

In its closing argument, the developer referenced several documents regarding its engagement with LKFN on various subjects including Traditional Knowledge. These documents include the developer’s engagement record and engagement plan, several letters, technical session and hearing transcripts and closing arguments (PR#127, PR#128, PR#150, PR#163, PR#221, PR#232, PR#489, PR#553, PR#528). In contrast, as described above, LKFN expressed concerns throughout this assessment that its Traditional Knowledge was not being adequately considered by CanZinc (e.g., PR#242; #276 p9; PR#528 p31). The developer informed the Review Board in its closing argument that no commitments or discussions about a Traditional Knowledge study had taken place between the developer and LKFN since the cultural technical session (PR#553 p1-2).

Parks Canada recommended 2 measures in relation to Traditional Knowledge (Appendix D, Parks Canada recommendations #11 and 12) (PR#452 p29-30). One of these recommended that the AIA “incorporate Traditional Knowledge from all Indigenous communities that may have all season knowledge of the project area including place names, traditional land use and harvesting in areas directly impacted by the expanded footprint of an all season road”. The developer stated that it was “largely in agreement” with Parks Canada’s recommendations #11 and 12 (PR#484 p15). Therefore, in its closing arguments, Parks Canada advised the Review Board that no significant adverse impacts on heritage resources were likely to occur as a result of the Project (PR#546 p10).

In its closing argument, the developer listed its commitments to mitigate impacts on heritage resources related to those recommended by Parks Canada (PR#553 p7). The developer’s commitment #215 [Appendix C] restates almost verbatim the recommendation of Parks Canada, but instead of saying “Traditional Knowledge from *all* [emphasis added]

Indigenous communities” (PR#452 p29-30) it says “Traditional Knowledge from Indigenous communities.”

In its technical report, Parks Canada outlined its dissatisfaction with the previous AIA for the Prairie Creek Mine and Winter Road (EA0809-002), as well as that AIA’s applicability to this Project. Parks Canada pointed to concerns with the traditional and scientific knowledge and methods used to understand culture and heritage baseline conditions for the All Season Road. Parks Canada pointed out that “Traditional Knowledge used for the winter road was from one community and the knowledgeable elder was not available for the archaeologist to consult with prior to the AIA for the winter road”. Parks Canada pointed out that three areas of high potential were identified for EA0809-002 but only two were ground-truthed, and argued that the approach was “insufficient for determining the presence or absence of cultural resources” (PR#452 p29).

Parks Canada concluded in its technical report that “additional collection of Traditional Knowledge and archeological investigation...” would be required for an AIA for the All Season Road Project, “...to ensure that impacts to heritage resources are not significant.” It supported this conclusion by describing that, “there have been limited archeological investigations conducted in NNPR [Nahanni National Park Reserve]” (PR#452 p29), and confirmed that its mandate includes the “protection of natural and cultural heritage” (PR#452 p5).

Dehcho First Nations (DFN) referenced the *Traditional Knowledge Assessment Addendum* (PR#18) in its technical report, to show that members of DFN have traditionally used the Project area, and mountain passes in particular (PR#459 p26):

Given that the ancestors of the Nahæê Dehé people are known to have traveled overland to a greater extent than via waterways, the mountain passes that provide easy access into and between valleys are potential areas for pre-historic and historic artifacts.

In its technical report, DFN recommended the Review Board obtain clarity on the developer’s commitments to avoid significant adverse impacts on heritage resources (PR#459 p26). DFN advised that outcomes from the AIA could result in significant modifications of the Project and provided several recommendations regarding archaeological investigation methods (PR#459 p26). DFN recognized that the “rigor” of the AIA would likely be addressed during the permitting process through regulations (PR#459 p26). DFN supported Parks Canada’s recommendation #11, and wanted to have local communities involved in the development of the scope of the AIA (PR#549 p13). DFN

informed the Review Board that it believed additional Traditional Ecological Knowledge of the Project area was required and outlined the standards for which this type of knowledge is gathered, housed and used (PR#549 pp13-14).

During the hearings, LKFN stated that the area is a sacred area (PR#528 p238) and Grand Chief Herb Norwegian stated that travel there is a “pilgrimage” to a place of prayer (PR#528 pp225-227):

[P]eople from all over the world come to the south Nahanni. And some people go there every year, and they feel like they are being forgiven. There's something that happens there on that journey when you're in those mountains, and the very thing that they feel is something that they cherish. And our people, the Naha Dehe, are the same thing.

In its response to technical reports, the developer restated for DFN that it would complete an AIA and a Cultural Resource Protection Plan. The developer also confirmed that it would complete pedestrian studies and pointed out that it already made commitments with respect to the involvement of local community members (PR#484 PDF p27). The developer pointed out that it intended to involve local members in the AIA and suggested that it would be unlikely that Project modifications would occur as the result of heritage resource discovery (PR#484 PDF p28). In addition to already having engaged with NBDB, the developer said that it intends to engage with Elders of LKFN, the Metis community, and Acho Dene Kué from Fort Liard in formulating the scope of work for the upcoming AIA (PR#528 p55).

## **10.2 Review Board analysis and conclusions**

### **10.2.1 Summary of Review Board findings**

The Review Board finds that the Prairie Creek All Season Road Project (All Season Road or the Project) is likely to cause significant adverse impacts on cultural and heritage resources<sup>9</sup> for the following reasons:

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<sup>9</sup> Heritage resources, as defined in Section 2 of the MVRMA, refers to “archaeological or historic sites, burial sites, artifacts and other objects of historical, cultural or religious significance, and historical or cultural records.” Given the inclusive nature of this definition, this chapter will primarily refer to the term “heritage resources” from this point on.

- Potentially-affected Aboriginal groups have used and continue to use the Project area for traditional activities and remain concerned that Project activities will adversely affect heritage resources.<sup>10</sup>
- By failing to consider Traditional Knowledge from all potentially-affected Aboriginal groups, which was required by the *Terms of Reference* (PR#42), the developer failed to meet its burden of proof to convince the Board that Traditional Knowledge has been adequately considered and the project will not have a significant adverse impact on heritage resources.
- The Review Board is not confident that the developer's final commitments will ensure that CanZinc considers all relevant Traditional Knowledge and mitigates significant adverse impacts on heritage resources in the vicinity of the Project.

The sections below set out the Review Board's analysis and conclusions in relation to these reasons. . Section 10.3 recommends measures to prevent significant adverse impacts on heritage resources.

### **10.2.2 Traditional and continuing use of the area**

The Review Board observes that, based on the evidence, Project activities will occur in areas traditionally used by Nahanni Butte Dene Band (NBDB), Liidlii Kué First Nation (LKFN), and Dehcho First Nations (DFN), so there is potential for the Project to interact with cultural uses or heritage resources. The record clearly shows that both NBDB and LKFN have used and continue to use the Project area. For example, in the DAR, the developer stated that “[t]he area of Nahæâ Dehé (Nahanni River) between Ndutah (the Splits) and its mouth at Náchádeh (Liard River) is of paramount ecological and cultural importance to NDDDB” (PR#55 p126).

In the past (for the Prairie Creek Mine and Winter Road), the developer completed Impact Benefit Agreements (IBAs) with both NBDB and LKFN (PR#55). In the Review Board's opinion, these actions by the developer demonstrate that it also acknowledges its proposed activities in the Project area potentially affect both NBDB and LKFN.

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<sup>10</sup> In this EA, the Review Board heard that Liidlii Kué First Nation, Dehcho First Nations, and particularly Nahanni Butte Dene Band have used the Project area for harvesting and other traditional activities, and continue to use the area.

The Review Board heard from Parks Canada that Traditional Knowledge from all potentially-affected Aboriginal groups is valuable and relevant to prevent impacts on heritage resources (PR#452 p29). For example, Traditional Knowledge may be used to identify trails, habitat areas and place names that signify cultural values in the Project area (PR#276). The Review Board agrees that Traditional Knowledge from all potentially-affected Aboriginal groups needs to be considered and incorporated into the detailed Project design to avoid significant adverse impacts on heritage resources. The Review Board finds that NBDB, LKFN, and DFN are potentially-affected Aboriginal groups and acknowledges that other groups or individuals with Traditional Knowledge of the project area may identify themselves during the regulatory process for the AIA.

### **10.2.3 Relevant Traditional Knowledge was missing**

Paragraph 115(1)(c) of the MVRMA requires the Review Board to “have regard to the importance of conservation to the well-being and way-of-life of the Aboriginal peoples of Canada to whom Section 35 of the *Constitution Act, 1982* applies and who use an area of the Mackenzie Valley.” Section 115.1 of the MVRMA states that “[t]he Review Board shall consider any Traditional Knowledge and scientific information that is made available to it.” The Review Board’s *Traditional Knowledge Guidelines*, prepared under the authority of Section 120 of the MVRMA, provide further guidance on the Board’s expectations regarding Traditional Knowledge submissions. Section 1.1 of these Guidelines state “[t]he Review Board is committed to fully consider any Traditional Knowledge brought forward in its proceedings”.

In this case, parties have expressed concerns that the developer failed to make reasonable efforts to incorporate Traditional Knowledge from *all* potentially-affected Aboriginal groups, in accordance with the ToR (PR#42 p4-5). The developer only considered a portion of the relevant Traditional Knowledge from potentially-affected Aboriginal groups and only provided a portion of relevant Traditional Knowledge for the Review Board’s consideration.

The Review Board considered the evidence and submissions regarding the developer’s use of Traditional Knowledge in this EA. The Review Board acknowledges the changes the developer has made to the road alignment, for example between Silent Hills and Grainger Gap, at the request of NBDB. The Board also recognizes any efforts the developer may have made to acquire and incorporate Traditional Knowledge from other potentially-affected Aboriginal groups into its Project design. In the DAR and DAR Addendum, it is clear that the developer has engaged and continues to engage with NBDB, has considered information

from the band's *Traditional Knowledge Assessment of the Prairie Creek Mine Operation and Traditional Knowledge Assessment Addendum*, and has incorporated this information into its Project design.

With respect to engagement with LKFN, the developer submitted numerous documents that reference, in the developer's view, evidence of efforts to obtain Traditional Knowledge from LKFN. These documents include the developer's engagement record and engagement plan, several letters, technical session and hearing transcripts and closing arguments (PR#127, PR#128, PR#150, PR#163, PR#221, PR#232, PR#489, PR#553, PR#528).

During the course of the EA the Board heard from LKFN that it 1) has knowledge including Traditional Knowledge that is relevant, 2) wants to be involved in mitigating impacts on heritage resources, and 3) needs opportunities and resources to do so. The Review Board is not convinced that the developer has done its due diligence to collect Traditional Knowledge from the LKFN and integrate it into Project design. The Review Board disagrees with the developer's claim that it has engaged "...with LKFN extensively regarding the project, both before and during this environmental assessment" (PR#489 p1). The Review Board only has evidence of two meetings; both in 2014, only one with a signed record, and neither of which discussed impacts from the All Season Road.

At the cultural technical session (Figure 10-2), LKFN told the Review Board that it had requested funding support from the developer and government to carry out a Traditional Knowledge study (PR#276 p7), which to the Review Board's knowledge, was never conducted. In its closing arguments, LKFN told the Review Board it remains "...extremely concerned about potential impacts to heritage resources" (PR#550 p6). With regard to this concern, the Review Board believes that Traditional Knowledge from LKFN will help to identify cultural and heritage resources in the Project area and is essential to mitigate as yet undefined impacts. The Review Board concludes that including LKFN, along with the NBDB, in identification and mitigation of impacts on culture and heritage resources may address these concerns.

In its closing argument, DFN told the Review Board that it believes that "[i]n addition to Traditional Land Use information, further work is needed on traditional ecological knowledge (TEK) to determine historical resources potential along the proposed all-season road alignment" (PR#549 p12). This suggests that the developer has not done enough to incorporate Dehcho First Nation's existing and available land use information to understand or mitigate impacts on heritage resources.



Considering the evidence on the record, the Review Board concludes that engagement with LKFN in relation to Project impacts and Traditional Knowledge has not been thorough enough to identify or characterize potential adverse impacts on heritage resources. The Review Board finds that there remains a need to acquire and incorporate Traditional Knowledge from all potentially-affected Aboriginal groups to prevent significant adverse impacts on heritage resources.

It is the developer's responsibility to provide evidence that clearing, digging, blasting and other construction, operation, closure and reclamation activities will not cause significant adverse impacts on heritage resources.<sup>11</sup> In the Board's opinion, the developer has failed to satisfy its burden of proof in this regard, in large part due to the lack of consideration and incorporation of Traditional Knowledge from all potentially-affected Aboriginal communities.



**Figure 10-2: Cultural technical session in Fort Simpson, July 5, 2016.**  
(Review Board photo)

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<sup>11</sup> See Chapter 4 for further discussion regarding the burden of proof.



#### **10.2.4 Developer's commitments are not sufficient**

Parks Canada recommended that the AIA “incorporate Traditional Knowledge from all Indigenous communities that may have all season knowledge of the project area...” (PR#452 p29). However, the developer's commitment submitted during closing arguments does not include the word “all” (PR#553; Appendix C, commitment #215). In the Board's view, CanZinc's wording leaves uncertainty about how the commitment will be implemented, particularly considering CanZinc's limited engagement with and lack of consideration of Traditional Knowledge from LKFN, despite LKFN's repeated requests to be engaged in relation to Project effects and Traditional Knowledge.<sup>12</sup>

Meaningful engagement and consideration of Traditional Knowledge is a necessary and important part of resource management in the Mackenzie Valley. In addition the Board finds that incorporating Traditional Knowledge from only some potentially-affected Aboriginal groups would result in excluding valuable Traditional Knowledge and limit the collection of information necessary to mitigate impacts on heritage resources from the All Season Road.

#### **10.2.5 Conclusion**

It is clear to the Review Board that Project activities will take place in and around areas of traditional and ongoing use by NBDB, LKFN, and DFN. However, CanZinc has not convinced the Review Board that the developer has made sufficient efforts to engage all potentially-affected parties and consider all relevant and available Traditional Knowledge. Even with CanZinc's current commitments, the Review Board is not confident that Traditional Knowledge will be adequately considered. This Traditional Knowledge is necessary to identify heritage resources to avoid significant adverse impacts. More generally, Traditional Knowledge needs to be considered for Project design, mitigation of impacts on

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<sup>12</sup> The Review Board acknowledges that the developer has voiced its intent to remain open to discussing the impacts on culture and heritage resources with potentially-affected Aboriginal groups (for example, PR#163 p1; PR#528 p55). However, evidence suggests that CanZinc has had several opportunities to engage with LKFN to date and has not done so meaningfully.

people and the environment, and development and implementation of monitoring and adaptive management.<sup>13</sup>

The developer failed to meet its burden of proof to convince the Board that all relevant and available Traditional Knowledge has been adequately considered and the Project will not have a significant adverse impact on heritage resources. The Review Board accepts the concerns of LKFN, DFN, and Parks Canada and the Board requires the developer to take a more comprehensive approach to considering all relevant Traditional Knowledge.<sup>14</sup>

### **10.3 Measures**

The Review Board finds that without the following measures the Project is likely to cause significant adverse impacts on heritage resources. The measures below build on CanZinc's commitments and are intended to ensure that all potentially-affected Aboriginal groups will be engaged and all relevant and available Traditional Knowledge will be considered, in a culturally appropriate way that respects existing policies and practices. Engagement on and consideration of Traditional Knowledge is also needed to support and inform Project design, mitigation of impacts on people and the environment, monitoring, and adaptive management. This includes related requirements in other measures in this Report of EA, (for example: Measures 6-1, 6-3, 8-1, and 15-1).

Measure 10-1 is focussed on Traditional Knowledge. Measure 10-2 is focussed on the Archaeological Impact Assessment (the prior to "ground disturbance" requirement is meant to ensure that the AIA is completed prior to the developer carrying out any Project activities that could impact heritage resources).

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<sup>13</sup> See Chapter 15 for more discussion of about monitoring. Other Chapters also discuss the importance of Traditional Knowledge (for example, Chapter 6: Wildlife, which includes Traditional Knowledge requirements in the Review Board's recommended measures).

<sup>14</sup> As initially requested in the ToR for this environmental assessment.

## Measure 10-1

### **Measure 10-1: Traditional Knowledge**

In order to prevent significant adverse impacts on heritage resources, and to support Traditional Knowledge requirements in other measures in this Report of EA, the developer will:

- i. engage with potentially-affected Aboriginal groups, including Nahanni Butte Dene Band, Liidlii Kué First Nation, and Dehcho First Nations, about ways to avoid impacts from the Project, including impacts on heritage resources;
- ii. conduct this engagement prior to the Archaeological Impact Assessment (AIA), so that the resulting information can inform the AIA (see Measure 10-2);
- iii. thoroughly consider and, where applicable, incorporate Traditional Knowledge into Project design, mitigations, monitoring, and adaptive management; and
- iv. submit an updated engagement record and plan in accordance with Mackenzie Valley Land and Water Board (MVLWB) Engagement Guidelines<sup>15</sup> for review and approval by Parks Canada and the MVLWB.

The developer will do this in a culturally-appropriate way that respects applicable Traditional Knowledge policies and protocols.

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<sup>15</sup>MVLWB Engagement Guidelines for Applicants and Holders of Water Licences and Land Use Permits (<https://mvlwb.com/sites/default/files/documents/wg/MVLWB%20Engagement%20Guidelines%20for%20Holders%20of%20LUPs%20and%20WLS%20-%20Oct%202014.pdf>)

## Measure 10-2

### **Measure 10-2: Archaeological Impact Assessment**

In order to prevent significant adverse impacts on heritage resources, the developer will conduct an Archaeological Impact Assessment to the specifications detailed in commitments #215 and #216 in Appendix C of this Report. The Archaeological Impact Assessment will also:

- be developed in consultation with Parks Canada, the Government of the Northwest Territories, Nahanni Butte Dene Band, Liidlii Kué First Nation, and Dehcho First Nations;
- incorporate all evidence of place names, traditional land use, Traditional Knowledge, cultural and spiritual use, and harvesting in the vicinity of the Project;
- be conducted along the final alignment of the All Season Road, at borrow site locations, and other areas where ground disturbance is proposed; and
- be completed prior to any new ground disturbance.

## 11. Vegetation, including rare plants, rare plant assemblages, and harvested species

### *Summary of Review Board findings*

The Review Board finds that the Prairie Creek All Season Road Project (All Season Road or the Project) will likely cause significant adverse impacts on vegetation. The Review Board's reasons for this determination are as follows:

- The road passes through unique karst terrain and a glacial refugium<sup>1</sup> in Nahanni National Park Reserve (NNPR). This area is likely home to rare plants or plant communities that may not exist elsewhere. Impacts from the Project on vegetation are more likely to be significant in this area and to include impacts on the ecological integrity of the Park near the road.
- There is uncertainty in the developer's impact predictions and proposed mitigations related to vegetation, including invasive species, due to insufficient baseline data on vegetation, including rare plants and rare plant assemblages.
- Canadian Zinc Corp.'s prediction that all impacts on vegetation will be reversible depends on prevention of permafrost thaw and appropriate reclamation; if permafrost thaw occurs or reclamation is ineffective, there will be significant impacts on vegetation and the ecological integrity of NNPR.

The Review Board finds that the likely significant adverse impacts on vegetation can be successfully avoided through robust baseline, mitigation, monitoring, and adaptive management measures.

### *Organization of this chapter*

In Section 11.1 below, the Review Board has provided readers with a more thorough and detailed summary of the evidence than it has in other environmental assessments. This is intended to allow readers to see firsthand the range and degree of uncertainties identified throughout the environmental assessment. These uncertainties present a particular

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<sup>1</sup> an area that did not have glaciers during the most recent ice age

challenge to impact predictions and decision making<sup>2</sup>, and are a relevant part of the Review Board's consideration of the evidence in this section.

In Section 11.2, the Review Board presents its analysis and conclusions in relation to impacts on vegetation. The Review Board's recommended mitigation measures are outlined in Section 11.3.

### **11.1 Evidence from parties and the developer**

Based on discussions during the scoping phase, vegetation was identified by the Review Board as a subject of note in the *Terms of Reference* (ToR) for this environmental assessment (EA) (PR#42 p32). The ToR provided guidance to Canadian Zinc Corp. (CanZinc or the developer) on which potential impacts to assess, including pathways of impacts and impacts on specific vegetation components such as rare plant species and rare plant assemblages.

The Review Board also identified aspects of vegetation within two of the key lines of inquiry: traditional harvesting and traditionally-harvested species, and impacts on NNPR. Traditional harvesting and traditionally-harvested species included consideration of harvesting traditional plants, such as berries and medicinal plants (PR#42 p25), and impacts on NNPR included consideration of invasive species (PR#42 p27). Evidence and analysis related to traditionally-harvested plants and invasive species are included in this section.

This section summarizes the evidence on the public record presented by the developer in its Developer's Assessment Report (DAR) and DAR addendum, as well as evidence from parties and the developer from technical sessions, information requests (IRs), and the hearing phase (technical reports, hearings, and closing arguments). The evidence related to impacts on vegetation includes consideration of impact pathways from the Project on vegetation, including rare plants and rare plant assemblages, and traditionally harvested species.

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<sup>2</sup> See Chapter 4 for further discussion.

### 11.1.1 Baseline information

In its DAR and DAR addendum, CanZinc provided baseline information from previous desktop and field studies. CanZinc indicated that it used baseline work from the 1980s, 1990s, 2009, and 2010 (PR#55 p114; PR#121 p54; PR#102 p61). Parks Canada expressed concern over the limited 1980s surveys that included only 14 transects, and also indicated that between natural and climate change impacts, conditions may have changed since that time (PR#186 p28). The 2009 and 2010 rare plant surveys included eight days of work for the mine and winter road EA (EA0809-002), including on the winter road alignment, on the Polje pass realignment, within the waste rock storage facility at the mine, and around the mine camp and beaver pond (PR#186 p29). CanZinc also completed vegetation mapping using Earth Observation for Sustainable Development of Forests vegetation classification data for the Northwest Territories (PR#55 p114; PR#121 p54; PR#102 p61).

In its DAR, CanZinc identified sixteen vascular plants, one lichen, and thirteen bryophyte species that the NWT General Status Ranking Program considers 'may be at risk' and that have been previously identified within 50 kilometres of the Project (PR#55 p115). Three of these species (Nahanni aster, Raup's willow, and Velenovsky's hilpertia moss) are also listed as globally critically imperiled (PR#55 p116). The Committee on the Status of Endangered Wildlife in Canada<sup>3</sup> also identifies the Nahanni aster (*Symphyotrichum nahanniense*) (Figure 11-1) as being of Special Concern. The field studies described above did not identify any listed rare plant species (PR#55 p117).



**Figure 11-1: Nahanni aster**  
(PR#505 p4)

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<sup>3</sup> A description of the Committee on the Status of Endangered Wildlife in Canada is provided in Section 6.1.12.



On several occasions during the scoping and analytical phases, Parks Canada, Government of Northwest Territories (GNWT), and Canadian Parks and Wilderness Society (CPAWS) requested additional baseline field work, including for rare plants and rare plant assemblages (PR#33 pA1-17; PR#33 pA1-17; PR#230 p228). One of Parks Canada's concerns was that the vegetation data from the 1980s used was out of date and specific to the old winter road alignment (PR#200 p31).

For rare plants, Parks Canada was also concerned about the developer's lack of focus on high potential areas, rare plant assemblages, and field survey timing and repetition (PR#200 p31). During the technical sessions, Parks Canada indicated that "...with these unknowns, it's difficult at this stage to determine if there are potential significant impacts, or what appropriate mitigations would be" (PR#232 p17).

Discussions at the technical sessions led to an undertaking (#11) to provide a map of unglaciated terrain crossed by the Project (PR#250 p1; PR#282 PDF p7) and several days of field work by CanZinc in July 2016 (PR#289). On September 30, 2016, Parks Canada submitted a letter to the Review Board expressing ongoing concerns over inadequate baseline information, including vegetation baseline, that Parks Canada considered "necessary to allow full examination of the potential for significant adverse effects" (PR#308 p1). Parks Canada's outstanding concerns related to rare plants included that (PR#308 p7):

- rare plants or rare plant assemblage potential was not assessed to identify high potential areas for field surveys;
- rare plant surveys were limited geographically;
- rare plant surveys were not completed between or within growing seasons; and
- rare and valued plant assemblages were not identified or described.

Parks Canada's letter requested a desktop survey of rare plant and rare plant assemblage potential, to be followed by field surveys of high potential areas following the Alberta Native Plant Council guidelines (PR#308 p9). CanZinc responded that there is sufficient information to assess potential impacts, and that CanZinc should be allowed to address remaining baseline gaps prior to construction (PR#317 p1). Later, in response to a Review Board IR, CanZinc committed to complete an early season rare plant survey prior to construction and to develop a rare plant management plan (PR#320 p22).

In its technical report, Parks Canada stated that even though CanZinc has agreed there are data gaps and committed to additional surveys, Parks Canada remains concerned over the

timing and details of the surveys (PR452 p24). Parks Canada recommended two measures in its technical report (PR#452 p26; Appendix D, Parks Canada recommendations #9 and #10).

Parks Canada's recommendation #9 concerned the collection of additional baseline information, and included details on survey methods and locations (PR#452 p26). Parks Canada concluded that baseline work should begin prior to construction of the road, including winter road construction. In particular, Parks Canada would like fine-scale field assessment in representative habitats and high priority areas for rare, valued, or protected plants and plant assemblages (for example, areas highly sensitive to disturbance, microhabitats, or uncommon plant communities). Parks Canada considers rare and valued plant assemblages to include locally-significant communities, which could be uncommon or on the edge of their range, and could be small-patch communities that greatly increase biodiversity.

Parks Canada's recommendation #10 was for CanZinc to complete an updated effects assessment once the baseline information from recommendation #9 is collected (PR#452 p26). Parks Canada discussed how potential impacts could occur from direct or indirect impacts from Project components including right-of-way clearing, construction of the roadbed, traffic, spills, and reclamation. It stated that because of the information gaps, the impacts of these pathways (and the effectiveness of proposed mitigations) are difficult to assess. Parks Canada stated that potential mitigation after a review of more complete baseline information could include re-routing sections to accommodate setbacks. Parks Canada further stated that Measures 9 and 10 are necessary because there is currently not enough information to make a significance determination for impacts on vegetation.

In response to Parks Canada's technical report and recommendation #9 (additional baseline work), CanZinc pointed out that it completed rare plant surveys in 2009, 2010, and 2016 and no currently-listed federal or territorial species were identified (PR#484 p13). CanZinc stated that it has already committed to completing an early season rare plant survey in mid-June, prior to construction, in order to address this information gap. CanZinc disagreed with Parks Canada's conclusion that it must complete the work prior to permitting, and argued that because it has not found any rare plants to date, there is enough information to determine that the potential for significance is low.

In response to Parks Canada's recommendation #10 (updated effects assessment), CanZinc indicated it believes that an updated effects assessment will not be appropriate because the

EA will be complete at that time (PR#484 p14). Instead, CanZinc suggested that the field work findings should inform adaptive management and additional mitigation, if necessary.

At the public hearing, Board member Bertha Norwegian asked if Parks Canada is still concerned about vegetation, and Parks Canada replied that it is concerned about impacts on rare and protected species and plant assemblages, which is why it has identified baseline gaps and recommended more baseline information be collected (PR#525 p195). Ms. Norwegian also asked what baseline work Parks Canada has completed for the area, to which Parks Canada replied that the proposed road is within the 2009 Park expansion area, where no fieldwork has been completed.

At the public hearings, Board staff asked Parks Canada about the timing of its recommendation #10 for an updated effects assessment (PR#525 p179). Parks Canada stated that information from CanZinc's early season rare plant survey could be used to update the effects assessment and identify additional mitigation. Parks Canada would like this updated effects assessment to inform the permitting phase.

In its presentation at the public hearing, Liidlii Kué First Nation (LKFN) expressed concerns regarding vegetation and recommended baseline studies on vegetation, rare plants, and invasive species prior to permitting (PR#528 p237). In its closing arguments, LKFN stated that it believes more evidence is required to assess significant adverse impacts on vegetation (PR#550 p3). LKFN indicated that it believes there is potential for the Project to have significant impacts on rare, valued, and protected plants and plant assemblages. In its closing arguments, LKFN recommendation #7 stated that it "...supports Parks Canada's recommendations as outlined in their report" (PR#550 p3; Appendix D, LKFN recommendation #7).

In its closing arguments, Parks Canada restated that it believes there are potential significant adverse impacts from the Project on vegetation, but that there is not enough information for Parks Canada to determine the likelihood of these impacts (PR#546 p9). Parks Canada indicated that it supports CanZinc's commitment to complete an early season rare plant survey, but noted that some of Parks Canada's concerns are not included in the commitment, namely:

- the survey method;
- a timeline for baseline data collection;
- an updated effects assessment following baseline data collection; and
- an adaptive management framework within the rare plant management plan.

Parks Canada noted that the rare plant management plan was not included in CanZinc's table of plans, but that Parks Canada's recommendation #10 (the updated effects assessment) would contribute to developing mitigation, thresholds, and triggers in the rare plant management plan (PR#546 p9). Parks Canada requested its recommendations #9 and #10 to be added to CanZinc's commitments table, and if not, for the Review Board to include them as measures "...in order to mitigate potential significant adverse impacts to vegetation" (PR#546 p9; Appendix D, Parks Canada recommendations #9 and #10).

In response to parties' closing arguments, CanZinc reiterated that it believes the potential for significant adverse impacts on vegetation and rare plants is low (PR#553 PDF p12). CanZinc did not provide any response to LKFN's recommendations, but indicated it has agreed to complete an early season rare plant survey with Parks Canada in June 2017 to address Parks Canada's recommendation #9.

CanZinc indicated it will not commit to Parks Canada's recommendation #10 as written, but will commit to using the baseline survey data for adaptive management and identifying additional mitigation if necessary (Appendix C, commitment #147) (PR#553 PDF p12). CanZinc indicated it believes there will be no significant impacts on vegetation and that no measures are required.

### **11.1.2 Project interactions and impact predictions**

CanZinc and parties identified a variety of potential pathways for impacts on vegetation (including rare plants, rare plant assemblages, and merchantable timber) through the course of the EA. Based on the TOR, DAR, DAR addendum, and other information on the record, the following pathways are included in the sections below (PR#42; PR#55; PR#102):

- vegetation clearing;
- fires<sup>4</sup>;
- vegetation contamination;
- dust;

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<sup>4</sup> This was not a major topic of discussion with regard to the Project's impacts on vegetation and is not discussed in this chapter. CanZinc predicted that adverse impacts from fire on vegetation will have moderate duration, and low magnitude, geographical extent, frequency, reversibility, and certainty ( PR#102 p235). CanZinc predicted low significance.

- air emissions<sup>5</sup>;
- changes to soil, hydrological, or permafrost regimes;
- invasive species; and
- re-establishment of vegetation.

These topics are discussed in the sections below (aside from the footnoted exceptions).

Table 11-1 and Table 11-2, based on Appendix E of CanZinc’s DAR Addendum, present CanZinc’s definitions of effects assessment criteria and significance (PR#102 p12). These definitions are relevant for CanZinc’s impact predictions summarized in the sections below.

**Table 11-1: Assessment of effects criteria for vegetation<sup>6</sup>**

<b>Criterion (of effect)</b>	<b>Low</b>	<b>Moderate</b>	<b>High</b>
Direction and magnitude	Change is above baseline conditions but within thresholds and within likely range of natural variability	Change is substantially above baseline conditions but within thresholds and within likely range of natural variability	Change exceeds baseline conditions and causes changes beyond the range of natural variability
Geographic extent	Area of effect does not extend past the footprint of the project	Area of effect extends beyond the project footprint but not of regional or territorial consequence	Area of effect is likely to extend into the region or be of territorial consequence
Duration	Effect is only evident during the construction or startup phase	Effect is evident during construction, operation, and reclamation phases	Effect extends beyond the operational life and reclamation of the road
Frequency	Factors causing the effect occur infrequently	Factors causing the effect occur at regular intervals but infrequently	Factors causing the effects occur regularly and frequently
Reversibility	Effect is readily reversible over a short period of time (i.e., one season)	Effect is reversible over the life of the road	Effect is not reversible even after road closure and reclamation

<sup>5</sup> Not a major topic of discussion with regard to the Project’s impacts on vegetation and not discussed in this chapter. CanZinc predicted that adverse impacts from air emissions during construction and operation will be , high certainty, low magnitude and reversibility, and moderate geographic extent, duration, and frequency (PR#102 p237). CanZinc predicted low significance.

<sup>6</sup> (PR#102 p12)

Certainty	Unlikely to occur	Could reasonably be expected to occur	Will occur, or is likely to occur
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**Table 11-2: Significance criteria for vegetation<sup>7</sup>**

<b>Overall Significance</b>	Low	The effect is expected to be of low significance and further assessment and/or specific management are likely not required.
	Moderate	The effect is expected to be of moderate significance and specific management measures or plans are necessary.
	High	The effect is expected to be of high significance and further study or monitoring is necessary to supplement the baseline data, and to be used for refining a management strategy and planning.

### 11.1.3 Impacts from invasive species

In its DAR, CanZinc identified the introduction of invasive species as a potential impact because invasive species can establish and spread quickly and out-compete native vegetation, thereby affecting vegetation community composition or distribution (PR#55 p218). CanZinc noted that exposed soil and equipment transporting seeds (for example, by carrying soil from other locations) can create ideal conditions for the spread of invasive species.

CanZinc concluded that there are no invasive species present on the All Season Road alignment based on a 2010 survey of 24 sampling locations along of the Permitted Winter Road, mostly west of Polje Pass (PR#231 p5). In its DAR, CanZinc recommended the development of an invasive species management plan and suggested that revegetation by natural encroachment could help avoid the spread of invasive species through seed mixtures (PR#55 p219; PR#186 PDF p45). In Appendix E of its DAR Addendum, CanZinc predicted that adverse impacts of invasive species during construction and operation will be moderate duration and frequency, and low magnitude, geographic extent, reversibility, and certainty (PR#102 p241). CanZinc predicted low significance.

The draft invasive species management framework CanZinc provided included the basic strategies of prevention, detection, control, and restoration (PR#186 PDF p44). In the framework, CanZinc included a list of exotic or alien species in the territory, but also noted that not all of these species are aggressive and need to be controlled. In response to a round

<sup>7</sup> (PR#102 p12)

one IR from Parks Canada, CanZinc stated that "[t]he invasive species management plan will be developed in consultation with applicable stakeholders to ensure proposed mitigation efforts comply with existing regulations which may potentially limit the application of specific invasive species control measures (e.g., use of herbicides in National Parks or prescribed burns)" (PR#186 PDF p45). In response to an IR from the GNWT, CanZinc also indicated that it will consider a washing station for vehicles heading to the mine from Highway 7 (PR#200 p39).

In its hearing presentation, LKFN expressed concerns regarding invasive species, and recommended baseline studies and the assessment of impacts of invasive species on riparian habitat (PR#528 p237). In response to a question from LKFN at the public hearing, the GNWT agreed to an undertaking (#8) to describe current invasive species protection measures and identify who is responsible for invasive species control (PR#525 p222).

GNWT's response to the undertaking explained that there are no GNWT policies or legislation in place to control invasive plant species (PR#540 p2). GNWT does work to develop capacity and increase knowledge about invasive species, but relies on members of the public for identifying and monitoring invasive species. The GNWT also has a database of invasive species in the Northwest Territories. GNWT further indicated that it expects the developer will be responsible for monitoring and mitigating impacts on vegetation related to the Project, including impacts from invasive species (PR#540 p2). In response to questioning at the public hearing, CanZinc agreed as an undertaking (#4) to describe how it will determine which invasive species need to be controlled (PR#525 p80). In its response to undertaking #4, CanZinc stated that invasive species control is species dependent and will be influenced by the health of the surrounding vegetation community, the degree and method of dispersal, how competitive the species is, and the control measures available (PR#539 p2). If invasive species are detected, CanZinc will consult GNWT or Parks Canada (depending on location), with input from First Nations.

In closing arguments, LKFN indicated it believes there are potential significant adverse impacts from invasive species and recommended to the Review Board that baseline studies on vegetation be conducted, including an assessment of significant adverse impacts from invasive species on riparian habitat (PR#550 p3; Appendix D LKFN recommendation #8). CanZinc did not respond to LKFN's recommendation #8 (PR#553).

In its closing argument, regarding the location of a wheel washing station, CanZinc indicated that although there may be a slight increased potential of invasive species being present on the south side of the Liard crossing, it does not believe the risk of invasive



species spread will be different based on its location on the north or south of the crossing (PR#553 PDF p4). CanZinc explained that the wheel-wash station will be located on gravel and that invasive species will have trouble growing there and indicated that the wheel wash station is more likely to be located on the north side of the Liard crossing.

#### **11.1.4 Impacts from clearing vegetation**

In its DAR, CanZinc described impacts from vegetation clearing as limited to the Project footprint, expected to occur only once (i.e. during construction), and reversible following decommissioning and reclamation (PR#55 p258). In Appendix E of its DAR Addendum (PR#102 p234), CanZinc concluded that the impacts of land clearing are low because: the right of way largely follows the Permitted Winter Road, borrow material will be taken from the right of way as much as possible, the realignment has shortened the road and avoids wetlands and karst features. In its effects assessment for vegetation clearing during construction and operations, CanZinc identified adverse impacts with high certainty and low magnitude, geographic extent, duration, frequency, and reversibility. CanZinc predicted low significance.

In its DAR, CanZinc indicated that road construction in numerous locations along the alignment will require overland construction techniques such as corduroy construction, which uses logs under the road to increase stability in wet or permafrost areas (PR#55 p27). CanZinc concluded that a low volume of merchantable timber leftover after construction will be available to the local community (PR#55 p260). In Appendix E of its DAR Addendum, CanZinc predicted that adverse impacts on merchantable timber during construction and operation have high certainty, and low magnitude, geographical extent, duration, frequency, and reversibility (PR#102 p235). CanZinc predicted low significance.

#### **11.1.5 Impacts on traditionally-harvested plants**

In the DAR, CanZinc briefly discussed the uses of harvested plants by Nahanni Butte and completed an effects assessment on landscape changes and habitat loss that could affect traditionally-harvested species, with a focus on berries and medicinal plants (PR#55 p181). Nahanni Butte participants reiterated the importance of berries and collecting medicine at the Nahanni Butte cultural technical session in June 2016 (PR#275 p8, 11). In the DAR, CanZinc predicted that direct, negative impacts will occur due to the removal of surface vegetation for the Project footprint, including the new Project right-of-way and borrow areas (PR#55 p182). CanZinc predicted that direct Project impacts on traditionally-harvested plants would be reversible and of low significance.

CanZinc also identified potential indirect impacts on traditionally-harvested plants from road dust, spills, and invasive species (PR#55 p182). Road dust and spills (of mineral concentrates and diesel fuel) have the potential to alter physical and chemical properties of vegetation communities, which can lead to changes in plant health or vegetation community composition. Invasive species can also alter vegetation community composition and out-compete native vegetation. CanZinc predicted that the extent, magnitude, duration, and frequency of indirect impacts on traditionally-harvested plants to be moderate and reversible, and, with mitigation in place, of low significance.<sup>8</sup>

CanZinc identified the following mitigation (PR#55 p182):

- dust suppression
- Spill Management Plan
- industry standard fuel storage facilities
- industry standard haul containers with appropriate spill containment and management
- Invasive Species Management Plan

#### **11.1.6 Impacts on rare plants and rare plant assemblages**

In its DAR and DAR Addendum, CanZinc predicted that adverse impacts on rare plants would occur during both construction and operations with high certainty, moderate reversibility, and low magnitude, geographic extent, duration, and frequency (PR#55 p263; PR#102 p239). This was based on the rare plant baseline data from the previous assessment of the mine and winter road (EA0809-002) and assuming that mitigation for dust, spills, and invasive species will be effective. CanZinc predicted low significance.

Parties raised concerns regarding insufficient baseline information for rare plants on numerous occasions during the course of the EA, as discussed above in Section 11.1.1. Parks Canada expressed concerns about reliance on data from the 1980s and limited surveys in 2009 and 2010 which did not consider rare, valued, protected, or designated plant assemblages and did not consider rare plant potential to target high potential areas

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<sup>8</sup> CanZinc assumed that present contaminant levels are low and that berries cannot store contaminants but may have trace levels of heavy metals that occur naturally (PR#102 p156). CanZinc also provided an overall table of impacts on harvested plants in its DAR addendum (PR#102 p239).

(PR#200 p31). CanZinc noted, following the 2016 field surveys, that surveys were too late for early season rare plant identification and recommended an early season rare plant survey prior to construction (PR#289 p20). In response to a Review Board IR, CanZinc committed to completing an early season rare plant survey prior to construction and to developing a rare plant management plan (PR#320 p22).

### **11.1.7 Impacts on soil, hydrological, and permafrost regimes**

In its DAR, CanZinc acknowledged that the removal of vegetation, and other Project activities, can result in permafrost thaw, which can lead to sediment movement, landslides, and subsidence (PR#55 p242).<sup>9</sup> CanZinc pointed out that thawing permafrost, whatever its cause, can affect vegetation communities by altering the landscape, drainage patterns, moisture and nutrient regimes, and soil characteristics. CanZinc indicated that it will follow industry best standard construction practices. In Appendix E of its DAR Addendum, CanZinc predicted that adverse impacts on soil, hydrological, and permafrost regimes during construction and operations will be low in magnitude, geographic extent, duration, frequency, reversibility, and certainty, and of low ( PR#102 p243) significance.

In the first round of IRs, Parks Canada stated that there is a “high likelihood of permafrost degradation along the all season road in areas with ice-rich permafrost, which is challenging to mitigate, and the ecological impacts are likely to be persistent... yet in the DAR the significance of effects on the ability of habitat to recover is expected to be low...” (PR#200 p5). Parks Canada expressed concern about the potential impacts of permafrost thaw or other changes to drainage patterns on vegetation communities (PR#230 p114). In particular, Parks Canada pointed out that changes to permafrost have the potential to lead to persistent changes in vegetation communities and to ecosystem structure and function (PR#230 p114). Parks Canada also had questions about culvert and permafrost locations and mitigations along the road. For more evidence and analysis related to permafrost and surface water drainage, see chapters 12 and 8, respectively.

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<sup>9</sup> See Chapter 12 for more discussion about permafrost.

### 11.1.8 Impacts from dust and concentrate contamination

#### **Concentrate hauling**

In its DAR, the developer stated that, small and continuous loss of concentrate has the potential to contaminate soil, vegetation, water, and aquatic life along the road (PR#55 p191). Vegetation contamination has the potential to affect the health of plants and their suitability for consumption by people and animals.<sup>10</sup> To minimize contamination and address these potential impacts, CanZinc indicated it will transport concentrate in sealed bags with clean exteriors or in containerized trailers, and that truck wheels will be washed prior to departure (PR#55 p191, 204). CanZinc developed a draft Contaminant Loading and Management Plan for the Permitted Winter Road that includes gathering baseline data and monitoring along the road bed (PR#55 p192). CanZinc also indicated that the appropriate time to sample vegetation baseline contaminant levels would be prior to the start of hauling, rather than prior to construction (PR#200 p30).

At technical sessions, Environment and Climate Change Canada (ECCC) expressed concern about contaminant dispersal along the haul road, which has happened at similar mines, but indicated that with proper mitigation, significant impacts can be avoided (PR#240 p26). After the technical sessions undertakings, CanZinc committed to updating the Contaminant Loading Management Plan to include both mining and road operations, as well as soil sampling, snow sampling, dustfall, and ambient dust monitoring (PR#282 PDF p2).

In its technical report<sup>11</sup>, ECCC offered five recommendations to the Review Board in relation to mitigating contamination from concentrate dust (PR#448 p14; Appendix D, ECCC recommendations #4.1-4.5). The recommendations included identifying and implementing mitigation approaches at the mine and along the road, describing the monitoring program, describing trigger and action levels, describing adaptive management if triggers or action levels are exceeded, and monitoring of annual soil, snow, dustfall, and ambient dust in the Contaminant Loading Management Plan.

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<sup>10</sup> Contamination of vegetation from concentrate dust as a result of hauling is also discussed in 11.1.5 under traditionally harvested plants

<sup>11</sup> ECCC had also raised concerns during the technical analysis phase.

In its closing arguments, ECCC explained that CanZinc's response to technical reports had addressed the first (mitigation) and last (annual monitoring) of its recommendations, but had not described the monitoring program, trigger or actions levels, and adaptive management (PR#544 p4). ECCC reiterated the importance of monitoring, trigger or action levels, and adaptive management, but concluded that these issues can be addressed during the regulatory phase.

In response to ECCC's closing arguments, CanZinc indicated that it will commit to providing a description of a monitoring program, trigger or action levels, and adaptive management plans in its Contaminant Loading Management Plan (Appendix C, commitment #213),

In its closing arguments, DFN discussed concerns over the transportation of concentrate and confusion over how CanZinc intends to transport these materials (PR#549 p9). DFN recommended that the Review Board specify that CanZinc can only transport lead and zinc concentrate by double containment within a container or in a hydraulic haulage fleet with covers and solid sides (Appendix D, DFN recommendation #3). At the public hearings, CanZinc had described that it will transport concentrate either in bags in truck boxes with lids, or in bulk in lockable trailers (PR#513 p20).

### **Dust**

CanZinc also identified that dust deposition from Project construction and operations could affect plants (PR#55 p261). CanZinc pointed out that moss and lichen species tend to be more sensitive to dust impacts. CanZinc expected the majority of dust to settle within 10 metres of the road, and suggested that snowmelt and rainfall will help remove dust from plants. CanZinc stated it will use dust suppression techniques and limit road speeds to reduce dust levels (PR#55 p262). In response to an IR, the developer stated that it expects dust from construction to be lower than dust during operations, which is why the assessment was focused on operations (PR#200 p36). In Appendix E of its DAR Addendum, CanZinc explained that contaminant monitoring will also assist by measuring dust from concentrate hauling (PR#102 p238).

#### **11.1.9 Monitoring and field work**

In its closing arguments, LKFN made two recommendations to the Review Board regarding involvement in baseline studies and monitoring impacts on vegetation. Recommendation #9 stated that "LKFN further recommends that the Board require a measure for an ongoing monitoring of vegetation and impacts to vegetation in the area of final alignment during construction and operations" (PR#550 p3). Recommendation #10 requests that the Board

“recommend that First Nations, including LKFN, be involved in the above studies and monitoring of the vegetation” (PR#550 p3)<sup>12</sup>. CanZinc did not respond to LKFN’s recommendations #9 and #10 (PR#553).

#### **11.1.10 Revegetation and reclamation**

In its DAR, CanZinc indicated that revegetation would occur through natural encroachment by the surrounding native vegetation (PR#55 p267). In response to an IR from DFN, CanZinc indicated that it expects some sections to take 20-30 years to revegetate, and other sections even longer (PR#200 p5). Golder Associates’ 2013 Archaeology Report refers to a cutline from the early 1960s that is still visible (PR#195 p11). CanZinc’s invasive and rare plant survey report from 2011 states that (PR#232 p5):

[t]he entire access road has been re-colonized by vegetation from adjacent plant communities. The success of the revegetation is due, to a large extent, to the fact that the organic layer was never compromised (i.e. not scraped off) during initial road construction, except in a few locations.

In response to information requests, CanZinc stated that “revegetation will take many years because of the short growing season, but will occur eventually” and that “[t]he road footprint is not dissimilar to adjacent slopes” (PR#188 pdf p155). Moreover, the developer suggested that “in the longer term we would expect the pre-disturbance assemblage to completely return” (PR#188 pdf p 158). In contrast, Parks Canada, in one of its IRs regarding reclamation of borrow pits, stated that (PR#200 p16; PR#192):

Given low rates of re-establishment through natural re-vegetation processes, active restoration practices are required in addition to re-establishing flow paths. By contrast, CZN has proposed using passive natural re-vegetation, with roughening of and scarifying compacted surfaces to promote natural re-vegetation.

Parks Canada also stated that along the Permitted Winter Road (PR#200 p5): “[t]he outcomes of natural revegetation were highly variable by terrain type, and were likely influenced by construction practices. Natural revegetation has been very limited along sections of the road in the alpine.” Figure 11-2 shows revegetation on the Ram Plateau.

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<sup>12</sup> For more on involvement of parties in monitoring, see Chapter 15.





**Figure 11-2: Revegetation of the Permitted Winter Road on the Ram Plateau (PR#188 PDF p158).**

As discussed above<sup>13</sup>, Parks Canada pointed out that permafrost degradation can be challenging to mitigate and can lead to persistent impacts on vegetation, while CanZinc predicted low significance and no residual impacts in the DAR (PR#200 p5). During discussions at the technical session, Parks Canada pointed out examples where the

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<sup>13</sup> And in Chapter 12: Permafrost. (In addition, restoration and revegetation are also discussed under closure and reclamation in Chapter 14)



hydrological and vegetative regimes changed from black spruce bog to sedge wetlands, as a result of permafrost degradation (PR#282 PDF p4).

In response to technical session undertaking #2<sup>14</sup>, Parks Canada and CanZinc discussed the relationship between permafrost thaw and changes in hydrology and vegetation, as well as the implications for reclamation. The developer followed up on the undertaking by stating that a report with field study results would be forthcoming (PR#298) and would be integrated into the closure and reclamation plan. CanZinc also acknowledged that in fen communities, the Permitted Winter Road footprint lacked shrub cover and seemed wetter than adjacent areas, while in spruce muskeg/poor fen/spruce bog communities, tree cover was lacking.

As a result of the undertaking, Parks Canada and the developer agreed that overlaying areas with permafrost potential on the existing vegetation mapping would be a useful preliminary step for identifying areas where vegetation may be susceptible to a change in hydrology due to permafrost thaw (most significantly black spruce bogs) (PR#262; PR#282 PDF p6). Parks Canada pointed out that this is a first step that must be followed by ground-truthing and follow-up surveys (PR#282 PDF p6).

In its technical report, Parks Canada expressed concern that CanZinc has not provided sufficient rationale for reclamation plans and that they contain no measurable targets, timelines, or adaptive management (PR#452 p53). Parks Canada indicated it does not consider the revegetation of the Permitted Winter Road comparable, because it did not involve placing and compacting fill. Parks Canada recommended that the Review Board impose measure #33 regarding reclamation and revegetation (PR#452 p56; Appendix D, Parks Canada recommendation #33). Parks Canada proposed revegetation techniques that it considers more appropriate for the Project, including plant salvage and transplant, and collecting and sowing local seeds.

In response to Parks Canada's technical report and its recommendation #33, CanZinc responded that it believes one detailed reclamation plan can address all vegetation and terrain types (PR#484 p24). CanZinc agreed to rip and roughen surfaces, but indicated that

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<sup>14</sup> The undertaking stated: "Parks and CanZinc will discuss need for additional assessment of ecosystems that will be disturbed so as to tailor reclamation approaches (and potentially further examination of potentially permanent impacts e.g., those associated with permafrost degradation) and report to the Board" (PR#250 p1).

the remaining requirements are over-prescriptive and unnecessary. CanZinc stated that it prefers to revegetate by natural encroachment, supported by available local seed and cuttings, to avoid introduction of non-native seed. CanZinc indicated it would update the draft reclamation plan prior to construction, and immediately after. At the public hearing, CanZinc reiterated its intention to revegetate by natural encroachment, but also said it will consider using seed (PR#528 p21). CanZinc argued that the potential for significant impacts on vegetation is low.

In its closing arguments, Parks Canada acknowledged CanZinc's commitments, but cautioned that natural encroachment is only one method of many, and that it will not be effective for all vegetation or terrain (PR#546 p20). As such, "Parks Canada requests that CZN modify past commitments to reflect their more recent commitment that is consistent with PC's measure 33" (PR#546 p20; Appendix D, Parks Canada recommendation #33). Parks Canada indicated that recommendation #33 will be relevant to the road closure and reclamation plan, and that significant adverse impacts can be mitigated if this measure and all commitments are implemented.

In response to Parks Canada's closing arguments, CanZinc updated commitments #64 and #68 (Appendix C) to include revegetation by natural encroachment, supplemented by local seed and cuttings (PR#553 PDF p16).

## **11.2 Review Board analysis and conclusions**

### **11.2.1 Summary of Review Board findings**

The Review Board finds that the Prairie Creek All Season Road Project (All Season Road or the Project) will likely cause significant adverse impacts on vegetation. The Review Board's reasons for this determination are as follows:

- The road passes through unique karst terrain and a glacial refugium<sup>15</sup> in Nahanni National Park Reserve (NNPR). This area is likely home to rare plants or plant communities that may not exist elsewhere. Impacts from the Project on vegetation are more likely to be significant in this area and to include impacts on the ecological integrity of the Park near the road.

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<sup>15</sup> an area that did not have glaciers during the most recent ice age

- There is uncertainty in the developer's impact predictions and proposed mitigations related to vegetation, including invasive species, due to insufficient baseline data on vegetation, including rare plants and rare plant assemblages.
- Canadian Zinc Corp.'s prediction that all impacts on vegetation will be reversible depends on prevention of permafrost thaw and appropriate reclamation; if permafrost thaw occurs or reclamation is ineffective, there will be significant impacts on vegetation and the ecological integrity of NNPR.

The Review Board finds that the likely significant adverse impacts on vegetation can be successfully avoided through robust baseline, mitigation, monitoring, and adaptive management measures. The following sections describe the Review Board's analysis, conclusions, two measures, and three suggestions.

### **11.2.2 Ecological integrity and high potential for rare plants and rare plant assemblages**

The Review Board notes that the Project crosses approximately 65 kilometres of a glacial refugium (PR#282 PDF p24). Glacial refugia are typically home to species or communities that do not exist elsewhere. In addition, the road is adjacent to karst landform features which Parks Canada has indicated have a high potential for rare, valued, and protected plants (PR#525 p168; PR#546 p9). These characteristics are unique and contribute to the importance and ecological integrity of NNPR<sup>16</sup>.

In the Board's view, the Project is likely to have significant adverse impacts on the ecological integrity of NNPR from changes to vegetation, including impacts on rare plants and rare plant assemblages or from the spread of invasive species, as described above. Vegetation species and communities provide valuable wildlife habitat and influence surface drainage patterns and permafrost. Changes to vegetation would ultimately affect multiple valued components, including the NNPR. The likely presence of unique species or communities combined with the importance of the ecological integrity of NNPR support the Review Board's conclusions that measures are required to mitigate significant adverse impacts on vegetation.

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<sup>16</sup> The ecological integrity of Nahanni National Park Reserve is described in Chapter 4.

### 11.2.3 Uncertainty of impacts on vegetation due to insufficient baseline

CanZinc predicted that impacts on vegetation, including rare plants, would be low in significance based on data collected during previous assessments for the mine and Permitted Winter Road (PR#55 p258-266; PR#102 p233-243). Throughout this EA parties, particularly Parks Canada, expressed concern over the amount and quality of vegetation baseline data available (PR#33; PR#200; PR#230; PR#308; PR#452; PR#546; PR#550; Section 11.1.1). The Review Board heard that these concerns were related to: the use of vegetation data from the 1980s, the use of surveys that focused on the Permitted Winter Road alignment<sup>17</sup> (PR#186 p28), the lack of focus on high potential rare plant and rare plant assemblage areas (PR#200 p31; PR#308 p7), and the timing and repetition of field surveys (PR#200 p31; PR#452 p26). Parks Canada and LKFN were particularly concerned about rare plant species and rare plant assemblages.

CanZinc completed several days of additional baseline work in July 2016 (PR#289). However, Parks Canada submitted a letter to the Review Board in September 2016 that outlined outstanding concerns regarding inadequate vegetation baseline data (PR#308 p9). These concerns were focused on rare plants and rare plant assemblages, as well as on field survey methods and locations. CanZinc responded that there is sufficient information for the EA and that remaining baseline gaps can be addressed prior to construction (PR#317 p1).

Parks Canada disagreed, and in its technical report recommended that baseline work begin prior to winter road construction, and include desktop surveys and fine-scale field assessments focusing on rare, valued, or protected plants and plant assemblages (PR#452 p26). Parks Canada also indicated that Project components that could affect vegetation include clearing, construction, traffic, spills, and reclamation. Parks Canada stated that (PR#452 p26):

...given the gaps in baseline data and the higher potential for rare species and assemblages in rare terrain types (e.g., karst, glacial refugia) it is difficult to accurately assess potential impacts, and thus difficult to determine if proposed mitigations would effectively limit impacts.

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<sup>17</sup> The Board notes that approximately half of the Project has been realigned and no longer follows the original winter road alignment.

The Review Board agrees that the gaps in baseline information made it difficult to assess impacts and determine the effectiveness of proposed mitigation.

In response to Parks Canada's technical report and recommendations, CanZinc pointed out that it completed rare plant surveys in 2009, 2010, and 2016 and did not identify any currently listed rare or protected species (PR#484 p13). CanZinc also indicated that additional baseline work can be completed after permitting and that the appropriate use of baseline information would be to inform adaptive management and mitigation, rather than to complete a revised effects assessment (PR#484 p14).

In its closing arguments, Parks Canada indicated it supports this early season rare plant survey, but continued to request additional field assessments in areas of high potential for rare plants and rare plant assemblages (PR#525; PR#546). Parks Canada concluded that "...there is insufficient basis for the proponent to conclude that there is a low potential for significant adverse effect, due to lack of baseline information on vegetation, specifically rare plants" (PR#546 p9). Parks Canada concluded that some of its outstanding concerns were survey methods, timelines, the updated effects assessment, and adaptive management within the rare plant management plan. Parks Canada noted that the rare plant management plan was not included in CanZinc's table of plans and that it believes the updated effects assessment requested would inform mitigation and thresholds in the plan. CanZinc agreed that the baseline survey data should inform adaptive management and mitigation options, but that an updated effects assessment is unnecessary (PR#553 PDF p12).

Based on the evidence above, the Review Board concludes that CanZinc's commitments do not resolve Parks Canada's concerns and requests for additional baseline field work outlined in its technical report (PR#452 p26; PR#546 p9; Section 11.1.1). The Review Board also heard from LKFN that it has concerns about significant impacts on rare, valued, and protected plants and plant assemblages, and its recommendation for baseline surveys on vegetation, rare plants, and invasive species prior to permitting (PR#528 p237; PR#550 p3).

In the Review Board's opinion, CanZinc's commitment #147 to complete an early season rare plant survey is a good start on addressing these gaps, but is not sufficient to address parties' concerns. The Review Board agrees with CanZinc that an updated effects assessment is not necessary and that instead any baseline information collected should be used to inform adaptive management and future mitigation.

The Review Board agrees with Parks Canada's conclusion that there is insufficient knowledge of vegetation to assess the likelihood, magnitude, and significance of impacts. The Review Board finds that the methods and extent of the work completed to date have not been sufficient to properly inform mitigation and monitoring to prevent significant impacts on vegetation, including rare plants and rare plant assemblages. The Review Board concludes that CanZinc has not met its burden of proof in this regard.

### ***Rare plant management plan***

During the second round of IRs, CanZinc committed to an early season rare plant survey, as well as a rare plant management plan to address a specific information gap identified by Parks Canada (PR#320 p22; Appendix C commitment #147). However, the Review Board notes that the final language of this commitment was modified in closing arguments to include the language 'as necessary' (Appendix C, commitment #147, emphasis added):

Commitment #147: An early (spring) rare plant survey will be completed prior to construction for the flowering periods of plant families such as Ranunculaceae (buttercups) and Rosaceae (rose), for the all season road project footprint. The resulting data from the vegetation survey will be incorporated into adaptive management plans and may result in further mitigation actions. A rare plant management plan will be developed as necessary.

In the Board's view, if rare plant species are present, they are likely to be affected by Project construction or operations (such as through clearing, maintenance activities, spills and so on), causing significant adverse impacts. The Review Board finds that the rare plant management plan is necessary, even if no rare plants are identified during the field surveys CanZinc will complete prior to construction. In the Board's view, CanZinc must have a management plan in place that considers how it will continue to identify and monitor rare plants during construction and operations. If rare plants or rare plant assemblages are identified at any time, impacts must be mitigated to prevent significant adverse impacts from Project activities. The Review Board notes that adaptive management and potential future mitigation will be a vital part of the rare plant management plan, following the framework outlined in Chapter 4 and Appendix B.

### **11.2.4 Uncertainty of impacts from invasive plant species**

At the public hearing and in its closing arguments, LKFN expressed concern regarding potential significant impacts on invasive species and recommended additional baseline studies (PR#528 p237; PR#550 p3).

The Review Board appreciates that CanZinc provided a draft invasive species management framework that includes adaptive management techniques. These techniques include mitigations to: prevent the establishment of invasive species, detect invasive species through monitoring, control infestations, and restore sites to pre-infestation conditions (PR#186 PDF p44; Appendix C, commitments #144, #145). The Review Board notes that commitment #144 (Appendix C) specifies that mitigation will be implemented to prevent or control the establishment of invasive species off-site, but does not discuss on-site prevention and control. In the Review Board's opinion, on-site control is the first step to preventing off-site establishment. Commitments #144 and #145 are as follows (Appendix C, commitments #144, #145):

Commitment #144: An invasive species management plan will be developed and implemented to ideally prevent, or if necessary, control the establishment of invasive plant species in off-site vegetation communities adjacent to the roadway.

Commitment #145: The Invasive Species Management Plan is adaptive and will evolve as the project evolves and invasive species are, or are not, detected. The four key principles are prevention, detection, control and restoration.

The draft invasive species management framework includes a list of invasive species in the territory, but notes that not all are aggressively invasive and need to be controlled (PR#186 PDF p44). At the hearing, CanZinc indicated that if it finds invasive species, it will consult the GNWT or Parks Canada, with input from First Nations (PR#539 p2). In addition, CanZinc committed to washing the wheels of mine haul vehicles travelling towards the mine (Appendix C, commitment #146), likely on the north side of the Liard river crossing (PR#553 PDF p4).

The Review Board notes that CanZinc relied on a 2010 survey with 24 sampling locations along the All Season Road that confirmed the absence of invasive species (PR#231 p5). Based on the map provided, the Review Board notes that the sampling locations appear to be clustered at limited locations within NNPR (PR#231 PDF p28). The Review Board notes that this survey was limited in geographic extent, was completed for the mine and Permitted Winter Road EA, and did not cover locations with higher probability of invasive species. The Review Board is concerned about the relevance of this data for the effects assessment of invasive species, and, as a result, whether sufficient or appropriate mitigation has been identified by the developer.

In the Review Board's opinion, there is still a high degree of uncertainty about the impacts of invasive species. The Review Board agrees with LKFN that invasive species have the potential to lead to significant impacts on vegetation and that the Project could act as a



corridor and facilitate the spread of invasive species into a relatively undisturbed landscape. Invasive species are of particular concern because of the location of approximately half the Project in NNPR. In the Board's view, if invasive species spread into the Park, it could permanently affect the ecological integrity of NNPR. For this reason, the Review Board finds that preventing the spread of invasive species along the entire All Season Road is important.

In light of these findings, the Review Board believes that measures are necessary to prevent significant adverse impacts resulting from the introduction or spread of invasive species.

#### **11.2.5 Uncertainty about the reversibility of impacts on vegetation**

Irreversible impacts on vegetation are likely to affect the ecological integrity of NNPR. The Review Board notes that in its DAR, CanZinc described all impacts on vegetation as reversible within a short period of time following reclamation and revegetation (PR#55 p258; PR#102 p233). However, the Review Board heard concerns from Parks Canada about the effectiveness of proposed restoration methods and about permanent, long-term impacts on vegetation from permafrost thaw as observed on the Permitted Winter Road (PR#200 p5; PR#452 p53; PR#546 p20). During the technical sessions, Parks Canada continued to question the developer about the permanent changes to vegetation structure and function that may result from permafrost degradation, stating that “[w]e’re concerned that significant impacts on ecological integrity could result from permafrost degradation” (PR#232 p27). For example, according to Parks Canada, restoring drainage in some areas (like black spruce bog) is not possible, and “will result in significant ecosystem changes”.

For more information on permafrost, please see Section 5.1.1 (geohazards) as well as Chapters 12 (permafrost) and 14 (closure and reclamation). The Review Board finds that CanZinc has not provided sufficient evidence to support its conclusions that impacts on vegetation are reversible and will occur within a short period of time, and has therefore not met its burden of proof.

In the Board's view, if revegetation is not effective (because of the technique used or because of permafrost thaw), impacts on vegetation will not be reversible and will cause a significant adverse impact on the ecological integrity of NNPR. The Review Board concludes that the issue of reversibility of impacts on vegetation can be addressed through careful management of permafrost during construction (Chapters 5 and 12; Measures 5.1 and 12.1) and appropriate closure and reclamation (Chapter 14; Suggestion 14-1). An

adequate understanding of the baseline vegetation communities in the area will also be required to inform monitoring, adaptive management, and closure and reclamation.

### **11.2.6 Conclusion**

The All Season Road has the potential to cause adverse impacts on vegetation through Project clearing, changes to hydrology and permafrost, the spread of invasive plant species, and reclamation activities. In the Review Board's opinion, CanZinc has not provided sufficient evidence to support its effects assessment on rare plants, rare plant assemblages, and invasive species. This lack of evidence creates uncertainty and undermines the Board's confidence in impact predictions (including reversibility and significance) and the effectiveness of mitigation as described by CanZinc. Without a more complete understanding of vegetation baseline, including rare plants and rare plant assemblages as well as invasive species, and corresponding mitigation, the Review Board concludes that significant adverse impacts on vegetation are likely. This is particularly relevant within NNPR, where the road crosses a glacial refugium and unique karst terrain which have high potential to support rare plant species or rare plant assemblages and are vulnerable to disturbance by Project activities (such as clearing) and invasive species.

The uncertainty of impact predictions (including the reversibility of impacts) and the effectiveness of proposed mitigations, combined with the potential for serious harm as indicated by parties and the sensitivity of the Project area, leads the Review Board to conclude significant adverse impacts are likely. The Review Board finds that CanZinc has not met its burden of proof<sup>18</sup> and that, in addition to CanZinc's commitments, measures are required to prevent significant impacts on vegetation. Additional baseline work, the rare plant management plan, and invasive species management will reduce the risks of serious harm to vegetation, including rare plants and rare plant assemblages, and prevent likely significant adverse impacts from the Project.<sup>19</sup>

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<sup>18</sup> Burden of proof is described in Chapter 4.

<sup>19</sup> The Board finds that CanZinc's commitments in relation to the Contaminant Loading Management Plan and proposed methods of containment for concentrate transport are, in combination with other commitments and the Review Board's recommended measures, necessary and will be sufficient to prevent significant adverse impacts on vegetation impacts concentrate contamination (described in 11.1.8).

### **11.3 Measures and suggestions**

The following measures are required to prevent significant adverse impacts on vegetation from the Project. In addition, the Review Board has provided three suggestions related to vegetation for regulatory agencies. Additional measures related to the reversibility of impacts on vegetation are set out in Chapter 5 (Human safety), Chapter 12 (Permafrost), and Chapter 14 (Closure and reclamation).

#### **Measure 11-1**

The Review Board acknowledges CanZinc's commitment to complete an early season rare plant survey but believes other surveys are necessary and must follow the guidance provided by Parks Canada. Following the collection of additional baseline information, the developer must identify and implement appropriate mitigation and adaptive management to prevent significant adverse impacts on vegetation in NNPR. This measure is particularly relevant to NNPR because of the presence of a glacial refugium and unique karst terrain within the park boundaries. The Review Board believes mitigation and adaptive management is particularly critical for rare plants and rare plant assemblages, and should be completed through the Rare Plant Management Plan. In order to address the uncertainty regarding baseline information and rare plant management and prevent significant adverse impacts, Measure 11-1 builds on the developer's commitment #147. Note that Suggestion 11-1 encourages Parks Canada to provide additional guidance to CanZinc with regard to rare plant assemblages.

## **Measure 11-1: Rare plant and rare plant assemblage baseline surveys and management in the Nahanni National Park Reserve**

### **11-1, Part 1: Baseline surveys**

In order to inform effective mitigations, adaptive management, and reclamation and to prevent significant adverse impacts on vegetation within Nahanni National Park Reserve, the developer will complete vegetation field surveys focussed on the presence of rare plants and rare plant assemblages prior to ground disturbance or clearing<sup>20</sup> within Nahanni National Park Reserve. Parks Canada will approve the details of these surveys, including timing, seasonality, and methods.

CanZinc will use the results of the baseline surveys to inform the following:

- i. understanding impacts on rare plants and rare plant assemblages;
- ii. identifying appropriate mitigation to prevent significant adverse impacts;
- iii. monitoring and adaptive management; and
- iv. closure and reclamation.

The results of the baseline surveys will be submitted to Parks Canada.

### **11-1, Part 2: Rare Plant Management Plan**

In order to prevent significant adverse impacts on rare plants as a result of construction and operation, CanZinc will develop a Rare Plant Management Plan prior to construction. This plan will include mitigation, monitoring, and adaptive management for rare plants.

- Mitigation: CanZinc will use the information gathered in the surveys required by Measure 11-1 part 1, as well as any other relevant information, to identify appropriate mitigation within the plan to minimize significant adverse impacts on rare plants or rare plant assemblages.
- Effects monitoring: The plan will include details on how rare plants will be

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<sup>20</sup> Timing to be determined in consultation with Parks Canada. These surveys could occur prior to construction of individual sections of road to allow for a phased approach to construction.

identified and monitored during construction and operations activities. The plan will include effects monitoring for any identified rare plants or rare plant assemblages.

- **Adaptive management:** The plan will include the principles of adaptive management outlined in Appendix B. This will include identifying the actions that will be taken if rare plants are identified at any time during construction and operation of the Project.

The Rare Plant Management Plan will be reviewed and approved by Parks Canada prior to construction. The developer will operate in accordance with the approved plan.

### **Measure 11-2**

The Project has the potential to facilitate the spread of invasive plant species along a corridor through a relatively undisturbed region. Monitoring, early detection, and control of invasive species along the entire All Season Road are important to prevent significant adverse impacts on vegetation communities, wildlife habitat, and the ecological integrity of Nahanni National Park Reserve.

There is currently insufficient information on the presence of invasive species in the Project area. Additional information on invasive species is required to inform the development of the Invasive Species Management Plan. The Review Board considers monitoring and early detection key to appropriate mitigation and adaptive management responses to invasive species, and that mitigation must be developed for the entire Project in order to prevent significant adverse impacts. In addition, the Review Board notes that on-site control of invasive species is the first step to preventing off-site establishment.

In order to prevent significant adverse impacts from invasive species on vegetation communities (which also serve as wildlife habitat), Measure 11-2 builds on CanZinc's commitments #144, #145, and #146 related to invasive species management.

## **Measure 11-2: Invasive species management**

### **11-2, Part 1: Introduction**

In order to reduce the likelihood of significant impacts on vegetation through the introduction or spread of invasive species, the developer will survey the right-of-way, mitigate the spread of invasive species, monitor for the presence of invasive species, and incorporate adaptive management, as described in the rest of this measure.

### **11-2, Part 2: Baseline**

CanZinc will survey the entire right-of-way for the presence of invasive species, prior to ground disturbance during construction<sup>21</sup>, focussing on areas with higher likelihood for the establishment of invasive species. CanZinc will use the results of the surveys to inform Parts 3 and 4 of this measure.

### **11-2, Part 3: Mitigation**

CanZinc will mitigate the potential spread of invasive species by implementing the mitigations it has already identified (e.g., the wheel-wash station). CanZinc will work with the Government of Northwest Territories and Parks Canada to identify additional mitigation that will prevent the spread of invasive species.

### **11-2, Part 4: Invasive Species Management Plan**

CanZinc will revise the invasive species management framework and create an Invasive Species Management Plan prior to construction, considering off-site as well as on-site prevention and control. CanZinc will include the adaptive management principles set out in Appendix B within the invasive species management framework, the Invasive Species Management Plan, and any individual weed control plans, if or as they are developed.

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<sup>21</sup> Timing to be determined in consultation with Parks and GNWT. These surveys could occur prior to construction of individual sections of road to allow for a phased approach to construction.

Prior to the commencement of construction, the Invasive Species Management Plan will be reviewed and approved by Parks Canada and the Mackenzie Valley Land and Water Board, with input from the Government of Northwest Territories where appropriate, as conditions in their respective land use permits. The developer will implement the approved plan(s).

### **Suggestion 11-1**

In addition to rare plant species, Parks Canada expressed concerns regarding insufficient baseline information on rare plant assemblages. Parks Canada has referred to valued, protected, or designated assemblages or communities, describing them as “uncommon plant communities”, “microhabitats”, areas that are “highly sensitive to disturbance”, “locally significant communities”, and “small patch communities with high biodiversity”.

The Review Board agrees that these communities or assemblages are important, but acknowledges that it may be challenging for the developer to identify these communities without additional guidance. As such, the Review Board provides the following Suggestion 11-1 to Parks Canada.

#### **Suggestion 11-1: Rare plant assemblages**

The Review Board suggests that Parks Canada should provide more guidance and definitions on what rare plant assemblages in the region are important. The Review Board suggests that Parks Canada do this prior to the surveys required by Measure 11-1 in order to help guide the surveys and that Parks Canada use the information gathered in the surveys required by Measure 11-1 to assist CanZinc in determining which assemblages should be monitored through the Rare Plant Management Plan.



### **Suggestion 11-2**

CanZinc committed to develop a rare plant management plan ‘as necessary’ (Appendix C, commitment #147). The Review Board finds this to be insufficient for areas within NNPR and in Measure 11-1 requires a rare plant management plan to manage rare plants within the park. Although the Review Board’s significance finding is related to NNPR, the Review Board suggests that it would preferable to have a rare plant management plan that applies to the entire Project.

#### **Suggestion 11-2: Rare Plant Management Plan**

The Review Board suggests that the Mackenzie Valley Land and Water Board consider requiring a Rare Plant Management Plan for the portion of the Project it regulates. The Review Board suggests that this plan could be combined with the one for NNPR and Parks Canada.

### **Suggestion 11-3**

The Review Board notes that during the analytical phase of the EA, CanZinc suggested that the appropriate time to sample vegetation baseline contaminant levels would be prior to the start of hauling, but did not formally commit to this testing. The Review Board offers Suggestion 11-3 to regulators.

#### **Suggestion 11-3: Vegetation contaminant levels**

The Review Board suggests that the Mackenzie Valley Land and Water Board and Parks Canada should consider potential impacts on vegetation from contamination from spills, concentrate loading, and road dust, and determine if sampling of vegetation contaminant levels prior to operations (start of hauling), is necessary.

## 12. Permafrost

### *Summary of Review Board findings*

The Review Board finds that the Prairie Creek All Season Road (All Season Road or the Project) is likely to cause permafrost degradation and result in associated significant adverse impacts on human safety, water, and vegetation (discussed in Chapters 5, 8, 11). The Review Board's reasons for this determination are summarized as follows:

- Permafrost degradation from Project activities is likely to occur, and is also likely to have significant adverse impacts on the surrounding environment, including impacts on water, vegetation, the success of reclamation, the ecological integrity of Nahanni National Park Reserve (NNPR), and on road infrastructure itself (leading to increased risk of accidents and malfunctions, and associated impacts on people and the environment<sup>1</sup>).
- Information on specific areas susceptible to permafrost degradation was not provided, creating uncertainty in impact predictions and an inability to develop appropriate mitigations.
- Parties and the Review Board agree that permafrost investigations, monitoring, and adaptive management are needed to mitigate likely significant adverse impacts related to permafrost degradation.

Despite these findings, the Review Board finds that the likely significant adverse impacts from permafrost degradation can be successfully avoided through robust mitigation, monitoring, and adaptive management measures.

### *Organization of this chapter*

In section 12.1, the Review Board has provided readers with a more thorough and detailed summary of the evidence than it has in other environmental assessments. This is intended to allow readers to see firsthand the range and degree of uncertainty identified throughout the environmental assessment. These uncertainties present a particular challenge to

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<sup>1</sup> See chapter 5 for more discussion of accidents and malfunctions, human safety, and potential impacts on people.

impact predictions and decision making<sup>2</sup>, and are a relevant part of the Review Board's consideration of the evidence in this section.

In Section 12.2 the Review Board presents its analysis and conclusions in relation to impacts on permafrost. The Review Board's recommended mitigation measure is outlined in Section 12.3.

## **12.1 Evidence from parties and the developer**

Based on discussions during the scoping phase, the Review Board's Terms of Reference (ToR) identified terrain, soils, permafrost, and karst topography as a subject of note for this environmental assessment (EA) (PR#42 p27).<sup>3</sup> Of these topics, most of the evidence and submissions in the EA focused on issues related to permafrost, and permafrost is the focus of this chapter. Terrain stability is covered in Human safety (Chapter 5). The developer and parties discussed karst during the analytical phase, but it was only raised briefly in the hearing phase; in this Report of EA karst is mentioned in Chapter 5: Human safety, Chapter 6: Wildlife and wildlife habitat, Chapter 8: Water quality and quantity, and Chapter 11: Vegetation. Soil was a minor topic in this EA and receives minimal attention in this Report of EA.

This section summarizes the evidence on the record from the Developer's Assessment Report (DAR) and DAR Addendum, technical sessions, information requests (IRs), and the hearing phase (technical reports, hearings, and closing arguments). Four parties commented on permafrost issues in the hearing phase: NRCan, GNWT, Liidlii Kué First Nation (LKFN), and Parks Canada.

### **12.1.1 Baseline information**

In its DAR, CanZinc summarized the existing topography, terrain, geology, karst features, surficial materials, soil, permafrost, and potential borrow sources in the Project area, noting that the road is completely within a zone of discontinuous permafrost.

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<sup>2</sup> See Chapter 4 for further discussion.

<sup>3</sup> The key line of inquiry impacts on Nahanni National Park Reserve also considered karst.

In response to a Review Board IR, CanZinc described that permafrost is generally found on northern slope aspects or flat, poorly drained areas and that high ice content permafrost is expected in low lying areas on north-facing slopes (PR#188 PDF p18). CanZinc explained that high elevation areas may have permafrost, but mass movement processes can cover or hide it. CanZinc also indicated, in response to a Government of Northwest Territories (GNWT) IR, that permafrost issues are not expected along Sundog Creek because of the nature of the material (gravel and cobble sized) and water flow (PR#200 p1; PR#237 p83).

In response to an IR, the developer indicated that it believes sufficient work has been completed for this stage, and that site-specific review will occur during detailed design (PR#200 p1).

### 12.1.2 Project interactions and impact predictions

The developer and parties identified a variety of potential pathways of impacts on permafrost. Based on the ToR, DAR, and DAR addendum, these pathways include (PR#42; PR#55; PR#100):

- road construction activities;
- physical presence and operation of the road;
- fires<sup>4</sup>;
- borrow pit construction and operation.

CanZinc did not make any significance predictions or characterize impacts with regard to permafrost, soil, or terrain in its DAR or DAR Addendum.<sup>5</sup> However, CanZinc discussed road design details and mitigations to reduce the impacts of road construction and operation on soil, permafrost, karst, and terrain (PR#55 p235). CanZinc explained that the selected route is intended to avoid sensitive terrain and suggested that with careful surface water management, most or all of the potential impacts should be limited to the road and borrow footprints. CanZinc further stated that if quick revegetation occurs during closure and reclamation, it would reduce on-road impacts (PR#55 p237).

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<sup>4</sup> Fires were not a major topic of discussion in relation to permafrost. CanZinc did note that, following a fire, road inspections would occur to check for permafrost thaw and ground instability.

<sup>5</sup> In Appendix F of its DAR addendum, CanZinc predicted significant impacts related to karst would be low, after mitigations have been applied (PR#99 p8)

### 12.1.3 Impacts on permafrost from road construction and operations

In the DAR, CanZinc noted that road construction or development of borrow sources in thaw-sensitive permafrost could cause subsidence, water ponding, erosion and sedimentation, and permafrost thaw (PR#55 p231). The developer acknowledged that permafrost thaw can cause slumping, ground instabilities, erosion, and subsidence, which can also change surface water drainage, and that road construction could disturb existing slope instabilities or create new instabilities. CanZinc described ground conditions as being most vulnerable in spring, summer, and fall, when soil may be thawing or thawed. CanZinc pointed out that travel and work over the ground in these conditions can lead to compaction or movement of surface water, which in turn can lead to permafrost thaw.<sup>6</sup>

In Appendix F of its DAR addendum, CanZinc stated that building a road will change the surface properties of the ground, and even a small change such as peat compaction can affect permafrost (PR#99 p10). CanZinc indicated that its mitigation includes the use of existing disturbed areas from the winter road for much of the Project alignment and following industry best practices, such as thicker embankments in soft areas or corduroy<sup>7</sup> in wet areas (PR#102 p242).

In the DAR, CanZinc also noted that after construction, the physical presence of the road itself, including the embankment, bridges, and culverts, has the potential to affect the ground (PR#55 p232). CanZinc pointed out that the warm permafrost along the road is particularly sensitive to changes in ground temperature. The edges of the embankment may thaw, causing ponding, while permafrost under the middle may stay or grow. Snow drift can exaggerate this by insulating the edges of the embankment. The road can also act as a barrier to surface water, which could result in additional ponding, thaw, or erosion. CanZinc identified Highways 3 and 7 as examples of roads in warm discontinuous permafrost that have had continuous settlement issues and instabilities. CanZinc notes that

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<sup>6</sup> Whole paragraph is summarized from CanZinc DAR (PR#55 p231).

<sup>7</sup> Corduroy construction involves placing a foundation layer of logs, perpendicular to the road direction, in wet or permafrost areas. This technique avoids disturbing the ground layer, and includes sealing the logs under the road materials to greatly slow decomposition of the logs.

these examples show that to mitigate anticipated impacts on the Project will require careful design and construction.<sup>8</sup>

In Appendix F of its DAR addendum, CanZinc discussed the potential for thaw-sensitive soils to heave and settle when thawing and for ice-rich soils to deform even under small loads (PR#99 p10). In Appendix A of its DAR addendum, CanZinc reported that ongoing maintenance is expected along the road, but after approximately 5 years of operations, stability and maintenance issues should be reduced (PR#101 p52). In Appendix F of its DAR Addendum, CanZinc indicated that it intends to construct the sections of road that are susceptible to thaw for a 20 year-life, but that if maintenance or replacement is required sooner, it will consider options such as culvert replacement or reconstruction of thawed or unsupported subgrade (PR#99 p14). According to CanZinc, climate change is expected to have similar impacts along the entire route and at different elevations, although the impacts of increased air temperature on permafrost may depend on slope, aspect, and how warm the permafrost currently is (PR#99 p6).

During the first round of IRs, parties asked questions related to impacts on permafrost and subsequent impacts on borrow sources, culverts, stream diversion, stream crossings, and construction methods (PR#200). In response to a Review Board IR, the developer proposed additional mitigation options for mitigating permafrost thaw at crossings, such as avoiding ice-rich terrain, building foundations into frost-stable layers, and possible use of thermoprobes, thermopiles, or thermosyphons (PR#188 p97). In response to a DFN information request about culverts, the developer indicated that it will consider the need for additional culverts to prevent ponding water and consider permafrost protection measures at culvert locations during detailed design (PR#200 p25). In response to DFN and GNWT information requests about construction methods for wet or ice-rich areas, CanZinc indicated that: log corduroy is the main mitigation for wet or thaw-sensitive terrain, that geotextile fabric may be used in addition to corduroy in some areas, and that cut slopes will be avoided in thaw-sensitive terrain (PR#200 p19; PR#184 p4).

Parties also asked questions about permafrost in relation to road maintenance, mitigation for snow accumulation, monitoring, and climate change (PR#200). DFN pointed out that “(i)n a recent study from the Yukon Government, public highway maintenance costs were up to 10 times higher in sections of the highway with underlying permafrost than in non-

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<sup>8</sup> Whole paragraph summarized from CanZinc’s DAR (PR#55 p232).

permafrost areas” (PR#200 p19). CanZinc responded that road maintenance is expected and will be completed, but should be minimal in permafrost areas due to the proposed construction techniques. DFN and GNWT both asked about snow accumulation and mitigation, with GNWT stating the following (PR#200 p20):

Collection of snow along the sides of the road is identified as potentially resulting in warmer ground temperatures, which could lead to thawing permafrost and ponding of water along the toe of the road embankment. This effect has been identified on several highways in the NWT and Yukon (e.g., Dempster Highway, Alaska Highway).

CanZinc responded to a GNWT IR about CanZinc’s plans for mitigating impacts on permafrost by: (1) stating that site-specific measures will be identified in detailed design, and (2) identifying general mitigation options such as snow fencing, flattened embankment sides, snow sheds, or cooling systems (PR#188 PDF p13).

In a second-round IR, GNWT indicated that “additional information is still required at the EA stage to ensure there are no significant adverse environmental effects related to permafrost from all road construction activities” and requested a summary table of all permafrost areas and mitigation measures (PR#320 p11). CanZinc responded that permafrost issues would be investigated further during detailed design and also provided a table of anticipated permafrost locations and potential mitigation measures such as thicker or wider road embankment, fill-only embankments, and additional culverts (PR#344).

Parks Canada pointed out in its technical report that potential disturbance or change to permafrost could occur near the Project as a result of construction, operations, and closure and therefore effective mitigation is needed to limit impacts (PR#452 p51). GNWT stated that in its experience, if ice-rich permafrost exists along the road or in borrow sites, this will likely lead to significant adverse impacts on water and the landscape (PR#551 p8).

At the public hearings, LKFN questioned CanZinc’s assumption that the terrain in northern British Columbia around Fort Nelson is very similar to the terrain crossed by the Project, and its intention to use the corduroy road approach as a result of the assumed similarity (PR#524 p85). CanZinc acknowledged that there is no permafrost around Fort Nelson (PR#524 p87). In a follow up response to a public comment at the Fort Simpson community hearing, CanZinc further described the corduroy road construction method and stated that if the logs are properly buried and sealed in soil, they will freeze in and not rot (PR#524 p44).

In response to questions from LKFN at the public hearing, CanZinc stated that permafrost is more common in fine-grained soils, and as a result, it does not expect permafrost in the



karst terrain (PR#524 p81). CanZinc also explained that it believes the direct impacts of climate change on permafrost are very slow. CanZinc pointed out that one of its most important mitigations for permafrost is to properly manage surface water, which CanZinc intends to do through adequate cross-drainage and use of natural slopes (PR#524 p81).

In its technical report, NRCan expressed concern about changes that could occur as a result of changes to drainage leading to settlement and ponding of water. NRCan stated that earlier freeze-up under the embankment can also change subsurface flow and create icing and ponding which will further affect permafrost (PR#451 p6). NRCan discussed how construction and operation in ice-rich, thaw-sensitive permafrost can result in ground instabilities and ponding of water (PR#451 p8). NRCan also pointed out that changes to permafrost can have implications for ground stability and infrastructure, and that climate change will be an added challenge (PR#451 p9).

NRCan concluded that CanZinc could minimize impacts on permafrost by implementing appropriate mitigation (e.g., culverts, protecting permafrost). At the hearing, NRCan indicated that it agrees with CanZinc's approach in identifying potential impacts and proposing mitigation to minimize them (PR#524 p220). It pointed out that CanZinc's qualitative analysis was conservative and that CanZinc will complete a quantitative analysis during detailed design. In its closing argument, NRCan reiterated several recommendations regarding the permafrost investigations and activities CanZinc should complete during detailed design (PR#547 p1).

In its closing arguments, Parks Canada discussed outstanding permafrost concerns along the All Season Road (PR#546 p19). Parks Canada had provided two recommended measures to the Review Board in its technical report (Appendix D, Parks Canada recommendations #31-32). Following CanZinc's response (which indicated that the developer mostly agrees with recommendation #31) and later discussions at the public hearings, Parks Canada recommended that the Review Board include recommendation #31 and #32 in this report, unless CanZinc's final commitments table is updated to include the details discussed at the hearing with regard to permafrost considerations during road design and permafrost monitoring (PR#546 p19).

LKFN also provided recommendations<sup>9</sup> about permafrost in its closing argument, stating that (PR#550 p1): “[t]here is a lack of evidence on which to assess the full significance of these impacts or the adequacy of mitigation, as [CanZinc] has not provided a detailed design of the proposed road...and precautionary measures are required”. LKFN recommendation #1 was for the Review Board to consider a measure requiring independent review of the detailed road design prior to construction. Recommendation #2 was related to specific mitigation LKFN believed should be in place. Recommendation #3 was for First Nation, including LKFN, involvement in the review of road design and monitoring<sup>10</sup>. CanZinc did not respond to LKFN’s recommendations (PR#553).

#### **12.1.4 Impacts from borrow pits**

In addition to general discussions about impacts on permafrost from the Project, parties also raised questions and concerns about impacts on permafrost specifically related to borrow pits.

In Appendix 1D of its DAR, CanZinc proposed 59 detailed borrow pit locations (PR#62). CanZinc later increased this to 80 potential borrow source locations, with 44 of them preferred (PR#350). CanZinc explained that each borrow pit will be operated by CanZinc or a contractor following land use permit conditions and pit development plans (PR#55 p237).

In a first-round IR, Parks Canada raised concerns about borrow pit management, specifically when it would occur, what the monitoring will be, and whether the Project would affect the integrity of permafrost (PR#200 p16). Parks Canada also raised concerns about the potential use of borrow sources with significant permafrost or ground ice and asked CanZinc to monitor and mitigate any borrow sources with permafrost (PR#200 p16). CanZinc responded that borrow sources with permafrost will either not be used or will be used following the guidance of a geotechnical engineer. Figure 12-1 shows permafrost thaw, or creep, at borrow pit #10.

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<sup>9</sup> The recommendations are on page 2 of PR#550 LKFN’s closing arguments and also shown in Appendix D of this Report of EA (as LKFN recommendations 1-3). These recommendations also mention karst. In this Report of EA karst is also discussed in Chapter 11 (Vegetation).

<sup>10</sup> For more on community involvement in monitoring, see Chapter 15.

At the technical sessions, borrow pits were raised on several occasions. CanZinc stated that the borrow estimate was very conservative, and that it identified sufficient backup borrow locations for up to six times as much borrow material as it estimated needing (PR#237 p42). CanZinc reiterated its commitment that every borrow pit will have a borrow site management plan<sup>11</sup> that will be drafted and circulated to regulators for comment (PR#240 p44).



**Figure 12-1: Permafrost thaw or creep in borrow pit #10**  
(PR#62 p6)

In the second round of information requests, Parks Canada continued to raise concerns regarding borrow site management, including the “...long-lasting effects to the delicate ground thermal regime if permafrost is allowed to degrade, and the effects to the surrounding terrain if massive ground ice was allowed to melt” (PR#320 p16). In response to Parks Canada’s request to provide a draft permafrost mitigation and monitoring plan for borrow sources, CanZinc indicated that site-specific permafrost recommendations would

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<sup>11</sup> In an earlier IR response, CanZinc committed to developing site specific or individual borrow site management plans following Indigenous and Northern Affairs’ *Northern Land Use Guidelines for Pits and Quarries* and the *Borrow Pit Management and Reclamation Plan proposed* (PR#555 p25; Appendix C, commitment #119). The developer also informed parties that it will reclaim borrow pits progressively, shortly after they are no longer needed (PR#200 p16)

be included in individual borrow site management plans<sup>12</sup> and provided examples of potential mitigation (PR#351 p1). Mitigations for areas with higher ice content could include: opening small areas at a time, maintaining or restoring drainage, replacing overburden quickly, and promoting organic and vegetative cover. According to the developer, these mitigations are “...intended to reduce the overall exposure of potentially high-ice content layers to physical and thermal erosion” (PR#351 p5). CanZinc further advised parties that “[t]he goal is that ice-poor materials should be used in borrow, and ice-rich materials should either be rejected or improved before use” (PR#351p 1).

In its technical report, Parks Canada stated that there is potential for permafrost in the borrow pits (in the overburden, borrow material, or underburden), and use of borrows with permafrost will result in disturbance and changes to permafrost which could lead to environmental impacts (PR#452 p48). Parks Canada noted that the extent of permafrost in the Project area is unknown at this time and, as a result, CanZinc has not identified any site-specific mitigations. Parks Canada pointed out that CanZinc has not provided a draft permafrost mitigation and monitoring plan for borrow sites, but has only provided general mitigation measures and indicated that individual borrow site management plans will include permafrost considerations. At the hearings, CanZinc restated that if it finds permafrost in a proposed borrow pit, that borrow pit will likely not be used and pit development will be subject to mitigation and monitoring plans (PR#519 p46).

Parks Canada stated that it agrees that each borrow site will require a management plan and that site-specific permafrost management and protection measures should be included (PR#452 p49). Parks Canada concluded that complete characterization of conditions is necessary prior to site development, and that further mitigation will be needed<sup>13</sup>, in addition to the mitigations identified by CanZinc.

Parks Canada submitted three recommended measures to the Review Board in relation to borrow pits (PR#452 p50; Appendix D, Parks Canada recommendations 28-30). Parks Canada recommendation #28 was for CanZinc to complete geotechnical and permafrost investigations and develop each borrow site management plan before development of the borrow pit. Recommendation #29 provided suggestions for what should be included in

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<sup>12</sup> CanZinc also indicated that the borrow site management plans, would consider buffer strips, surface water runoff control, slope stability, final contouring, permafrost, ice rich soils, and access (PR#350 p1).

<sup>13</sup> See Section 12.2.4 for more on the need for further permafrost investigations.

each borrow site management plan and Recommendation #30 proposed specific permafrost mitigation measures for borrow pits. (Parks Canada also recommended requiring a permafrost monitoring and response action plan and provided a list of items that should be included in the plan).

In its closing arguments, Parks Canada discussed remaining concerns it has about permafrost in borrow pits (PR#546 p18) and stated that unless CanZinc adds additional detail from the hearings to its commitments table, Parks Canada requests that the Review Board include its recommendations #28-30 in the report of EA.

### **12.1.5 Implications of permafrost degradation for reclamation and revegetation**

As outlined above, parties discussed the likelihood of Project impacts on permafrost, including implications for the surrounding landscape, water, infrastructure, and reclamation. This section summarizes discussions about the long-term, potentially-irreversible impacts that could arise from permafrost degradation, including implications for reclamation and revegetation.

During the first round of IRs, Parks Canada questioned the developer's predictions about the significance of impacts on vegetation and the ability to re-establish vegetation, following potentially permanent impacts on hydrology from permafrost melt (PR#200 p5). In particular, Parks Canada questioned the developer's ability to restore drainage and return the area to productive use through natural revegetation methods. Parks Canada referenced a paper written by Cameron et al. (2015) (PR#160) to show that permafrost degradation associated with the winter road construction (around kilometre 95) altered road bed hydrology in the surrounding area. The developer's key mitigation to address impacts on permafrost is to avoid disturbing permafrost in thaw-sensitive terrain (PR#289 pp8-12).

During the first round of IRs, Parks Canada predicted that there would be a high likelihood of permafrost degradation along the access road in areas with ice-rich permafrost and concluded that irreversible impacts from permafrost degradation will last beyond the scope of the Project (PR#200 p5). At the technical sessions, Parks Canada reiterated its predictions that Project construction has the potential to alter permafrost hydrology and plant communities. Where these changes are permanent, Parks Canada concluded there would be a change in ecosystem structure and function (PR#232 p115-118). Parks Canada reiterated that there is evidence that changes to moisture regimes and permafrost



groundwater have occurred for the Permitted Winter Road, compared to un-cleared areas nearby (PR#232 p203). In response to a technical session undertaking, CanZinc acknowledged differences in vegetation and hydrology on the Permitted Winter Road footprint compared to adjacent areas and agreed to more investigation and careful planning for reclamation.<sup>14</sup>

In its technical report, Parks Canada reiterated the importance of designing the Project with closure in mind, as well as with appropriate permafrost monitoring and response plans (PR#452 p51). Parks Canada noted that avoidance is the preferred mitigation for permafrost degradation, stating that "(a)voidance of permafrost could be accomplished by, but not limited to: not constructing in areas of known permafrost, limiting cuts and utilization of fill construction practices, and ensuring proper site water drainage to prevent water pooling" (PR#452 p51).

#### **12.1.6 Need for further permafrost investigations**

During the first round of IRs, parties asked questions related to the method of permafrost identification, permafrost and terrain stability mapping, consideration of slope aspects and angles, and construction methods (PR#200). In response to a Dehcho First Nations IR, CanZinc explained that permafrost identification relied on visual and remote terrain analysis, soil characterization, shovel tests, and test pits (PR#200 p19). In response to a Parks Canada IR, CanZinc reiterated its commitment to complete further studies and detailed geotechnical investigations to better define permafrost and geotechnical conditions, prior to final design (PR#200 p2). The developer further specified that it will complete auger/drill holes and a quantitative analysis of the thermal regime beneath structures and the embankment during detailed design.

Natural Resources Canada (NRCan) indicated in its technical report that understanding permafrost distribution and drainage conditions is important for minimizing impacts on terrain and permafrost (PR#451 p6-7). NRCan said that it " ...agrees [with CanZinc] that quantitative analysis to assess changing permafrost conditions and to support slope stability analysis is required for areas identified as high risk including slopes and where major structures are planned" (PR#451 p11). NRCan pointed out that CanZinc has only completed qualitative analysis to date and suggested that CanZinc should complete

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<sup>14</sup> For more discussion about revegetation and reclamation, including linkages to permafrost degradation, see 11.1.10.

quantitative analysis for thaw-sensitive and high risk locations during detailed design (PR#451 p11).

NRCan offered three recommendations related to additional site investigations during detailed design (PR#451 p8). These recommendations included:

- identifying locations with potential cross flow obstruction and icing issues;
- confirming permafrost and subsurface condition; and,
- completing quantitative analysis (e.g., thermal modelling) for highly sensitive areas.

Parks Canada noted that CanZinc has identified general permafrost areas and mitigation options and Canzinc has indicated these will be further defined during detailed design when site-specific investigations occur. Parks Canada agrees that permafrost locations and mitigations need to be refined as more information becomes available and that site-specific information is required for detailed design (PR#452 p51). In response to Parks Canada's technical report recommendations, CanZinc indicated that the geotechnical and permafrost investigations it has committed to complete prior to detailed design will address most of Parks Canada's recommendations (PR#484 p24).

At hearings and in closing arguments, LKFN raised concerns about impacts on permafrost and recommended focussing mitigation measures on high snow areas, permafrost areas, and high freshet areas (PR#550 p1; PR#528 p236). LKFN indicated that it remains concerned about the impacts of thaw in fine-grained soils along the road and the lack of information on how much fine-grained soil there is along the Project route (PR#550 p1). LKFN concluded that there is not enough information to determine the adequacy of mitigation or the significance of potential impacts.

In its closing arguments, NRCan reiterated that it "...is satisfied that CanZinc has done a reasonable job identifying areas of permafrost along the alignment of the proposed road and generally agrees with the characterization for this stage of the design process..." (PR#547 p1). However, NRCan also recommended (PR#547 p1):

...that the Developer carry out site investigations to identify additional areas where obstruction of cross drainage may occur, confirm permafrost and subsurface conditions in areas where ground ice conditions occur, and conduct qualitative analysis in highly sensitive areas to better assess how permafrost conditions might change as a result of climate change.

In response to NRCan's technical report recommendations, CanZinc indicated that the suggestions NRCan made are in line with CanZinc's intentions for detailed design and



CanZinc provided some additional detail on work during detailed design (PR#484 PDF p48). CanZinc did not respond to NRCan's closing argument recommendations (PR#553).

In its technical report and at the hearings, GNWT acknowledged that CanZinc has committed to a permafrost monitoring plan, suitable site investigation of permafrost issues during detailed design, and individual borrow site management plans with site-specific permafrost considerations (PR#455 p28; PR#524 p239). However, because information on specific permafrost areas and ice content is not available, GNWT stated that there is not enough information to assess the magnitude of permafrost degradation or its significance (PR#455 p28; PR#524 p239).

### **12.1.7 Need for permafrost monitoring and adaptive management**

During the first round of IRs, parties asked questions about permafrost and CanZinc's plans for permafrost monitoring (PR#200). At the technical session, CanZinc committed to developing a permafrost monitoring plan (PR#237).

In its closing argument, Parks Canada recommended that permafrost monitoring be completed with geotechnical investigation, followed by development of a permafrost monitoring plan with updated mitigation and thresholds (PR#546 p19). In response, CanZinc updated its commitments #128 and #129 (Appendix C, commitments #128 and #129). At the public hearing, CanZinc agreed that permafrost monitoring could begin with ground temperature cables during geotechnical investigations, followed by monitoring plans for construction and operations (PR#524 p100). CanZinc stated that it believes it should develop the permafrost monitoring plan after detailed design but before construction (PR#484 p24).

GNWT also indicated it supports having a permafrost monitoring plan that includes borrow pits (PR#455 p28; PR#524 p239). In its closing arguments, GNWT pointed out that CanZinc has committed to developing a permafrost monitoring plan<sup>15</sup> after completing the additional geotechnical and geophysical investigations and final design of the road (PR#551 p8). Regarding the timing of this commitment, CanZinc and GNWT appear to

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<sup>15</sup> CanZinc also provided examples of what it may include in the plan, such as: at least two instrument monitored sections of road (using cables, plates, or stakes), at least four ground temperature cables in undisturbed permafrost, a plan for regular inspections by a geotechnical engineer, monthly documented inspection by the road maintenance supervisor, and documented records of all maintenance.

agree that the plan should be developed before construction begins. GNWT also noted that the “...monitoring program requirements and details should be discussed and determined during the regulatory phase” (PR#551 p8). GNWT specified that those requirements and details should be provided in time for the land and water board to consider them in the water licence, and that the plan should be approved prior to construction. It also reiterated that water and permafrost monitoring should occur at borrow sites.

Based on the information above, GNWT revised its recommendation #10 in its technical report to state the following (PR#551 p12; Appendix D, GNWT recommendation #10)<sup>16</sup>:

The GNWT acknowledges the developer’s commitments to establish a permafrost monitoring plan prior to the start of construction and to implement this plan during construction and road operation. The GNWT recommends that the MVEIRB recognize these commitments as developer’s commitments to be included in the scope of development for this EA and captured in the Report of Environmental Assessment. The GNWT agrees that the specifics of this monitoring can be discussed during the regulatory phase.

In response to GNWT’s closing arguments, CanZinc pointed out that it plans to develop its permafrost monitoring plan after the additional field investigations and detailed design, because monitoring requirements may not be apparent until after that work is done (PR#553). Because field investigations and detailed design will occur after permitting, CanZinc stated that the monitoring details will not be available during the regulatory phase (that is, prior to permitting). However, CanZinc agreed that permits should have conditions requiring these plans prior to construction.

## **12.2 Review Board analysis and conclusions**

### **12.2.1 Summary of Review Board findings**

The Review Board finds that the Prairie Creek All Season Road is likely to cause permafrost degradation and result in associated significant adverse impacts on human safety, water, and vegetation (discussed in Chapters 5, 8, 11). The Review Board’s reasons for this determination are summarized as follows:

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<sup>16</sup> See Section 2.1.2 for more information on the Board’s response to this type of recommendation.

- Permafrost degradation from Project activities is likely to occur, and is also likely to have significant adverse impacts on the surrounding environment, including impacts on water, vegetation, the success of reclamation, the ecological integrity of Nahanni National Park Reserve (NNPR), and on road infrastructure itself (leading to increased risk of accidents and malfunctions, and associated impacts on people and the environment<sup>17</sup>).
- Information on specific areas susceptible to permafrost degradation was not provided, creating uncertainty in impact predictions and an inability to develop appropriate mitigations.
- Parties and the Review Board agree that permafrost investigations, monitoring, and adaptive management are needed to mitigate likely significant adverse impacts related to permafrost degradation.

The following sections describe the Review Board's analysis and conclusions. Ultimately, the Review Board finds that the significant adverse impacts from permafrost degradation can be successfully avoided through robust mitigation, monitoring, and adaptive management. The Review Board's recommended measure is outlined in Section 12.3.

#### **12.2.2 Permafrost degradation from Project activities is likely and will affect the surrounding environment**

CanZinc and other parties have identified that permafrost is likely to occur along the All Season Road. In the DAR, CanZinc noted that the Project is in the extensive discontinuous permafrost zone, where 50-90% of the area may contain permafrost, with average temperatures around 0°C expected at lower elevations and -2°C or colder at higher elevations (PR#55, p65).

During the EA, CanZinc, NRCAN, GNWT and other parties discussed how construction and operation of the road and borrow pits is likely to affect permafrost. The developer and parties clearly acknowledged the relationship between the Project, permafrost degradation, and subsequent impacts on the surrounding environment. For example, following the technical sessions, CanZinc stated that (PR#298 p4):

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<sup>17</sup> See chapter 5 for more discussion of accidents and malfunctions, human safety, and potential impacts on people.

[CanZinc] understands that particular care needs to be taken in the design and construction of an all-season road in the zone of warm, discontinuous permafrost. CZN acknowledges that any permafrost degradation from their activities has the potential to alter surrounding communities, if not closely managed and monitored from construction to the reclamation phase.

Natural Resources Canada (NRCan), a department considered to have expert knowledge of permafrost, indicated in its technical report that (PR#451 p10):

Construction and operation of infrastructure can lead to alteration of the ground thermal regime and thawing of permafrost which may have implications for ground instability and drainage which can affect the integrity of infrastructure and the surrounding environment. Climate change presents an additional challenge and long-term warming can result in additional thaw of permafrost. Assessment of how permafrost conditions may change over time is therefore required to evaluate the impact of the project on the environment and also the impact of the environment on the project.

With regard to drainage, NRCan further stated that (PR#451 p7):

Changes to drainage for example can occur... through permafrost thawing beneath the right-of-way and subsequent settlement and ponding of water. Also, earlier freeze-back of the active layer beneath the embankment can block shallow subsurface flow originating upslope of the embankment that can result in icings which can present a road hazard as well as a buildup of ice adjacent to the embankment and ponding of water during spring melt which can have further impacts on permafrost.

In response to technical session undertaking #2, Parks Canada described how activities like road construction can affect permafrost melt, which can in turn affect hydrology, vegetation composition, wildlife habitat, and ecological integrity in the NNPR (PR#282; PR#262). Certain areas, such as black spruce bogs and alpine terrain are especially sensitive to changes in hydrology and vegetation as a result of permafrost melt (PR#262; PR#282 p4). Parks Canada further noted that there is a high likelihood of permafrost degradation along the road in areas with ice rich permafrost (PR#200 p5).

In its closing arguments, LKFN expressed concern (PR#550 p1) over the lack of information available and how this has made it difficult to assess the adequacy of mitigation or the significance of impacts, stating, therefore, that “precautionary measures are required.” According to GNWT, if there is ice rich permafrost on the road or in borrow pits, there will likely be significant adverse impacts on water and the landscape (PR#455 p28).

### **Impacts from borrow pits**

In its technical report, Parks Canada noted that use of borrow pits with permafrost will result in disturbance and changes to permafrost which could lead to environmental impacts such as thaw settlements (PR#452 p48). Parks Canada raised concerns about the “long-lasting effects” from permafrost melt, and about the developer’s proposed plans for mitigating and monitoring impacts on permafrost in borrow areas (PR#320 p16). In response, the developer acknowledged that borrow sources with visible ice would need additional measures to protect permafrost or manage meltwater (PR#351 p3). The developer has committed to preparing individual borrow site management plans that include site-specific permafrost recommendations (Appendix C, commitment #118).

Parks Canada recommended measures to the Review Board, including those related to preventing impacts from borrow pits (PR#452 p50; Appendix D, Parks Canada recommendation #28, #29, and #30). The Review Board accepts Parks Canada’s concerns and agrees with CanZinc that the developer will need to assess permafrost conditions in borrow areas and develop appropriate mitigation measures (including borrow site management plans), as well as undertake monitoring to ensure mitigation is effective and informs adaptive management. However, in the Review Board’s view, there is clear risk of significant adverse impacts from permafrost degradation and substantial uncertainty due to lack of information about permafrost conditions at borrow locations.<sup>18</sup>

In order to ensure a consistent and effective approach to permafrost assessment, mitigation, monitoring, and adaptive management, the Review Board concludes that borrow pits should be included in the recommended measure set out below. However, because individual borrow source management plans will be reviewed and approved by regulators, the Review Board’s measure does not prescribe specific mitigation for permafrost in borrow pits.

#### **12.2.3 Impacts from permafrost degradation would be long-term or irreversible**

As described above, Parks Canada questioned the developer’s ability to restore drainage and re-establish vegetation and habitat in areas of permafrost degradation (PR#200 p5).

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<sup>18</sup> See Chapter 4 for more on the Board’s approach to uncertainty in this EA.

Parks Canada suggested that irreversible impacts from permafrost degradation will be persistent, particularly in areas with ice-rich permafrost (PR#200 p5). During the technical sessions, Parks Canada questioned the developer about the permanent changes to vegetation structure and function that could occur as a result of permafrost degradation, indicating it is concerned about significant impacts on ecological integrity as a result of permafrost degradation (PR#232 p27).

Given the uncertainty and potential irreversibility of impacts, the Review Board is concerned about the adverse, long-term impacts that permafrost melt may have on many valued components, including water quality, vegetation, wildlife habitat, and the ecological integrity of the NNPR in areas near the Project. The Review Board believes that irreversible impacts would also affect the Project's closure goals and potential future uses of the area (by people and the environment) after closure. The Review Board notes that reclamation to effectively reverse impacts is also relied upon by CanZinc in its assessment of impacts for several valued components (for example, see Chapter 11 regarding impacts on vegetation).

#### ***Impacts on ecological integrity of Nahanni National Park Reserve***

Permafrost degradation from Project activities will likely cause significant adverse impacts on many different valued components such as water and vegetation (including species at risk), and thereby has the potential to affect the ecological integrity of the NNPR near the Project. As stated in Chapter 4, the Review Board considers that a higher standard of protection is appropriate when considering the significance of impacts from the proposed Project on the NNPR. As noted by Parks Canada, long-term or irreversible impacts are particularly concerning for the ecological integrity of the park (PR#232 p27). In addition, due to the impacts of permafrost degradation on Project components (e.g., the road bed and other infrastructure), there is an increased risk of accidents and malfunctions along the All Season Road. In addition to the potential for people to be injured or killed, accidents and malfunctions could include spills, which may result in significant adverse impacts on the ecological integrity of NNPR in areas near the Project.

The likely impacts from permafrost degradation (on water, vegetation, wildlife habitat, and human safety) combined with the importance of the ecological integrity of NNPR support the Review Board's conclusions significant adverse impacts due to permafrost degradation are likely, and that comprehensive mitigation is needed.

#### 12.2.4 Site-specific permafrost investigation is required

The Review Board observes that parties and the developer have acknowledged the need for further investigation of permafrost occurrence and characteristics. In its closing arguments, GNWT stated that it cannot assess the magnitude of permafrost degradation or its significance because information on specific permafrost areas and ice content is not available (PR#551 p8). LKFN expressed similar concerns (PR#550 p1). Parks Canada pointed out that the extent of permafrost is currently unknown and that as a result no site-specific mitigations have been identified (PR#452 p48). In its technical report and closing argument, NRCan noted that additional permafrost investigations will be required in thaw-sensitive terrain during detailed design, including: identifying cross flow obstruction and icing issues; confirming permafrost and subsurface conditions; and, completing quantitative analysis (PR#451 p8; PR#547 p1).

In response to Parks Canada's technical report recommendations, CanZinc indicated that the geotechnical and permafrost investigations it has committed to complete prior to detailed design will address most of Parks Canada's recommendations (PR#484 p24). In response to questions from Parks Canada at the public hearings, CanZinc stated that the geotechnical investigations would include installation of ground temperature cables, which would inform road design in permafrost areas (PR#524 p100). However, Parks Canada indicated in its closing arguments that unless CanZinc adds additional detail from the hearings to its commitments table, Parks Canada requests that the Review Board include its recommendations #28-30 in the Report of EA (PR#546 p18).

In response to Parks Canada's closing arguments, CanZinc indicated that it has updated its commitments #128 and #129 (see Appendix C) to address Parks Canada's recommendations 28-32. In response to Parks Canada's final recommendation that permafrost monitoring be completed with geotechnical investigations, CanZinc said it intends to begin collecting permafrost monitoring data during and after the geotechnical investigations, and that monitoring plans for construction and operation will be provided in the detailed design report and updated following construction (PR#553 p11).

In a meeting with Parks Canada, CanZinc agreed that as a first step in its permafrost and geotechnical investigations it would "...overlay areas of permafrost potential on the established vegetation mapping to identify locations where mitigation specific to vegetation may be needed, and identify any additional data requirements" (PR#282 PDF p5).



The Review Board acknowledges the uncertainty due to a lack of detailed information on permafrost, as well as parties' recommendations for and the developer's commitment to further investigations. Unless plans and mitigations are fully developed and implemented as part of a coordinated strategy that links further investigations, design and construction, ongoing monitoring, and adaptive management, the Review Board concludes that permafrost degradation and associated impacts on the environment are likely to occur. In the Review Board's view, these impacts are significant; the Review Board has therefore built on CanZinc's commitments in the measure set out below. Measure 12-1 will ensure further permafrost investigations are undertaken and provide sufficient information to inform Project design and construction so that impacts on permafrost can be avoided.

### **12.2.5 Monitoring and adaptive management**

In its closing arguments, Parks Canada recommended that the Review Board include its recommendation #32 regarding permafrost monitoring in this report as a measure, unless CanZinc's final commitments table is updated to include the details on permafrost monitoring discussed at the hearing. Following the hearing, CanZinc updated its commitments, but not to the extent recommended by Parks Canada (Appendix D, Parks Canada recommendation #32; Appendix C, commitments #128 and #129). Parks Canada's recommendation #32 (PR#546 p19) refers to an "Action Plan" with a "...suite of mitigations (including thresholds and triggers)...." This recommendation is consistent with the type of adaptive management referred to in Chapter 4 of this REA and the requirements set out in Appendix B.

The GNWT initially expressed concerns over the lack of site-specific permafrost information, and recommended a permafrost monitoring and mitigation plan or program (PR#455 p28; PR#524 p239). In its closing arguments, GNWT noted that CanZinc had agreed to additional geotechnical and geophysical investigations prior to final design, followed by the development of a permafrost monitoring plan. GNWT also revised its technical report recommendation #10 to instead recommend that the Review Board recognize CanZinc's commitment for a permafrost monitoring plan as part of the scope of development (PR#551 p12; Appendix D, GNWT recommendation #10).

As explained in the Section 2.1.2 (Scope of Development), the Review Board finds the GNWT's recommendation to be unworkable. Considering GNWT's recommendation to formalize and give full effect to CanZinc's commitment, the Review Board deduces that GNWT views such a plan as an important part of mitigation. The Review Board also notes and appreciates GNWT's submission that, in its experience, if ice-rich permafrost exists

along the road or in borrow sites, the Project will likely lead to significant adverse impacts on water and the landscape (PR#551, p8).

Considering the recommendations from Parks Canada and GNWT, CanZinc's commitments, and the likelihood of impacts on permafrost and subsequent impacts on the surrounding environment, the Review Board has recommended permafrost monitoring requirements. These requirements will ensure monitoring is robust enough to meet the objectives set out by the Review Board and that it will inform adaptive management to minimize permafrost degradation and associated impacts.

### **12.2.6 Conclusion**

The Review Board finds that the Project is likely to cause permafrost degradation. Permafrost degradation and associated landscape changes may not always be significant on their own, but the Review Board views the associated (and in some cases irreversible) impacts on water and vegetation (discussed in Chapters 8 and 11) as significant, especially in traditional use areas and in NNPR<sup>19</sup>. Similarly, in Chapter 5, the Review Board found that impacts on people due to accidents are significant, including accidents related to permafrost degradation affecting the road.

The Review Board acknowledges parties' concerns and recommendations and the commitments<sup>20</sup> made by CanZinc. The Review Board remains concerned about the lack of site-specific permafrost information, and finds that this lack of information makes it difficult to assess the effectiveness of proposed mitigations. In the Board's opinion, CanZinc has not met its burden of proof<sup>21</sup>, and a precautionary approach is warranted. In addition, climate change in an area of warm, discontinuous permafrost is yet another reason to monitor and adaptively manage impacts on permafrost. In order to minimize permafrost degradation and prevent associated significant adverse impacts on the environment from

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<sup>19</sup> See Chapter 4 for more on the importance of the project area.

<sup>20</sup> CanZinc has committed to additional permafrost site investigation during detailed design to identify permafrost areas and appropriate mitigation (Appendix C, commitments #129 and #232). CanZinc has also committed to developing a Permafrost Monitoring and Response Action Plan before construction, informed by permafrost investigations during detailed design (Appendix C, commitments 128 and #222). Finally, CanZinc has agreed that the detailed design of the road within NNPR will be reviewed and approved by Parks Canada (Appendix C, commitment #223).

<sup>21</sup> The concept of burden of proof is described in Chapter 4.

the Project during construction, operations, closure, and post-closure, the Review Board recommends a precautionary approach to permafrost management.

The Review Board therefore concludes that significant adverse impacts related to permafrost degradation are likely, but can be prevented through permafrost investigations to inform road design and appropriate permafrost mitigations, combined with systematic monitoring and adaptive management. Further permafrost investigations are needed to ensure the developer, the independent technical review panel (referred to in Measure 5-1), and regulators, have the information they need to ensure the Project is designed and constructed in a way that avoids permafrost degradation and related impacts. In order to inform adaptive management, protect the environment in spite of uncertainty, and respond to changing conditions throughout the life of the Project, the Review Board's recommended measure 12-1 also requires a permafrost management plan that includes an adaptive management framework.

### **12.3 Measures**

In order to prevent significant adverse impacts on permafrost and subsequent impacts on water, vegetation, and human safety, the Review Board recommends the suite of mitigations set out in the measure below.

#### **Measure 12-1**

In order to minimize permafrost degradation and prevent associated significant adverse impacts on the environment from the Project during construction, operations, closure, and post-closure, the Review Board recommends a precautionary approach to permafrost management. This includes additional permafrost investigations, careful design and construction of the Project, and a permafrost management plan.

CanZinc has made several relevant and applicable commitments related to permafrost. This measure formalizes CanZinc's commitments (Appendix C, commitments #128, #129, #222, #232) and links the critical components of permafrost investigations, detailed Project design and permafrost mitigations, ongoing monitoring, and adaptive management.

In Chapter 5, Measure 5-1 requires the establishment of an independent technical review panel. The panel's considerations will include all permafrost data or information to inform road design in permafrost areas. The Review Board finds that this, together with the

measure set out below, will limit permafrost degradation and prevent the associated significant adverse impacts discussed above.

### **Measure 12-1: Permafrost management**

#### **12-1, Part 1: Introduction**

In order to avoid permafrost degradation and prevent associated significant adverse impacts on the environment from the Project during construction, operations, closure, and post-closure, the developer will conduct additional permafrost investigations to inform design and construction of the Project and will develop and implement a permafrost management plan.

#### **12-1, Part 2: Permafrost investigations**

The developer will investigate permafrost and collect baseline permafrost data for the road alignment and borrow pits, provide the data and results to the independent technical review panel and to regulators, and use the information and results to inform detailed and final design.

#### **12-1, Part 3: Design and construction of the Project**

CanZinc will design and construct the road, borrow pits, and other infrastructure in a way that anticipates and avoids permafrost degradation and associated impacts on the surrounding environment during all phases of the Project, including post-closure.

#### **12-1, Part 4: Permafrost Management Plan**

The developer will establish and implement a Permafrost Management Plan that includes permafrost monitoring and adaptive management.

The Permafrost Management Plan must include:

- monitoring to measure the effects of the Project on permafrost (with an emphasis on early detection of any changes in permafrost) and evaluate the effectiveness of Project design and mitigations in preventing or minimizing permafrost degradation;

and,

- an adaptive management framework that satisfies the requirements of Appendix B.

The Permafrost Management Plan will be for review and approval by the Mackenzie Valley Land and Water Board and Parks Canada.

## 13. Cumulative effects

Under Paragraph 117(2)(a) of the *Mackenzie Valley Resource Management Act* (MVRMA or the Act) an environmental assessment must consider any cumulative impact that is likely to result from the development in combination with other developments.

In Chapter 10 of the *Terms of Reference* for EA1415-01, the Review Board required the developer to assess the cumulative effects of the All Season Road (PR#42 pp35-36), with a focus on those valued components potentially affected by the Project in combination with other past, present, or reasonably foreseeable future human activities and developments. The developer was asked to (PR#42 p35):

- identify those valued components;
- identify the source of potential cumulative effects;
- predict the combined impacts of the All Season Road and other activities and developments; and,
- identify mitigations for any predicted cumulative effects predicted.

This chapter summarizes the evidence from the developer and parties (13.1), and provides the Review Board's analysis and conclusions (13.2).

### 13.1 Evidence from parties and the developer

In accordance with the *Terms of Reference*, the developer submitted a cumulative effects assessment in Chapter 13 of its DAR. In the *Adequacy Review* of the DAR, the Review Board found that there was not enough information regarding potential cumulative impacts from the Project, specifically for impacts on the NNPR. The Board required the developer to revise its cumulative effects assessment with a focus on the NNPR due to its importance as a key line of inquiry for the EA (PR#77 p24-25).

In its response to the *Adequacy Review*, CanZinc submitted an updated cumulative effects assessment as part of its DAR Addendum, and predicted residual impacts on wildlife from the Project and other existing and future human-related activities in the immediate vicinity of the Project and in the broader geographic region (PR#102 p245-252).

### **13.1.1 Projects considered in the cumulative effects assessment**

In its cumulative effects assessment, the developer considered other existing developments in the area, including the Cantung Mine, Liard Highway, NNPR, Howard's Pass Access Road, Canol Trail, and the Prairie Creek Mine (PR#102 pp245-248). The developer also considered foreseeable future developments in the area, including the Selwyn Mine, Mactung Mine, and a Parks Canada Directive to increase visitation to the NNPR (PR#102 p249). The developer explained that their cumulative effects assessment also considered conservation areas under the draft Dehcho Land Use Plan that exclude development, as well as excluded land use activities inside the NNPR (PR#102 p250).

### **13.1.2 Potential cumulative impacts on moose and grizzly bear**

In its DAR Addendum, the developer concluded that potential impacts from recently approved and future developments may have cumulative adverse impacts on wildlife. The developer stated that the All Season Road has the potential to interact with the Prairie Creek Mine (including its airstrip) and the Liard Highway, resulting in adverse impacts on wildlife. CanZinc predicted adverse cumulative impacts on grizzly bear and moose specifically (PR#102 p251).

The developer concluded that the proposed Project would create additional access to moose harvesting by allowing for year-round harvest along the access road (PR#102 p251). Additionally, harvest pressure on moose from the All Season Road may act cumulatively with moose harvest and vehicle collisions with moose along the Liard Highway. In its cumulative effects assessment, the developer predicted cumulative impacts on moose mortality as moderate in significance, local in extent and occurring through all Project phases, or approximately 20 years (PR#102 p251). Mitigation proposed by the developer to reduce cumulative impacts on moose include the implementation of strict access control measures to monitor and manage non Project-related travel and hunting pressure along the All Season Road. In addition, the developer will engage with NBDB annually on any perceived harvest pressure, and take an adaptive management approach to managing impacts (PR#102 p251).

In its cumulative effects assessment, the developer predicted residual impacts on local grizzly bear population recovery in the NNPR from the proposed All Season Road. The developer predicted that Project-related grizzly bear mortality would act cumulatively with bear-human encounters and potential mortality associated with the Prairie Creek Mine (PR#102 p251). The developer concluded that the combined impacts on grizzly bear



mortality are low in significance, local in extent and will occur through all Project phases. The developer will monitor and manage potential cumulative impacts on grizzly bears through the Prairie Creek Mine's Bear Management Plan, which was required under EA0809-002. The developer further advised that it will update the Bear Management Plan to include the All Season Road, and therefore concluded that no further mitigation is required (PR#102 p251).

### **13.1.3 Developer commitments to cumulative effects monitoring**

In its DAR, the developer made commitments to incorporate its wildlife monitoring into broader scale cumulative impacts monitoring in the Dehcho region. The developer committed to integrating its wildlife monitoring efforts with the NWT Cumulative Impact Monitoring Program and to provide the digital footprint of the Project to the Dehcho Land Use Planning Committee (PR#55 p256, 283). Moreover, CanZinc made a commitment that “[m]onitoring data will be compatible with the NWT Cumulative Impact Monitoring Program, where possible” (Appendix C commitment #19).

### **13.1.4 Cumulative effects described in specific chapters in Report of EA**

All additional evidence from parties and the developer on cumulative impacts during the analytical phase and hearing phase are described in specific valued component chapters in this Report of EA, where applicable. The potential for cumulative (additive) impacts on fish and aquatic life resulting from water withdrawal from lakes was raised by parties and is discussed in Section 9.1.11 in the fish and fish habitat chapter of this Report. No other cumulative impacts from the All Season Road in combination with other past, present or reasonably foreseeably developments were raised as an issue of concern by parties during the course of this EA.

## **13.2 Review Board analysis and conclusions**

Approximately half of the All Season Road passes through the NNPR. The Review Board is aware that access to the Prairie Creek Mine is authorized under *An Act to amend the Canada National Parks Act to enlarge Nahanni National Park Reserve of Canada S.C. 2009, c. 17*. Paragraph 41.1(2)(a) of that legislation allows the Minister to enter into leases or licences of occupation or access to the Prairie Creek Mine. In the Review Board's view, future development in the NNPR, apart from tourism, is not likely to occur, as the park excludes all land use activities except tourism and Aboriginal subsistence harvesting within park boundaries (PR#193 pp58-62).

The Review Board does not anticipate any other industrial developments within the NNPR that will, in combination with the All Season Road and other existing developments (e.g., the Prairie Creek mine), cause cumulative impacts on any valued components assessed in this EA. In this Report of EA, the Board has included measures related to traffic management and access, road design to minimize accidents, and measures to prevent significant adverse impacts and monitor project-effects on wildlife and the environment. If the Review Board's recommended measures are fully implemented and their intent is achieved, the Board does not anticipate any significant adverse cumulative impacts on the environment or people from the Project in combination with other developments.

## 14. Closure and reclamation

Closure and reclamation is an important Project phase that the Review Board considered during the environmental assessment of the Prairie Creek All Season Road Project (All Season Road or the Project). The minimum acceptable standard of closure for mining and associated activities in the Mackenzie Valley is to return a development to a healthy, self-sustaining ecosystem, according to the Mackenzie Valley Land and Water Board's closure guidelines<sup>1</sup>. These guidelines define reclamation as "the process of returning a disturbed site to its natural state or which prepares it for other productive uses that prevent or minimize any adverse effects on the environment or threats to human health and safety." The guidelines state that a conceptual closure and reclamation plan commonly identifies residual risks to human and wildlife health, a closure goal, and closure objectives<sup>2</sup>.

The timing of reclamation and the extent to which a site will be reclaimed are important factors that affect the magnitude, duration, and reversibility of impacts, and inform the Review Board's consideration of significant adverse impacts during an EA.

### 14.1 Evidence from parties and the developer

#### 14.1.1 Proposed closure and reclamation plans and activities

In its DAR, the developer explained its approach to closure and reclamation. The developer plans to reclaim the road within six years of closing the Prairie Creek Mine (PR#55 p223). The developer defined reclamation in the following way: "to return land to productive use, as near as possible to its original state" (PR#55 p24). The developer recognized that "road deactivation and closure begins with well-constructed, and inherently stable, road development" (PR#55 p287).

The developer's proposed approach to closure and reclamation involves leaving gravel and the sub-grade in place and completing reclamation work, including grading and scarifying surfaces where appropriate. The developer expected that the following areas with

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<sup>1</sup> INAC/MVLWB Guidelines for the Development of Closure and Reclamation Plans for Advanced Mineral Exploration and Mine Sites in the Northwest Territories (2013). Available through mvlwb.ca.

<sup>2</sup> *Ibid* pp.21-22

significant hill-cuts would require material pull back: Funeral Creek, Polje Creek, and the west side of the Silent Hills. The developer does not expect to have to pull back material at Prairie Creek and Sundog Creek (PR#55 p287).

Regarding structure removal, crossing structures and culverts will be removed, and the developer will temporarily or permanently stabilize the areas near watercourses (PR#55 p286). The developer committed to remove bridges from stream crossings and push back or remove abutments, re-contour hill cuts, install erosion control measures as necessary, and stabilize with natural revegetation (PR#29 p4, PR#55 and PR#355 p5; Appendix C, commitment #64). The developer stated it would likely create cross drains to restore drainage, but that the specific approach for restoring natural drainage would be determined near final deactivation. The developer also committed to monitoring the progress of reclamation activities (PR#355 p5; Appendix C, commitment #66).

The developer said it would complete soil surveys for metals during the last year of operation to identify areas that require remediation (PR#55 p288). The developer also described infrastructure needs to support remediation, saying “road removal and reclamation activities would be supported with temporary trailers providing dining and rest quarters for crews working shifts” (PR#55 p288).

The developer proposed to monitor the progress of reclamation using “low over-flights,” followed by helicopter inspections if problems are suspected. The developer suggested the use of shovels and silt fences to correct problems. Silt fences may be left in place or removed. Monitoring would occur in key areas during the spring, following reclamation, and until “all surfaces have stabilized and vegetation has grown” (PR#55 p288).

The developer submitted a conceptual *Borrow Pit Management and Reclamation Plan* (PR#101 PDF p113) and a conceptual *Road Closure and Reclamation Plan* (PR#101 PDF p150), describing methods that may be used during the reclamation process.

In previous chapters in this Report of EA, the Review Board found that the developer did not provide adequate baseline information (see Chapters 4, 6, 8, 10, 11 and 12 for more information). The Board notes that this information would be necessary to inform planning and actions to restore valued components to pre-disturbance conditions. Parks Canada noticed that the developer “contends that the present condition of the 1981 Prairie Creek permitted winter road demonstrates that the all season road alignment and associated components will readily revegetate (PR#55)” and Parks Canada does not agree with the analogue (PR#452 p55). In response to Parks Canada’s recommendations, the developer committed to incorporating methods like ripping and roughening (Appendix C,

commitment #18) and using local seeds and cuttings to aid in vegetation re-establishment (Appendix C, commitment #s64 and 68).<sup>3</sup>

In its closing arguments, Parks Canada informed the Review Board that with the implementation of commitments #56, 64, 65, 66, 67, 68, 140, 153, and 224 (Appendix C), “PC believes that potential significant adverse impacts to ecosystems can be mitigated” (PR#546 p20-21).

#### **14.1.2 Closure goals and objectives**

The developer’s closure goal is outlined in a commitment (Appendix C, commitment #67):

After Mine closure, if the access road is also to be closed and reclaimed, CanZinc is committed to a reclamation goal of restoring pre-disturbance conditions, as much as possible, including the removal of structures no longer required, subject to the engagement and agreement of all parties.

In its technical report, Parks Canada said it was dissatisfied with reclamation plans, saying the plans lacked clear objectives and predictions of realistic, long-term outcomes (PR#452 p53).

Indigenous and Northern Affairs Canada (INAC) recommended that the developer follow INAC/MVLWB *Guidelines for the Development of Closure and Reclamation Plans for Advanced Mineral Exploration and Mine Sites in the Northwest Territories* for closure and reclamation on Indian Affairs Branch lands (PR#450 p10). The developer did not respond to INAC’s recommendation, but made a general indication that where no response occurred, the developer likely had no problem with the recommendation (PR#484 p1).

### **14.2 Review Board analysis and conclusions**

#### **14.2.1 Summary of Review Board findings**

The Review Board has set out measures in the chapters on accidents and malfunctions, wildlife, water, fish, culture and heritage, vegetation, and permafrost to prevent significant

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<sup>3</sup> For more on vegetation and the irreversibility of certain types of impacts, see Chapter 11 (vegetation) and Chapter 12 (permafrost).

adverse impacts on the environment from the Project. In the Review Board's view, if these measures are implemented, along with the developer's commitments and proposed mitigations, impacts on the environment will be avoided through mitigation and reclamation. Analysis of the evidence from the environmental assessment did show some challenges with regard to closure and reclamation, detailed in the sections that follow, that the Review Board wishes to highlight for regulators. In Section 14.3, the Review Board provides two suggestions in relation to these challenges.

#### **14.2.2 Lack of consensus on future use of the Project area**

The public record shows there are at least nine federal, territorial and Aboriginal organizations that use and manage the Project area. The proposed Project spans lands and waters managed by Parks Canada, the Government of the Northwest Territories, Indigenous and Northern Affairs Canada, and the Mackenzie Valley Land and Water Board. Management responsibilities also overlap under the authority of Environment and Climate Change Canada, Fisheries and Oceans Canada and Natural Resources Canada. Land claim negotiations between the federal and territorial governments and Aboriginal organizations in the Dehcho region are ongoing. Land claim settlements may result in different arrangements for land and resource management in the Project area. The Dehcho Land Use Planning Process may also affect land use designations in the Project area.

The record also shows a number of different land uses in the Project area, including: traditional harvesting and cultural activities, hunting by people who travel in from outside the Dehcho, tourism, and recreation.

In the Review Board's view, these differing mandates, values and activities may create challenges for successful planning and implementation of closure and reclamation in the future. The developer needs to successfully close and reclaim the road to maintain values of NNPR for future generations. In the Review Board's opinion, the road, especially the portion within NNPR, should be closed and reclaimed in a manner suitable for future uses of the area, and guided by applicable values, standards, guidelines, and laws.

In the Review Board's opinion, closure of the road, so that vehicle access cannot occur after the mine operating and closure period, is necessary to reverse potentially significant, unassessed Project impacts on wildlife and other valued components. The Board understands that the Prairie Creek Mine is expected to operate for approximately 17 years and the All Season Road will be closed and reclaimed when the Mine is closed. The scope of

development set out in section 2.1 of this Report of EA includes closure and reclamation of the Project.

### **14.2.3 More information required to return pre-disturbance conditions**

There is a lack of information on baseline conditions.<sup>4</sup> To meet the developer's stated goal of returning the area to pre-disturbance conditions, a better understanding of baseline conditions will be needed. Several of the Review Board's recommended measures include a component related to collection of more baseline, primarily to inform design and mitigations, but the resulting information can also inform closure and reclamation.

### **14.2.4 Conclusion**

The Review Board acknowledges that predictions made for this EA have largely been based on the developer's assumption that many impacts will be limited in duration and reversible. There is a lack of information about pre-disturbance conditions that should be addressed to better inform closure planning and evaluate the effectiveness of reclamation activities. Some impacts, such as permafrost thaw, are likely to be irreversible. Such impacts need to be anticipated and avoided to prevent subsequent impacts on the surrounding environment (e.g., water, vegetation, and ecological integrity in NNPR).

The Review Board has recommended measures in this Report of EA that are intended to prevent significant adverse impacts on the environment, including in relation to permafrost, water, vegetation, and other valued components of the environment. Finally, in the Board's view, planning for closure and reclamation needs to address the current lack of pre-disturbance information and the variety of interests and perspectives on future use of the Project area.

## **14.3 Suggestions**

The Review Board is confident that the regulatory process will adequately address the closure and reclamation of the Project. In order to help address the challenges highlighted in this chapter, and promote closure and reclamation planning that mitigates any long-

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<sup>4</sup> See Chapter 4 for a general discussion, and other chapters for details.



term, adverse impacts from the Project, the Review Board makes the following suggestions to the developer, regulators, and land managers.

#### **Suggestion 14-1**

##### **Suggestion 14-1: Closure and reclamation plans (for the developer)**

In order to prevent post-closure impacts from the All Season Road, the developer should:

- define clear closure principles in consultation with potentially-affected Aboriginal groups, including Nahanni Butte Dene Band, Liidlii Kué First Nation, and Dehcho First Nations, and applicable regulators and land managers; and
- incorporate pre-disturbance information (including vegetation, wildlife, and permafrost conditions) into closure and reclamation planning.

#### **Suggestion 14-2**

##### **Suggestion 14-2: Closure and reclamation plans (for regulators and land managers)**

Regulators and land managers should proceed with closure and reclamation plans along the road alignment in a consistent manner, where appropriate.

## 15. Follow-up

### 15.1 Summary of Review Board findings

As described in previous chapters, the Review Board finds that the Prairie Creek All Season Road Project (All Season Road or the Project) is likely to cause significant adverse impacts on the environment. In order to prevent or minimize impacts on the environment and Aboriginal rights, particularly in light of the lack of certainty discussed in Chapter 4, the Review Board recommends a suite of measures that includes specific mitigations, monitoring (including independent monitoring by Aboriginal groups that were parties<sup>1</sup> to this environmental assessment), reporting, and adaptive management.

Monitoring and reporting are needed to ensure that the Review Board's measures set out in this Report of EA (REA) are effectively implemented and significant adverse impacts on the environment are avoided. Monitoring and reporting are also an essential part of adaptive management. In addition, the Board finds that Traditional Knowledge available from all potentially-affected Aboriginal groups (including Nahanni Butte Dene Band, Liidlii Kué First Nation, and Dehcho First Nations) needs to be appropriately considered in the development and implementation of monitoring programs<sup>2</sup>.

The Review Board acknowledges that parties are concerned about how the Project will affect the environment and Aboriginal rights and want to remain engaged in monitoring activities to ensure they are aware of changes in the environment and to help ensure responsible stewardship occurs. In the Board's view, independent monitoring by Aboriginal groups is also essential in relation to potential impacts from the Project on Aboriginal rights, such as traditional harvesting.

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<sup>1</sup> NBDB, LKFN, and DFN

<sup>2</sup> See Chapter 10 (Culture and Heritage) and Measure 10-1 for more on Traditional Knowledge.

## **15.2 Review Board analysis and conclusions**

### **15.2.1 Follow-up monitoring and reporting to inform adaptive management and evaluate effectiveness of measures**

The Review Board has determined, under subparagraph 128 (1)(b)(ii) of the Act, that significant adverse impacts from the All Season Road are likely. The Review Board has therefore set out mitigation measures in this Report of EA to prevent or otherwise reduce the significance of such impacts. To give full effect to, and derive the best environmental outcomes from these measures, monitoring and reporting are needed to:

- verify that measures are being implemented and evaluate their effectiveness;
- confirm that significant adverse impacts are not occurring;
- test EA predictions; and
- inform adaptive management.

As discussed in Chapter 4, adaptive management is a critical part of the mitigation strategy necessary to prevent significant adverse impacts on the environment. Without adequate monitoring to inform it however, adaptive management is unreliable and unlikely to result in effective mitigation. Monitoring may come from a variety of different programs or mechanisms, such as community-based monitoring, the developer's own monitoring programs, and others.

In consideration of paragraphs 114(c) and 115(1)(c), and section 115.1 of the MVRMA, the Review Board's view is that any monitoring carried out in relation to impacts on the environment should include consideration of Traditional Knowledge in its development and implementation. Chapter 10 details the Review Board's determination that Traditional Knowledge from all Aboriginal parties to this EA has not been adequately considered or incorporated by the developer. Ongoing engagement with potentially-affected Aboriginal groups (including NBDB, LKFN, and DFN) is needed to ensure that local and Traditional Knowledge is considered and used appropriately.

In Chapter 4, the Review Board concludes that lack of baseline and other project-related information combined with lack of confidence in impact predictions and proposed mitigations (including commitments) has resulted in the developer failing to satisfy the burden of proof. In many cases identified throughout this REA, CanZinc has not convinced the Board that impact predictions are accurate and proposed mitigations will be effective.

These issues make monitoring, reporting, and adaptive management especially important as part of the Review Board's mitigation strategy in this EA.

### **15.2.2 Aboriginal engagement and monitoring**

Section 115 of the *Mackenzie Valley Resource Management Act* (MVRMA or the Act) requires the EA process to have regard to the well-being and way of life of Aboriginal peoples. As described throughout this Report of EA, particularly in Chapters 4, 9, and 10, the Project area is important to and used by Aboriginal people. Throughout the EA process and its deliberations, the Review Board has, therefore, given due consideration to impacts on the rights, well-being, and way of life of Aboriginal peoples. Chapter 7 focuses specifically on traditional harvesting (with linkages to wildlife in Chapter 6, and access control discussions in Chapter 5).

Parties are concerned about how the Project will affect the environment and Aboriginal rights (such as harvesting), well-being, and way of life, and want to remain engaged in monitoring activities to ensure responsible stewardship occurs. Potentially-affected Aboriginal groups and government departments that were parties to this EA have requested involvement in the development, review, approval, and implementation of environmental monitoring programs for the Project (PR#549 p22; PR#546 p33; PR#550 p2; PR#544 p4; PR#545 p5).

#### ***Engagement and monitoring by Aboriginal groups***

For government departments and agencies, their respective mandates give them the authority to review and approve monitoring plans as required. However, the Review Board notes that this same level of participation is not guaranteed for the Aboriginal groups that participated in this EA. The Review Board acknowledges that public review and engagement with Aboriginal groups is an important and required component of the regulatory processes conducted by the Mackenzie Valley Land and Water Board, throughout the life of a Project. However, this is not necessarily the case for federal or territorial government agencies that will also issue authorizations related to the Project. For example, it is not clear to the Review Board whether Parks Canada has a process for public engagement in the review of authorizations and plans required under Parks Canada's jurisdiction. As a result, the Review Board strongly encourages all regulators to use best practices to facilitate participation of Aboriginal groups and the public in review of authorizations and related management and monitoring plans for the Project.

In the preceding chapters of this Report of EA, the Review Board recommends several measures that include monitoring and adaptive management and are intended to prevent significant adverse impacts on the environment and on Aboriginal rights. The Review Board finds that, together with all the other measures in this Report of EA, independent monitoring by Aboriginal groups is needed to prevent these impacts, ensure Traditional Knowledge is used effectively, and address concerns. However, the Review Board also believes that the Aboriginal groups themselves should design and manage their monitoring initiatives so that the programs are truly reflective of their concerns and priorities.

In response to a question from Review Board Member David Krutko, DFN described its community-based water monitoring program and reiterated its suggestion that there could be a role for Nahanni Butte or LKFN members to be involved in monitoring the road through that program (PR#525 p229). LKFN indicated in its closing arguments that it remains concerned about significant adverse impacts on water from a variety of sources and indicated that it supports ECCC's recommendations that the Review Board should require that affected First Nations, including LKFN, be involved in baseline studies and monitoring (PR#550 p3; Appendix D, LKFN recommendations #4 and #6)<sup>3</sup>.

As noted above, Aboriginal groups and other parties to this EA have requested involvement in monitoring programs. These requests reflect the parties' outstanding concerns about the potential impacts of the Project on the environment and Aboriginal rights (described throughout this Report of EA), as well as the uncertainties outlined in Chapter 4. The Review Board also views these requests as indicating that parties wish to ensure that their concerns are addressed and values are respected through appropriate environmental stewardship and ongoing communication, throughout the life of the Project.

Monitoring by Aboriginal groups will also help make sure Traditional Knowledge is considered and used appropriately.

### ***CanZinc commitments to community involvement in environmental management***

The Review Board understands that CanZinc has made commitments relevant to community involvement in environmental management, including:

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<sup>3</sup> For more on community involvement in monitoring, see Chapter 15.

- the development of a Technical Advisory Committee (TAC) for the mine and all season road (Appendix C, commitment #190); and
- hiring local environmental monitors from NBDB for the road, who would be employees of Canadian Zinc (PR#553 pp4/52).

While the Review Board acknowledges that these commitments may help to mitigate potential adverse impacts of the project, it finds that they are not sufficient because:

- The TAC has no mandate to conduct on the land investigations, beyond an annual site tour, and as such is limited in its ability to fully understand Project effects or suggest appropriate mitigations.
- If the developer's community monitors for the road are sourced solely from NBDB, there would be no role in monitoring or mitigation of the Project for members from other potentially-affected groups and their specific concerns or values.
- Relying solely on the developer's community monitors would result in no independent oversight of road construction or operation activities.
- The tasks of the environmental monitors, as described by CanZinc, include "observing conditions, collecting data including monitoring data, inspecting... and assisting with road use and access control monitoring" (PR#553 pp4/52). This is a varied and large mandate that may be difficult to achieve with limited personnel.

Also, in its closing argument, DFN states that the developer's mitigations place a significant burden on community-based monitors as the primary mechanism of access management (PR#549 p17). The Review Board agrees with DFN's concerns and observes that the capacity of CanZinc's proposed environmental monitoring team is likely to be outweighed by the proposed duties expected from these environmental monitors.

The Review Board finds that CanZinc's existing commitments will not facilitate the independent monitoring by Aboriginal groups that the Board views as necessary to ensure significant adverse impacts on the environment and on Aboriginal rights are avoided throughout the life of the Project.

### **15.3 Measures and suggestions**

The measures below set out the monitoring (including community-based monitoring) and reporting that are needed to inform adaptive management to prevent impacts that would otherwise be significant and to follow up on the implementation and effectiveness of mitigation measures.

## **Measure 15-1**

Many of the developer's own monitoring programs have already been created for the mine or winter road, or are in draft form for the All Season Road. This measure requires CanZinc to ensure that its monitoring programs meet the necessary objectives to reliably support the adaptive management frameworks and to monitor the effectiveness of all measures in this Report of EA. These general objectives must be incorporated into all monitoring programs that are identified in measures, either by revising existing programs or creating new ones, to ensure robust monitoring is carried out in relation to all of the measures. Where applicable, additional specific requirements are set out in the individual measures.

### **Measure 15-1: Monitoring by the developer**

#### **15-1, Part 1: Objectives**

In order to ensure that the measures the developer is responsible for are fully and effectively implemented and to inform adaptive management throughout all phases of the development, the developer will establish and implement monitoring programs that fulfill the following objectives:

- i. to measure the effects of the Project on the environment;
- ii. to assess the implementation and effectiveness of the measures in this Report of EA for preventing or minimizing impacts on the environment;
- iii. to inform the implementation of the adaptive management frameworks required by measures in this Report of EA, so that mitigation can be adjusted to ensure significant adverse impacts do not occur;
- iv. to assess the accuracy of the developer's predictions made during the environmental assessment, regarding the impacts of the Project on the environment; and
- v. where applicable, to provide relevant data and information to support other monitoring initiatives (such as Aboriginal monitoring initiatives and government monitoring).

These objectives must be incorporated into all monitoring programs that are identified in measures in this Report of EA, either by revising existing programs or creating new programs.



### **15-1, Part 2: Traditional knowledge and inclusion of Aboriginal groups**

The developer will engage and consider the advice of Nahanni Butte Dene Band, Liidlii Kué First Nation, and Dehcho First Nations, and consider all available Traditional Knowledge when developing its monitoring programs.

To the extent possible, the developer will involve potentially-affected Aboriginal groups, including Nahanni Butte Dene Band, Liidlii Kué First Nation, and Dehcho First Nations, in the implementation of the developer's monitoring programs.

### **Measure 15-2**

Parties expressed concern about the implementation and effectiveness of the developer's proposed mitigations. In addition to informing adaptive management (see Section 4.2), reporting is needed to demonstrate to the Review Board, parties and the public, that the developer is implementing the EA measures it is responsible for, and that the measures are fulfilling their intended purpose.

The developer may coordinate the reporting requirements of this measure with other reporting that it carries out. This measure is not intended to duplicate regulatory requirements, but to report specifically on the implementation of EA measures, including adaptive management requirements. The report can reference and rely on more detailed information that may be found in regulatory reports. This report on measures should be concise and use plain language, and must clearly satisfy the requirements listed below. The Review Board will receive the annual report required below and publish it to the Review Board's registry so it is accessible to the parties and the public.<sup>4</sup>

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<sup>4</sup> Also, in the Review Board's view, the systematic evaluation and reporting required through the measures below will help the Review Board learn more about the practical implementation of EA measures, and thereby improve future EAs and EA measures. These reporting and follow-up measures may also help inform regulators, inspectors, responsible ministers, and parties as they carry out their respective roles in future EAs and in the integrated resource management system in the Mackenzie Valley.

### **Measure 15-2: Annual reporting from the developer**

In order to demonstrate how measures are being implemented and to evaluate the effectiveness of the developer's efforts to prevent or minimize impacts on the environment, the developer will, throughout all phases of the development, prepare an annual Report on the Implementation of Measures. The Report will address the measures that the developer is responsible for and will:

- i. Describe the actions, including actions implemented through adaptive management, being undertaken to implement the measures.
- ii. Evaluate how effective the implementation actions are in controlling, reducing, or eliminating the impact (considering the results of monitoring programs and adaptive management frameworks). Where applicable, provide references to further information contained in other management plans or monitoring reports.

The developer will provide a copy of this annual report to the Review Board by June 30 of each year, following the commencement of construction of the Project.

The developer will also report in person annually, in a culturally appropriate way, to Nahanni Butte Dene Band, Liidlii Kué First Nation, and Dehcho First Nations.

### **Measure 15-3**

Regular reporting is needed to demonstrate that the measures in this Report of EA are being implemented and are fulfilling their purposes. Given that this Report of EA includes some measures specifically directed to regulatory authorities or government, and others which they are in part responsible for implementing (under subsection 130(5) of the Act), government and regulatory authorities must play a role in follow-up and reporting to ensure the measures are effective.

The Review Board hopes that communication about what government and regulators are doing to make sure EA measures are implemented can help strengthen the linkages between the different parts of the integrated system of resource management in the Mackenzie Valley. In particular, this communication can better connect, for the public and all participants in the resource management system, the significance determinations and EA measures required for Project approval with the regulatory process throughout the life of Project operations.

The Review Board will receive the reports required below, publish them to the Review Board's registry so they are accessible to the parties and the public, and learn from them to improve future EAs and EA measures.

**Measure 15-3: Annual reporting from government and regulatory authorities**

In order to evaluate the effectiveness of mitigation measures for the protection of the environment, each regulatory authority or government that is wholly or partly responsible for implementation of any measure in this Report of EA will prepare an annual Report on Implementation of Measures. The Report will:

- a) describe the actions being undertaken to implement the measures or the part(s) of the measures for which the regulatory authority or government is responsible; and
- b) explain how these actions, including those implemented through adaptive management, fulfill the intent of the EA measures, including consideration of the following questions:
  - i. How are implementation actions addressing a likely significant adverse impact on the environment?
  - ii. How effective are implementation actions at reducing, controlling, or eliminating the impact or its likelihood?

Government and regulators will provide a copy of this annual report to the Review Board by June 30 of each year.

**Measure 15-4**

In the preceding chapters of this Report of EA, the Review Board recommends several measures that are intended to prevent significant adverse impacts on the environment and Aboriginal rights. The Review Board finds that, together with all the other measures in this Report of EA, monitoring by Aboriginal groups is needed to prevent these impacts. Such monitoring will also help ensure Traditional knowledge is considered in monitoring and available to inform environmental management. However, the Review Board is not setting specific monitoring requirements or requiring any particular program; the monitoring programs should be designed and managed by the local Aboriginal groups themselves. The Measure below requires the developer to fully support, to the greatest extent practicable, monitoring initiatives undertaken by the Aboriginal groups that were parties to this EA.

#### **Measure 15-4: Support Aboriginal monitoring initiatives**

To help prevent significant adverse impacts on the environment and on Aboriginal rights, the developer will support, to the greatest extent practicable, independent monitoring of the Project area through monitoring initiatives undertaken by Nahanni Butte Dene Band, Liidlii Kué First Nation, and Dehcho First Nations. The developer will provide access to the All Season Road for these Aboriginal groups to conduct their monitoring activities throughout all phases of the Project, whenever it is safe to do so. The developer will also provide in-kind support for independent community monitors to conduct their monitoring activities (e.g., accommodations, meals, transportation and appropriate safety training to operate on the road).

#### **Suggestion 15-1**

Many measures in this Report of EA require the development and implementation of an adaptive management framework, and make reference to the requirements set out in Appendix B.

The suggestion below encourages the developer and regulators to apply the adaptive management principles in Appendix B to management and monitoring plans associated with the Project, even where such plans are not specifically addressed in the measures of this Report of EA.

#### **Suggestion 15-1: Systematic adaptive management in all applicable plans**

The Board encourages the developer to incorporate adaptive management principles (e.g., action levels, management responses, etc.), based on Appendix B of this report, into all relevant management plans and monitoring programs. The Review Board encourages regulators to consider these adaptive management principles when setting regulatory requirements and when reviewing and approving management plans and monitoring programs.

### **Suggestion 15-2**

The suggestion below encourages all regulatory authorities to provide opportunities for engagement of Aboriginal groups in regulatory processes.

#### **Suggestion 15-2: Public review process for regulatory authorizations and plans**

The Review Board strongly encourages all regulators to provide opportunities for engagement of Aboriginal groups in review of authorizations and related management and monitoring plans for the Project. (For example, the Mackenzie Valley Land and Water Board's standard practice is to request input from Aboriginal groups and other interested or affected parties on all regulatory decisions).

### **Suggestion 15-3**

The Review Board acknowledges the existing public registry hosted by the Mackenzie Valley Land and Water Board, but the Review Board is not familiar with Parks Canada's practices with regard to public access to regulatory documents. In the suggestion below, the Review Board encourages Parks Canada and the Land and Water Board to consider sharing or coordinating public registries for regulatory documents related to the Project, in order to support Aboriginal groups' and the public's awareness of and participation in regulatory processes.

The Review Board also notes that the Project is located across numerous jurisdictions and encourages regulators to take a coordinated approach, to the extent practicable.

#### **Suggestion 15-3: Regulatory coordination, including coordination of public registries**

The Review Board encourages all regulatory authorities to take a coordinated approach, to the extent practicable, to minimize duplication and promote consistency.

The Review Board suggests that Parks Canada investigate sharing the Mackenzie Valley Land and Water Board's public registry or developing a coordinated registry for regulatory documents related to the Project.

### **Suggestion 15-4**

The Review Board acknowledges CanZinc's commitment to expanding the mandate of the TAC to include the All Season Road, and to include representation from all affected Aboriginal groups that participated in the EA. The Review Board appreciates and encourages these commitments, but suggests that the TAC could be further expanded to help alleviate community concerns and further improve Project design and operations.

#### **Suggestion 15-4: Expand the mandate of the TAC**

The Review Board suggests that the mandate and activities of the TAC be expanded, such that the TAC can design and approve its own Terms of Reference, including consideration of:

- i. the frequency, objectives and scope of site visits; and
- ii. input into adaptive management frameworks including setting appropriate and protective action levels;
- iii. ways the TAC can support or compliment the Aboriginal monitoring initiatives referred to in Measure 15-4, such as:
  - o ensuring that Traditional Knowledge is collected and used appropriately,
  - o sharing resources, and
  - o providing a venue for addressing community concerns and reporting to communities.

## **16. Maximizing benefits and minimizing impacts on communities**

During this Environmental Assessment (EA) the Review Board heard consistent support for the Prairie Creek All Season Road Project (All Season Road or the Project) from the Nahanni Butte Dene Band (NBDB) and community members in Nahanni Butte. In the Board's view, there will be benefits to communities from the Project. However, the Review Board's mandate under the Mackenzie Valley Resource Management Act is to prevent significant adverse impacts on the environment from the Project. While this chapter summarizes the support for the Project from communities heard by the Board, the bulk of this Report of EA is focussed on preventing significant adverse impacts.

This chapter briefly summarizes how the developer proposes to maximize benefits and minimize impacts from the All Season Road on potentially-affected communities and provides the Review Board's analysis and conclusions.

### **16.1 Evidence from the parties and the developer**

During the environmental assessment of the Prairie Creek Mine and Winter Road (EA0809-002) in 2011, the developer signed a Socio-economic Agreement (PR#385) with the GNWT in order to maximize benefits to potentially-affected communities. Among other benefits, this agreement creates a tiered approach for the developer to prioritize hiring and procurement opportunities for Impact Benefit Agreement (IBA) communities, Nahendeh Aboriginal Economic Council (NAEC) communities, Dehcho communities, Aboriginal persons, and residents of the Northwest Territories (PR#385 p7).

In its DAR, CanZinc stated that the All Season Road will be incorporated into the existing Socio-economic Agreement (PR#55 p269). CanZinc confirmed this in a letter to GNWT dated August 14, 2014 advising that the "All Season Road and Airstrip Project, if approved and permitted, will become a part of the broader Prairie Creek Mine Project, and that the definition of "Project" in Appendix A of the Socio-economic Agreement would encompass the All Season Road and Airstrip Project" (PR#38 p1).

In 2011, CanZinc signed Impact Benefit Agreements with the NBDB and Liidlii Kué First Nation (LKFN) for the EA0809-002. In its DAR, the developer described some of the non-confidential provisions of the Impact Benefit Agreements and advised that they "will be retained for the all season road" (PR#55 p269).



In addition to these agreements to maximize benefits to communities, the developer proposes to minimize potential impacts on Nahanni Butte by banning employees at the Liard River camp from accessing the community of Nahanni Butte. Specifically, in its DAR, CanZinc committed to (Appendix C, commitment #11):

[...] restrict road crews from accessing Nahanni Butte (the only proximal community) by including this requirement in contracts for the work. The only exceptions would be if construction personnel are leaving or arriving at the Nahanni Butte airstrip, in which case they will be required to go directly to and from the airstrip only, and if personnel are invited by, and accompanied by, community members.

During the April 24 2017 community hearing in Nahanni Butte (Figure 16-1 and Figure 16-2), residents expressed overwhelming support for the mine and the employment opportunities it would bring, particularly for youth. As stated by the community's Senior Administrative Officer (PR#519 p68):

Elders have made it abundantly clear...they want to see this road happen in their lifetime. They see it as being critical to the well-being of the community, and the well-being of youth especially.

Over 30 Nahanni Butte residents, or approximately 30% of the entire community, travelled to Fort Simpson to participate in the technical public hearings. Nahanni Butte community members at the Fort Simpson hearing once again expressed support for the All Season Road to the Review Board. Band councillor Jayne Konisenta summarized the band's position, saying (PR#528 pp202-204):

We wanted to put the road through so that we can have employment. And in regards to the environment, we're always taking care of that. There's only 90 of us... all of our relatives have gone and moved over with their children. So that's because our community has no work. We want to create employment for our children, for our young women and men.



**Figure 16-1: Public hearing in Nahanni Butte April 24, 2017.**  
(Review Board photo)



**Figure 16-2: NBDB member speaking at public hearing, April 24, 2017.**  
(Review Board photo)

## **16.2 Review Board analysis and conclusion**

The Review Board acknowledges the efforts that the developer has made to engage with the NBDB throughout the regulatory and EA process to date. The Review Board further accepts that the existing Socio-economic Agreement and Impact Benefits Agreements with NBDB and LKFN will apply to the All Season Road.

Based on the evidence on the record, the Review Board observes that community members in Nahanni Butte as well as the Chief and Council support the All Season Road. During the public hearing in Nahanni Butte, the Board clearly heard community members speak in support of the Project. The Board also heard support for the Project during the hearing from residents of Fort Simpson. The Board accepts that there is broad support for the employment opportunities that the All Season Road will provide in the communities of Nahanni Butte and Fort Simpson.

The other chapters in this Report of EA focus on the Review Board's central mandate of assessing and preventing significant adverse impacts on the environment from the Project.

## 17. Conclusion

Considering the uncertainties that remain due to inadequate baseline information, insufficient Project design and unclear commitments, CanZinc has failed to meet the burden of proof required by the Review Board. In light of the sensitive setting where the Project is proposed, the Review Board has taken a precautionary approach in its deliberations.

Based on a careful consideration of all the evidence on the public registry, the Review Board finds that the Project is likely to have significant adverse impacts on the environment, and has prescribed measures that will mitigate these impacts. These measures will also address any public concern related to these impacts.

Some of these measures include requirements to:

- create an Independent Technical Review Panel, to ensure that the road is designed to a standard that is highly protective of people and the environment;
- create a *Traffic Control Mitigation and Management Plan*;
- conduct systematic wildlife monitoring and adaptive management incorporating Traditional Knowledge;
- prepare a *Wildlife Management and Monitoring Plan*;
- install stations to collect baseline water flow data, to use when designing water crossings;
- collect detailed baseline information, monitor effects and make an adaptive management framework for the Sundog Creek diversion;
- further engage Traditional Knowledge holders about cultural and heritage resources in the Project area, and conduct an Archaeological Impact Assessment incorporating this Traditional Knowledge;
- conduct a rare plant survey to form the basis of a *Rare Plant Management Plan*;
- conduct permafrost investigations to inform road design and appropriate permafrost mitigations;
- create a *Permafrost Management Plan* with systematic permafrost monitoring and adaptive management; and
- support independent community monitoring of the Project.

Each of the above plans will include monitoring, evaluation and adaptive management of impacts, including appropriate and timely mitigation. The Review Board has provided detailed requirements of adaptive management in this report.

The Review Board believes that the combination of measures it has recommended will mitigate the significant adverse impacts it has identified. These measures will:

- ensure that the road is designed to a high standard of safety;
- better manage traffic to improve safety for Project traffic and any other traffic;
- help CanZinc and regulators predict, identify, and manage impacts adaptively;
- identify important wildlife areas and wildlife crossings to reduce traffic impacts;
- ensure that Aboriginal parties have the opportunity to provide relevant Traditional Knowledge;
- better involve Aboriginal parties in Project monitoring;
- design appropriate water crossings;
- identify and avoid rare plants; and
- protect permafrost along the road.

With these and other measures to mitigate identified impacts, the Review Board has concluded that the Project may proceed to the regulatory phase for approvals. By addressing the significant adverse impacts in these and other ways, the Project will be improved, and meaningful actions will mitigate the significant impacts that would otherwise occur.

## Appendix A – Review Board measures and suggestions

Chapter	Measure
5. Human safety	<p><b>Measure 5-1: Independent technical review panel</b></p> <p><b>5 -1, Part 1: Introduction</b></p> <p>In order to prevent significant adverse impacts on people and the environment, CanZinc will establish and fund an independent technical review panel to evaluate and approve the final road design. The developer will follow the final recommendations of the review panel with respect to road design. CanZinc will develop a terms of reference for the panel based on the requirements of this measure.</p> <p><b>5 -1, Part 2: Panel mandate</b></p> <p>The mandate of the independent technical review panel will be to provide independent expert advice and recommendations on the design and construction of the road to minimize: traffic related accidents, road failure or malfunctions, and any resulting significant adverse impacts on human safety or the environment.</p> <p>The panel will ensure that the road is designed and constructed to an appropriate standard that is highly protective of people and the environment, including consideration of :</p> <ol style="list-style-type: none"> <li>i. the number and type of mine and non-mine related vehicles expected to use the road;</li> <li>ii. two-way traffic;</li> <li>iii. human safety and minimizing traffic related accidents;</li> <li>iv. permafrost degradation and impacts on water quality; and,</li> <li>v. appropriate road design criteria, including but not limited to:             <ul style="list-style-type: none"> <li>○ watercourse crossings;</li> <li>○ right of way clearing width;</li> <li>○ road alignment, grades, subgrade width, and road widening at curves;</li> <li>○ cut and fill slopes, cut and fill slope angles, slope stability; and</li> <li>○ number of, and distance between, pullouts.</li> </ul> </li> </ol> <p><b>5 -1, Part 3: Panel composition</b></p> <p>At a minimum, the panel will be comprised of three members who are professional engineers and geoscientists. The panel must have expertise in northern road design, including permafrost and mountainous terrain experience. Members of the panel will have knowledge and experience to appropriately address the mandate in Measure 5-</p>

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	<p>1 part 2 and considerations in Measure 5-1 part 5. CanZinc will engage with Parks Canada, the Mackenzie Valley Land and Water Board, the Government of the Northwest Territories, Nahanni Butte Dene Band, Liidlii Kué First Nation, and Dehcho First Nations on the panel composition. Members of the panel will be independent and will be approved by the Mackenzie Valley Land and Water Board and Parks Canada.</p> <p><b>5 -1, Part 4: Panel activities and timing</b></p> <p>The panel will be established prior to detailed design of the road. CanZinc will engage with Parks Canada, the Mackenzie Valley Land and Water Board, the Government of the Northwest Territories, Nahanni Butte Dene Band, Liidlii Kué First Nation, and Dehcho First Nations on the panel activities. CanZinc will provide the panel’s reports to Parks Canada and the Mackenzie Valley Land and Water Board. At a minimum, the panel will complete the activities listed below.</p> <ul style="list-style-type: none"> <li>i. Prior to detailed design of the road: <ul style="list-style-type: none"> <li>o review and comment on the Panel’s terms of reference.</li> </ul> </li> <li>ii. During detailed design of the road: <ul style="list-style-type: none"> <li>o work with CanZinc to review updated information, design plans, and detailed design work, including the terrain stability assessments undertaken for the proposed cut and fill slopes, and the developer’s detailed interpretation of the permafrost conditions at the site upon completion of geotechnical site investigation work; and,</li> <li>o provide advice and recommendations for improving road design, following the mandate above, and considering construction, operations and maintenance, closure and reclamation, and temporary closure.</li> </ul> </li> <li>iii. Following detailed design of the road: <ul style="list-style-type: none"> <li>o review the detailed design documents for the road;</li> <li>o provide a preliminary report to CanZinc on the panel’s findings and conclusions, including any additional or outstanding recommendations;</li> <li>o review CanZinc’s response and justification for any recommendations the developer does not wish to follow;</li> <li>o prepare and submit a final report to CanZinc that includes the panel’s findings and conclusions on the final design.</li> </ul> </li> <li>iv. During construction:</li> </ul> <p>work with the developer and regulatory authorities to determine the frequency and</p>



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	<p>nature of the panel’s activities during construction (at a minimum, the panel will be consulted and have the opportunity to revise its final report if any material changes to design are made following the panel’s report).</p> <p><b>5-1, Part 5: Other panel considerations</b></p> <p>The independent technical review panel will also consider any relevant information on the record from EA1415-01, information gathered as a result of relevant CanZinc commitments, and the requirements and outcomes of Review Board measures. This includes, but is not limited to:</p> <ul style="list-style-type: none"> <li>i. the updated risk assessment (Appendix C, commitment #241);</li> <li>ii. terrain stability assessment reports (Appendix C, commitment #137) and any additional mitigation required to address instability;</li> <li>iii. avalanche related information (Appendix C, commitment #114; Suggestion 5-1);</li> <li>iv. individual detailed borrow site plans and designs (Appendix C, commitment #119);</li> <li>v. geotechnical, geophysical, permafrost, and hydrological investigations (Appendix C, commitments #129, #156, #232, #235; Measure 12-1; Measure 8-1);</li> <li>vi. the Traffic Control Mitigation and Management Plan (Measure 5-2);</li> <li>vii. relevant management plans and proposed mitigations;</li> <li>viii. extreme weather events;</li> <li>ix. climate change; and,</li> <li>x. karst features.</li> </ul>
5. Human safety	<p><b>Measure 5-2: Traffic Control Mitigation and Management Plan</b></p> <p><b>5-2, Part 1: Introduction</b></p> <p>In order to prevent significant adverse impacts from the Project on human safety, water quality, and wildlife from accidents and increased harvest along the road, CanZinc will create a Traffic Control Mitigation and Management Plan. The purpose of the plan is to manage access control mitigations and all traffic on the road, including mine and non-mine traffic. The plan will consider all Project phases (construction, operation, closure [including temporary closure]) as well as seasonal or weather related closure. This plan will replace Section 7.1 of the Road Operations</p>

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	<p>Plan.</p> <p>Prior to construction, the developer will submit this plan to the Mackenzie Valley Land and Water Board and Parks Canada for approval, as a condition of respective land use permits. CanZinc will operate in accordance with the approved plan.</p> <p><b>5-2, Part 2: Managing traffic on the road</b></p> <p>CanZinc will include all the mitigations it has identified for controlling non-mine traffic on the road in the Traffic Control Mitigation and Management Plan. The plan will describe roles and responsibilities for non-mine traffic mitigation and monitoring. At a minimum CanZinc will:</p> <ul style="list-style-type: none"> <li>i. exercise its right to control access on the lease parcels at the Liard River to control non-mine traffic;</li> <li>ii. operate a checkpoint when haul trucks are using the road and document all traffic known to be on the road; and</li> <li>iii. install signs indicating that the road is operated as a mine haul road and any public traffic using the road does so entirely at its own risk.</li> </ul> <p>In the Traffic Control Mitigation and Management Plan, CanZinc will also address mitigation and management strategies for all traffic on the road, including how this relates to the Journey Management System that CanZinc intends to use for mine traffic. Mitigations to increase safety on the road with both mine and non-mine traffic present should consider:</p> <ul style="list-style-type: none"> <li>a) the independent technical review panel’s conclusions on road design and safety; and,</li> <li>b) data sources that can provide information about high wildlife collision areas and non-mine traffic presence (such as wildlife camera traps [see Measure 6-3] and the harvest monitoring program[see Suggestion 7-1]).</li> </ul> <p>CanZinc will monitor non-mine traffic on the road and establish adaptive management, following the guidance in Appendix B of this Report of EA, within the Traffic Control Mitigation and Management Plan.</p>
5. Human safety	<p><b>Suggestion 5-1: Avalanches (for the developer)</b></p> <p>In order to reduce the likelihood of potential adverse impacts on human safety and</p>

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	<p>Project infrastructure resulting from avalanches, the Review Board suggests the developer implement the following recommendations, prior to construction in high avalanche risk areas, based on the Alpine Solutions report<sup>1</sup> and CanZinc’s commitments.</p> <ul style="list-style-type: none"> <li>i. Review and update the avalanche hazard maps based on the final road alignment.</li> <li>ii. Complete a helicopter based reconnaissance in order to refine avalanche path locations and hazard areas. The helicopter based access will allow for ground based assessments in select areas. This reconnaissance could be completed in summer or winter.</li> <li>iii. Prepare an Avalanche Hazard Management Plan prior to construction. The plan will specify all measures employed to reduce risk to vehicles and occupants. This plan could be stand-alone or housed within the Emergency Response Plan (Appendix C, commitment #244).</li> <li>iv. If CanZinc or the independent technical review panel determine that more detailed avalanche risk assessment is required, complete a linear risk analysis. A typical method which can be used to compare with other industrial roads is the ‘Avalanche Hazard Index’.<sup>2</sup></li> <li>v. Incorporate the potential impacts of avalanches on crossings structures near avalanches paths (see also Appendix C, commitment #116).</li> <li>vi. Use all avalanche assessment and mapping information, including relevant mitigation options identified in the Alpine Solutions report, when updating the Road Operations Plan and the Avalanche Hazard Management Plan.</li> <li>vii. Provide the results of the above work to the independent technical panel (Measure 5-1).</li> </ul> <p>The Review Board acknowledges that there may be new or preferred methods of completing the above work and preventing significant impacts from avalanches and encourages the developer to use these where applicable.</p>
5. Human safety	<p><b>Suggestion 5-2: Avalanches (for regulators)</b></p> <p>The Review Board suggests that the Mackenzie Valley Land and Water Board and</p>

<sup>1</sup> PR#178 PDF p49.

<sup>2</sup> Schaerer, P. 1984. The Avalanche-Hazard Index. National Research Council of Canada. Annals of Glaciology, 13, 1989, p.241-247.

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	Parks Canada consider the Alpine Solutions recommendations, CanZinc’s commitments, and Suggestion 5-1 when setting land use permit conditions.
6. Wildlife and wildlife habitat	<p><b>Measure 6-1: Wildlife Management</b></p> <p><b>6-1, Part 1: Wildlife baseline information collection, monitoring, mitigation and adaptive management program</b></p> <p>In order to reduce adverse impacts on wildlife and wildlife habitat so they are no longer significant, the developer will collect additional wildlife baseline information to be integrated with mitigation, focused monitoring, and a systematic approach to adaptive management.</p> <p>In order to accomplish this, CanZinc will:</p> <ol style="list-style-type: none"> <li>i. collect baseline data as described in Part 2 of this measure;</li> <li>ii. monitor wildlife and wildlife habitat during construction and operations as described in Part 3;</li> <li>iii. incorporate Traditional Knowledge in developing and implementing a monitoring program; and,</li> <li>iv. develop and implement an adaptive management framework to manage impacts on wildlife.</li> </ol> <p><b>6-1, Part 2: Collection of baseline wildlife information for caribou, collared pika and bird species at risk that occur in the area</b></p> <p>The purpose of this baseline information collection is to confirm the presence or absence of listed wildlife species in the Project area, their population size, seasons of use and important habitat for species described below in the All Season Road corridor. In order to support Part 1, the developer will:</p> <ol style="list-style-type: none"> <li>a) submit a baseline survey plan for review and approval to Parks Canada within the NNPR and to GNWT on territorial lands;</li> <li>b) conduct baseline surveys for northern mountain caribou, boreal caribou, collared pika, and bird species at risk;</li> <li>c) use recognized methods and standards approved by Parks Canada within NNPR, by GNWT on territorial lands, and by ECCC for species at risk;</li> <li>d) conduct surveys at the direction and approval of Parks Canada within NNPR and of the GNWT on territorial lands;</li> </ol>

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	<ul style="list-style-type: none"> <li>e) complete surveys prior to road construction;</li> <li>f) share its baseline wildlife information with Aboriginal organizations, including NBDB, LKFN and DFN; and,</li> <li>g) present the results of its baseline information collection with Aboriginal organizations, including NBDB, LKFN and DFN, in a culturally-appropriate way.</li> </ul> <p><b>6-1, Part 3: Wildlife monitoring programs</b></p> <p>In order to reduce adverse impacts on wildlife so they are no longer significant, the developer will prepare and implement a systematic monitoring program(s) for wildlife that may be affected by the Project.</p> <p>The developer will:</p> <ul style="list-style-type: none"> <li>a) submit monitoring program(s) for review and approval to Parks Canada within the NNPR and GNWT on territorial lands;</li> <li>b) focus on monitoring of northern mountain caribou, boreal caribou, collared pika, and bird species at risk;</li> <li>c) use recognized methods and standards approved by Parks Canada within NNPR, by GNWT on territorial lands, and by ECCC for species at risk;</li> <li>d) conduct monitoring through all phases of the Project;</li> <li>e) formalize monitoring programs within the Wildlife Management and Mitigation Plan (Measure 6-2);</li> <li>f) provide annual monitoring reports to Parks Canada, GNWT, ECCC, NBDB, LKFN and DFN;</li> <li>g) share its wildlife monitoring data with Aboriginal organizations including NBDB, LKFN and DFN; and,</li> <li>h) present the results of its wildlife monitoring programs to Aboriginal organizations, including NBDB, LKFN and DFN, in a culturally appropriate way.</li> </ul>
6. Wildlife and wildlife habitat	<p><b>Measure 6-2: Wildlife Management and Monitoring Plan (WMMP)</b></p> <p><b>6-2, Part 1: GNWT to require a WMMP</b></p> <p>In order to reduce adverse impacts on wildlife and wildlife habitat so they are no</p>

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	<p>longer significant, GNWT will require the developer to prepare and implement a Wildlife Management and Monitoring Plan. The GNWT will :</p> <ul style="list-style-type: none"> <li>a) require that the developer prepare a WMMP under the legal authority of Section 95(1) of the <i>Wildlife Act</i> for portions of the Project in its jurisdiction; and</li> <li>b) include opportunity for public review of and comment on the final WMMP prior to construction and on updates to the WMMP throughout the life of the Project.</li> </ul> <p><b>6-2, Part 2: Parks Canada to require a WMMP</b></p> <p>In order to reduce adverse impacts on wildlife and wildlife habitat so they are no longer significant, Parks Canada will require the developer to prepare and implement a Wildlife Management and Monitoring Plan. Parks Canada will:</p> <ul style="list-style-type: none"> <li>a) require that the developer prepare a WMMP as a condition of an authorization for the portions of the road in its jurisdiction; and</li> <li>b) include opportunity for public review of and comment on the final WMMP prior to construction and on updates to the WMMP throughout the life of the Project.</li> </ul> <p><b>6-2, Part 3: Developer to prepare and implement a WMMP</b></p> <p>The developer will:</p> <ul style="list-style-type: none"> <li>a) update its draft WMMP to include all commitments and mitigations agreed to or recommended by its consultants throughout the EA;</li> <li>b) develop an adaptive management framework that links the results of monitoring with adjustments to mitigations as part of the WMMP that satisfies the requirements set out in Appendix B of this report;</li> <li>c) describe how the monitoring data is linked with adaptive management in the Traffic Control and Management Plan;</li> <li>d) submit its updated WMMP to the wildlife regulators described in Parts 1 and 2 for review and approval prior to construction; and</li> <li>e) prepare and submit an annual report to wildlife regulators on the effectiveness of the WMMP that includes a description of how the adaptive management framework was used to address Project impacts.</li> </ul>

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6. Wildlife and wildlife habitat	<p><b>Suggestion 6-1: Regulator collaboration</b></p> <p>Wildlife regulators should work together to ensure the WMMP is consistent for the entire All Season Road.</p>
6. Wildlife and wildlife habitat	<p><b>Measure 6-3: Reducing the risk of vehicle collisions with wildlife</b></p> <p>In order to reduce the likelihood of significant impacts on wildlife from collisions with vehicles along the road, the developer will identify and communicate wildlife caution zones to road users. The details of this approach will be incorporated into the developer’s WMMP (referred to in Measure 6-2) and will include:</p> <ul style="list-style-type: none"> <li>a) a description of how wildlife information from drivers will be collected and recorded to inform the selection of wildlife crossing areas;</li> <li>b) a detailed system for identifying wildlife (specifically big game as defined in the <i>Wildlife Act</i>) caution zones and marking them along the road (such as where sightings or collisions have occurred or where Traditional Knowledge identifies trails);</li> <li>c) use of a remote camera trap system to identify wildlife road crossing areas and identify non-mine related traffic;</li> <li>d) annual reporting of wildlife sightings by drivers that includes vehicle collisions with wildlife, locations of signage for wildlife caution zones and whether they were modified based on operational experience;</li> <li>e) annual reporting to regulators of remote camera log results, locations of primary wildlife crossings and how wildlife caution zones were modified based on monitoring results (if applicable); and,</li> <li>f) annual reporting to regulators on road use by non-mine vehicles using data from remote camera logs.</li> </ul> <p>The GNWT will regulate this measure on territorial lands and Parks Canada will regulate this measure within the NNPR. Reporting will be included in the WMMP annual report.</p>
7. Traditional harvesting	<p><b>Suggestion 7-1: Harvest monitoring program (for regulators)</b></p> <p>In order to mitigate potential adverse impacts of new access on traditional harvesting, wildlife management authorities should work with communities and harvesters to develop and implement a harvest monitoring program. The program</p>



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	<p>should:</p> <ul style="list-style-type: none"> <li>i. identify value-based objectives for successful harvest monitoring with measurable and achievable goals to meet objectives;</li> <li>ii. identify pre-construction harvest information that can be used for comparison over time;</li> <li>iii. implement monitoring activities specific to understanding harvest activities using methods that meet the needs of local communities and wildlife management authorities;</li> <li>iv. track and report on harvest patterns and pressures during the life of the Project in order to identify adverse trends; and,</li> <li>v. recommend adaptive mitigations to reverse any adverse trends through the Traffic Control Mitigation and Management Plan or the Wildlife Management and Monitoring Plan.</li> </ul>
7. Traditional harvesting	<p><b>Suggestion 7-2: Harvest monitoring program (for the developer)</b></p> <p>In order to mitigate potential adverse impacts of new access on traditional harvesting, the developer should support and cooperate with wildlife management authorities and potentially-affected Aboriginal communities to implement the harvest monitoring program.</p>
7. Traditional harvesting	<p><b>Suggestion 7-3: Examples of harvest monitoring programs</b></p> <p>The Review Board suggests that the developer, local communities and wildlife management authorities consider existing community-based harvest monitoring programs, including the Inuvialuit Settlement Region Community-based Monitoring Program and Tlicho Check Station Reports, for suggestions on harvest monitoring program design.</p>
7. Traditional harvesting	<p><b>Suggestion 7-4: Education about objectives</b></p> <p>The Review Board suggests that the developer, local communities and wildlife management authorities develop outreach and educational activities and materials to inform road users about the objectives of any harvest monitoring program.</p>
8. Water quality and quantity	<p><b>Measure 8-1 Water baseline data, mitigation, monitoring, and adaptive management</b></p>

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	<p><b>8-1, Part 1: Introduction</b></p> <p>To ensure that the road and crossings are designed to an appropriate standard, and constructed and operated in a manner that will be protective of the environment, CanZinc will:</p> <ul style="list-style-type: none"> <li>i. collect additional baseline data;</li> <li>ii. identify and implement appropriate mitigation to prevent significant adverse impacts;</li> <li>iii. combine monitoring programs and plans to coordinate water monitoring efforts; and</li> <li>iv. incorporate principles of adaptive management into road and crossing design and monitoring.</li> </ul> <p>Parks Canada, Fisheries and Oceans Canada, and the Mackenzie Valley Land and Water Board will (within their respective jurisdictions) review and approve CanZinc’s actions to ensure the requirements of this measure are satisfied.</p> <p><b>8-1, Part 2: Baseline data</b></p> <p>CanZinc will collect baseline data necessary to enable the design, construction, and maintenance of watercourse crossings that are protective of the environment and inform future monitoring. CanZinc will install hydrometric stations and use the resulting data in its road and crossing designs. These stations will measure continuous streamflow data during the open water season and instantaneous flow measurements during the ice-covered period for a minimum of one year prior to construction of watercourse crossings. The stations will be established to:</p> <ul style="list-style-type: none"> <li>i. characterize spatial variability;</li> <li>ii. characterize variability in watershed size;</li> <li>iii. measure conditions at Sundog Creek and other key locations<sup>3</sup> (to be determined in consultation with regulators); and,</li> <li>iv. provide locations for ongoing monitoring during operations.</li> </ul> <p>A minimum of one year of this data will be collected prior to the start of activities related to construction of watercourse crossings, and data collection will continue into construction (see Measure 8-1 part 4).</p>

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<sup>3</sup> Such as Casket Creek (km 6.2), Grainger River (km 124.8), and the tributary of Grainger River preferred alignment option (km 118.1).

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	<p>CanZinc will work with Parks Canada, Fisheries and Oceans Canada, and the Mackenzie Valley Land and Water Board to determine what, if any, other water baseline data is required prior to construction to inform mitigation, future monitoring, and adaptive management.</p> <p><b>8-1, Part 3: Mitigate impacts on water quality</b></p> <p>CanZinc will use the baseline data collected, as well as any other relevant information and best management practices, to determine appropriate mitigation prior to construction and to revise detailed design plans for watercourse crossings.</p> <p>The developer will share the baseline data with all relevant regulatory authorities and the independent panel (Measure 5-1) to facilitate Project review, permitting, and licensing.</p> <p><b>8-1, Part 4: Monitoring</b></p> <p>CanZinc has identified many different plans, programs, and commitments for monitoring Project effects on water during construction and operation. CanZinc will amalgamate these plans, programs, and commitments, to the extent feasible and practical, so that water monitoring is consolidated and coordinated. The Review Board understands that for operational purposes, CanZinc may wish to keep certain aspects of water monitoring separate. The Review Board encourages the developer to consolidate where it can, in order to simplify the number of plans to create and report on. The Review Board considers that this may be relevant to the following commitments (Appendix C): #55, #93, #94, #211, #212, #217, #218, and #239, among others.</p> <p>Regarding ongoing monitoring at hydrometric stations, Parks Canada and the Mackenzie Valley Land and Water Board will review and approve monitoring plans, through the water licenses, and determine if and when ongoing monitoring can be phased out.</p> <p><b>8-1, Part 5: Adaptive management</b></p> <p>As part of the water monitoring program(s), CanZinc will establish and implement an adaptive management framework that satisfies the requirements of Appendix B. This will include thresholds and actions that will be developed and adapted using all available baseline information, effects monitoring results, and Traditional Knowledge and will consider ways to coordinate or compliment Aboriginal</p>

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Chapter	Measure
	monitoring initiatives (see Measure 15-4).
8. Water quality and quantity	<p><b>Suggestion 8-1: Regulator coordination for water monitoring</b></p> <p>The Project crosses a number of jurisdictional boundaries and that water will be regulated by several different government agencies, including Parks Canada, Fisheries and Oceans Canada, and the Mackenzie Valley Land and Water Board. The Review Board encourages all regulators involved in the review and approval of the Project to work collaboratively to minimize duplication of monitoring and reporting requirements and develop consistency between monitoring program components. The Review Board also recommends to regulatory agencies that many aspects of Measure 8-1 could be incorporated into an aquatic effects monitoring program.</p>
8. Water quality and quantity	<p><b>Suggestion 8-2: Acid rock drainage and metal leaching</b></p> <p>The Review Board suggests that Parks Canada and the Mackenzie Valley Land and Water Board enforce strict acid rock drainage and metal leaching conditions to minimize any potential impacts on water quality or fish from acid rock drainage or metal leaching.</p>
9. Fish and fish habitat	<p><b>Measure 9-1 – Effects mitigation, baseline data, monitoring, and adaptive management for the Sundog Creek diversion</b></p> <p><b>9-1 Part 1: Introduction</b></p> <p>In order to prevent significant adverse impacts on fish and fish habitat, CanZinc will design, construct and operate the Sundog Creek diversion channel in a way that is protective of fish and fish habitat and ensures the ecological and hydraulic effectiveness of the diversion. Toward this end, CanZinc will develop a Sundog Creek Diversion Plan to:</p> <ul style="list-style-type: none"> <li>a) Mitigate and minimize potential adverse effects on fish and fish habitat from the Sundog Creek diversion through appropriate and protective channel design, and by using all available best practices during construction and operation of the channel.</li> <li>b) Collect baseline data necessary to design, construct and maintain the diversion channel in a way that is protective of fish and fish habitat throughout the life of the Project.</li> </ul>

## Appendix A – Review Board measures and suggestions

Chapter	Measure
	<p>c) Monitor for project-related effects on physical and biological characteristics relevant to the maintenance of effective fish habitat and ecological integrity and to ensure that mitigations are operational and effective.</p> <p>d) Develop and implement an adaptive management framework for Project effects on fish and fish habitat and ecological integrity.</p> <p>Parks Canada and DFO must review and approve this plan prior to the start of construction.</p> <p><b>9-1 Part 2: Collect baseline information</b></p> <p>CanZinc will collect baseline data necessary to design, construct and operate the Sundog Creek diversion so that fish and fish habitat are protected through the life of the Project. This baseline information will also be used to verify EA predictions and inform adaptive management. Prior to commencement of construction of the Sundog Creek diversion, CanZinc will collect a minimum of one year of baseline data for both hydrological and ecological characteristics, including at a minimum, information on:</p> <ul style="list-style-type: none"> <li>i. benthic invertebrates;</li> <li>ii. aquatic vegetation;</li> <li>iii. fish use and occupancy;</li> <li>iv. channel morphology;</li> <li>v. flow characteristics;</li> <li>vi. water quality;</li> <li>vii. hydrology (as described in Measure 8-1); and</li> <li>viii. any other variables of concern as deemed appropriate by DFO or Parks Canada.</li> </ul> <p><b>9-1 Part 3: Mitigate or minimize potential adverse effects</b></p> <p>CanZinc will use all available best management practices and all available baseline data (including data requirements in measure 8-1 and 9-1) to design and construct the Sundog Creek diversion channel to avoid and mitigate adverse effects on fish and fish habitat, including both ecological and hydrological considerations.</p> <p><b>9-1 Part 4: Monitor Project effects</b></p> <p>CanZinc will develop and implement a monitoring plan to detect project-related effects on fish and fish habitat from the Sundog Creek diversion. Monitoring must</p>

## Appendix A – Review Board measures and suggestions

Chapter	Measure
	<p>consider both hydrological and ecological characteristics including, at a minimum:</p> <ul style="list-style-type: none"> <li>i. benthic invertebrates;</li> <li>ii. aquatic vegetation;</li> <li>iii. fish use and occupancy;</li> <li>iv. channel morphology;</li> <li>v. flow characteristics;</li> <li>vi. water quality;</li> <li>vii. hydrology ; and</li> <li>viii. any other variables of concern as deemed appropriate by DFO or Parks Canada.</li> </ul> <p>Monitoring will consider both short and long-term effects of the diversion, and will incorporate appropriate flexibility such that monitoring requirements can be adjusted to reflect the Project stage, past monitoring results, and likely effects.</p> <p><b>9-1, Part 5: Adaptive management of Project effects</b></p> <p>CanZinc will develop and implement an adaptive management framework for effects on fish and fish habitat from the Sundog Creek diversion that satisfies the requirements of Appendix B.</p>
9. Fish and fish habitat	<p><b>Suggestion 9-1: Regulatory collaboration</b></p> <p>All regulators involved in the review and approval of the Sundog Creek Diversion Plan should work collaboratively to minimize duplication of monitoring and reporting requirements and develop consistency between monitoring program components, to the greatest extent possible.</p>
10. Culture and heritage	<p><b>Measure 10-1: Traditional Knowledge</b></p> <p>In order to prevent significant adverse impacts on heritage resources, and to support Traditional Knowledge requirements in other measures in this Report of EA, the developer will:</p> <ul style="list-style-type: none"> <li>i. engage with potentially-affected Aboriginal groups, including Nahanni Butte Dene Band, Liidlii Kué First Nation, and Dehcho First Nations, about ways to avoid impacts from the Project, including impacts on heritage resources;</li> <li>ii. conduct this engagement prior to the Archaeological Impact Assessment</li> </ul>

## Appendix A – Review Board measures and suggestions

Chapter	Measure
	<p>(AIA), so that the resulting information can inform the AIA (see Measure 10-2);</p> <ul style="list-style-type: none"> <li>iii. thoroughly consider and, where applicable, incorporate Traditional Knowledge into Project design, mitigations, monitoring, and adaptive management; and</li> <li>iv. submit an updated engagement record and plan in accordance with Mackenzie Valley Land and Water Board (MVLWB) Engagement Guidelines<sup>4</sup> for review and approval by Parks Canada and the MVLWB.</li> </ul> <p>The developer will do this in a culturally-appropriate way that respects applicable Traditional Knowledge policies and protocols.</p>
10. Culture and heritage	<p><b>Measure 10-2: Archaeological Impact Assessment</b></p> <p>In order to prevent significant adverse impacts on heritage resources, the developer will conduct an Archaeological Impact Assessment to the specifications detailed in commitments #215 and #216 in Appendix C of this Report. The Archaeological Impact Assessment will also:</p> <ul style="list-style-type: none"> <li>i. be developed in consultation with Parks Canada, the Government of the Northwest Territories, Nahanni Butte Dene Band, Liidlii Kué First Nation, and Dehcho First Nations;</li> <li>ii. incorporate all evidence of place names, traditional land use, Traditional Knowledge, cultural and spiritual use, and harvesting in the vicinity of the Project;</li> <li>iii. be conducted along the final alignment of the All Season Road, at borrow site locations, and other areas where ground disturbance is proposed; and</li> <li>iv. be completed prior to any new ground disturbance.</li> </ul>
11. Vegetation	<p><b>Measure 11-1: Rare plant and rare plant assemblage baseline surveys and management in the Nahanni National Park Reserve</b></p> <p><b>11-1, Part 1: Baseline surveys</b></p> <p>In order to inform effective mitigations, adaptive management, and reclamation and to prevent significant adverse impacts on vegetation within Nahanni National Park</p>

<sup>4</sup>MVLWB Engagement Guidelines for Applicants and Holders of Water Licences and Land Use Permits (<https://mvlwb.com/sites/default/files/documents/wg/MVLWB%20Engagement%20Guidelines%20for%20Holders%20of%20LUPs%20and%20WLS%20-%20Oct%202014.pdf>)



## Appendix A – Review Board measures and suggestions

Chapter	Measure
	<p>Reserve, the developer will complete vegetation field surveys focussed on the presence of rare plants and rare plant assemblages prior to ground disturbance or clearing<sup>5</sup> within Nahanni National Park Reserve. Parks Canada will approve the details of these surveys, including timing, seasonality, and methods.</p> <p>CanZinc will use the results of the baseline surveys to inform the following:</p> <ol style="list-style-type: none"> <li>i. understanding impacts on rare plants and rare plant assemblages;</li> <li>ii. identifying appropriate mitigation to prevent significant adverse impacts;</li> <li>iii. monitoring and adaptive management; and</li> <li>iv. closure and reclamation.</li> </ol> <p>The results of the baseline surveys will be submitted to Parks Canada.</p> <p><b>11-1, Part 2: Rare Plant Management Plan</b></p> <p>In order to prevent significant adverse impacts on rare plants as a result of construction and operation, CanZinc will develop a Rare Plant Management Plan prior to construction. This plan will include mitigation, monitoring, and adaptive management for rare plants.</p> <ul style="list-style-type: none"> <li>• Mitigation: CanZinc will use the information gathered in the surveys required by Measure 11-1 part 1, as well as any other relevant information, to identify appropriate mitigation within the plan to minimize significant adverse impacts on rare plants or rare plant assemblages.</li> <li>• Effects monitoring: The plan will include details on how rare plants will be identified and monitored during construction and operations activities. The plan will include effects monitoring for any identified rare plants or rare plant assemblages.</li> <li>• Adaptive management: The plan will include the principles of adaptive management outlined in Appendix B. This will include identifying the actions that will be taken if rare plants are identified at any time during construction and operation of the Project.</li> </ul> <p>The Rare Plant Management Plan will be reviewed and approved by Parks Canada prior to construction. The developer will operate in accordance with the approved</p>

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<sup>5</sup> Timing to be determined in consultation with Parks Canada. These surveys could occur prior to construction of individual sections of road to allow for a phased approach to construction.

## Appendix A – Review Board measures and suggestions

Chapter	Measure
	plan.
11. Vegetation	<p><b>Measure 11-2: Invasive species management</b></p> <p><b>11-2, Part 1: Introduction</b></p> <p>In order to reduce the likelihood of significant impacts on vegetation through the introduction or spread of invasive species, the developer will survey the right-of-way, mitigate the spread of invasive species, monitor for the presence of invasive species, and incorporate adaptive management, as described in the rest of this measure.</p> <p><b>11-2, Part 2: Baseline</b></p> <p>CanZinc will survey the entire right-of-way for the presence of invasive species, prior to ground disturbance during construction<sup>6</sup>, focussing on areas with higher likelihood for the establishment of invasive species. CanZinc will use the results of the surveys to inform Parts 3 and 4 of this measure.</p> <p><b>11-2, Part 3: Mitigation</b></p> <p>CanZinc will mitigate the potential spread of invasive species by implementing the mitigations it has already identified (e.g., the wheel-wash station). CanZinc will work with the Government of Northwest Territories and Parks Canada to identify additional mitigation that will prevent the spread of invasive species.</p> <p><b>11-2, Part 4: Invasive Species Management Plan</b></p> <p>CanZinc will revise the invasive species management framework and create an Invasive Species Management Plan prior to construction, considering off-site as well as on-site prevention and control. CanZinc will include the adaptive management principles set out in Appendix B within the invasive species management framework, the Invasive Species Management Plan, and any individual weed control plans, if or as they are developed.</p> <p>Prior to the commencement of construction, the Invasive Species Management Plan will be reviewed and approved by Parks Canada and the Mackenzie Valley Land and</p>

<sup>6</sup> Timing to be determined in consultation with Parks and GNWT. These surveys could occur prior to construction of individual sections of road to allow for a phased approach to construction.

## Appendix A – Review Board measures and suggestions

Chapter	Measure
	Water Board, with input from the Government of Northwest Territories where appropriate, as conditions in their respective land use permits. The developer will implement the approved plan(s).
11. Vegetation	<p><b>Suggestion 11-1: Rare plant assemblages</b></p> <p>The Review Board suggests that Parks Canada should provide more guidance and definitions on what rare plant assemblages in the region are important. The Review Board suggests that Parks Canada do this prior to the surveys required by Measure 11-1 in order to help guide the surveys and that Parks Canada use the information gathered in the surveys required by Measure 11-1 to assist CanZinc in determining which assemblages should be monitored through the Rare Plant Management Plan.</p>
11. Vegetation	<p><b>Suggestion 11-2: Rare Plant Management Plan</b></p> <p>The Review Board suggests that the Mackenzie Valley Land and Water Board consider requiring a Rare Plant Management Plan for the portion of the Project it regulates. The Review Board suggests that this plan could be combined with the one for NNPR and Parks Canada.</p>
11. Vegetation	<p><b>Suggestion 11-3: Vegetation contaminant levels</b></p> <p>The Review Board suggests that the Mackenzie Valley Land and Water Board and Parks Canada should consider potential impacts on vegetation from contamination from spills, concentrate loading, and road dust, and determine if sampling of vegetation contaminant levels prior to operations (start of hauling), is necessary.</p>
12. Permafrost	<p><b>Measure 12-1: Permafrost management</b></p> <p><b>12-1, Part 1: Introduction</b></p> <p>In order to avoid permafrost degradation and prevent associated significant adverse impacts on the environment from the Project during construction, operations, closure, and post-closure, the developer will conduct additional permafrost investigations to inform design and construction of the Project and will develop and implement a permafrost management plan.</p>

## Appendix A – Review Board measures and suggestions

Chapter	Measure
	<p><b>12-1, Part 2: Permafrost investigations</b></p> <p>The developer will investigate permafrost and collect baseline permafrost data for the road alignment and borrow pits, provide the data and results to the independent technical review panel and to regulators, and use the information and results to inform detailed and final design.</p> <p><b>12-1, Part 3: Design and construction of the Project</b></p> <p>CanZinc will design and construct the road, borrow pits, and other infrastructure in a way that anticipates and avoids permafrost degradation and associated impacts on the surrounding environment during all phases of the Project, including post-closure.</p> <p><b>12-1, Part 4: Permafrost Management Plan</b></p> <p>The developer will establish and implement a Permafrost Management Plan that includes permafrost monitoring and adaptive management.</p> <p>The Permafrost Management Plan must include:</p> <ul style="list-style-type: none"> <li>• monitoring to measure the effects of the Project on permafrost (with an emphasis on early detection of any changes in permafrost) and evaluate the effectiveness of Project design and mitigations in preventing or minimizing permafrost degradation; and,</li> <li>• an adaptive management framework that satisfies the requirements of Appendix B.</li> </ul> <p>The Permafrost Management Plan will be for review and approval by the Mackenzie Valley Land and Water Board and Parks Canada.</p>
14. Closure and reclamation	<p><b>Suggestion 14-1: Closure and reclamation plans (for the developer)</b></p> <p>In order to prevent post-closure impacts from the All Season Road, the developer should:</p> <ul style="list-style-type: none"> <li>• define clear closure principles in consultation with potentially-affected Aboriginal groups, including Nahanni Butte Dene Band, Liidlii Kué First Nation, and Dehcho First Nations, and applicable regulators and land managers; and</li> </ul>

## Appendix A – Review Board measures and suggestions

Chapter	Measure
	<ul style="list-style-type: none"> <li>incorporate pre-disturbance information (including vegetation, wildlife, and permafrost conditions) into closure and reclamation planning.</li> </ul>
14. Closure and reclamation	<p><b>Suggestion 14-2: Closure and reclamation plans (for regulators and land managers)</b></p> <p>Regulators and land managers should proceed with closure and reclamation plans along the road alignment in a consistent manner, where appropriate.</p>
15. Follow-up	<p><b>Measure 15-1: Monitoring by the developer</b></p> <p><b>15-1, Part 1: Objectives</b></p> <p>In order to ensure that the measures the developer is responsible for are fully and effectively implemented and to inform adaptive management throughout all phases of the development, the developer will establish and implement monitoring programs that fulfill the following objectives:</p> <ol style="list-style-type: none"> <li>to measure the effects of the Project on the environment;</li> <li>to assess the implementation and effectiveness of the measures in this Report of EA for preventing or minimizing impacts on the environment;</li> <li>to inform the implementation of the adaptive management frameworks required by measures in this Report of EA, so that mitigation can be adjusted to ensure significant adverse impacts do not occur;</li> <li>to assess the accuracy of the developer’s predictions made during the environmental assessment, regarding the impacts of the Project on the environment; and</li> <li>where applicable, to provide relevant data and information to support other monitoring initiatives (such as Aboriginal monitoring initiatives and government monitoring).</li> </ol> <p>These objectives must be incorporated into all monitoring programs that are identified in measures in this Report of EA, either by revising existing programs or creating new programs.</p>
15. Follow-up	<p><b>15-1, Part 2: Traditional knowledge and inclusion of Aboriginal groups</b></p> <p>The developer will engage and consider the advice of Nahanni Butte Dene Band, Liidlii Kué First Nation, and Dehcho First Nations, and consider all available</p>

## Appendix A – Review Board measures and suggestions

Chapter	Measure
	<p>Traditional Knowledge when developing its monitoring programs.</p> <p>To the extent possible, the developer will involve potentially-affected Aboriginal groups, including Nahanni Butte Dene Band, Liidlii Kué First Nation, and Dehcho First Nations, in the implementation of the developer’s monitoring programs.</p>
15. Follow-up	<p><b>Measure 15-2: Annual reporting from the developer</b></p> <p>In order to demonstrate how measures are being implemented and to evaluate the effectiveness of the developer’s efforts to prevent or minimize impacts on the environment, the developer will, throughout all phases of the development, prepare an annual Report on the Implementation of Measures. The Report will address the measures that the developer is responsible for and will:</p> <ul style="list-style-type: none"> <li>i. Describe the actions, including actions implemented through adaptive management, being undertaken to implement the measures.</li> <li>ii. Evaluate how effective the implementation actions are in controlling, reducing, or eliminating the impact (considering the results of monitoring programs and adaptive management frameworks). Where applicable, provide references to further information contained in other management plans or monitoring reports.</li> </ul> <p>The developer will provide a copy of this annual report to the Review Board by June 30 of each year, following the commencement of construction of the Project.</p> <p>The developer will also report in person annually, in a culturally appropriate way, to Nahanni Butte Dene Band, Liidlii Kué First Nation, and Dehcho First Nations.</p>
15. Follow-up	<p><b>Measure 15-3: Annual reporting from government and regulatory authorities</b></p> <p>In order to evaluate the effectiveness of mitigation measures for the protection of the environment, each regulatory authority or government that is wholly or partly responsible for implementation of any measure in this Report of EA will prepare an annual Report on Implementation of Measures. The Report will:</p> <ul style="list-style-type: none"> <li>a) describe the actions being undertaken to implement the measures or the part(s) of the measures for which the regulatory authority or government is responsible; and</li> <li>b) explain how these actions, including those implemented through adaptive management, fulfill the intent of the EA measures, including consideration of</li> </ul>

## Appendix A – Review Board measures and suggestions

Chapter	Measure
	<p>the following questions:</p> <ol style="list-style-type: none"> <li>i. How are implementation actions addressing a likely significant adverse impact on the environment?</li> <li>ii. How effective are implementation actions at reducing, controlling, or eliminating the impact or its likelihood?</li> </ol> <p>Government and regulators will provide a copy of this annual report to the Review Board by June 30 of each year.</p>
15. Follow-up	<p><b>Measure 15-4: Support Aboriginal monitoring initiatives</b></p> <p>To help prevent significant adverse impacts on the environment and on Aboriginal rights, the developer will support, to the greatest extent practicable, independent monitoring of the Project area through monitoring initiatives undertaken by Nahanni Butte Dene Band, Liidlii Kué First Nation, and Dehcho First Nations. The developer will provide access to the All Season Road for these Aboriginal groups to conduct their monitoring activities throughout all phases of the Project, whenever it is safe to do so. The developer will also provide in-kind support for independent community monitors to conduct their monitoring activities (e.g., accommodations, meals, transportation and appropriate safety training to operate on the road).</p>
15. Follow-up	<p><b>Suggestion 15-1: Systematic adaptive management in all applicable plans</b></p> <p>The Board encourages the developer to incorporate adaptive management principles (e.g., action levels, management responses, etc.), based on Appendix B of this report, into all relevant management plans and monitoring programs. The Review Board encourages regulators to consider these adaptive management principles when setting regulatory requirements and when reviewing and approving management plans and monitoring programs.</p>
15. Follow-up	<p><b>Suggestion 15-2: Public review process for regulatory authorizations and plans</b></p> <p>The Review Board strongly encourages all regulators to provide opportunities for engagement of Aboriginal groups in review of authorizations and related management and monitoring plans for the Project. (For example, the Mackenzie Valley Land and Water Board’s standard practice is to request input from Aboriginal groups and other interested or affected parties on all regulatory decisions).</p>
15. Follow-up	<p><b>Suggestion 15-3: Regulatory coordination, including coordination of public</b></p>



## Appendix A – Review Board measures and suggestions

Chapter	Measure
	<p><b>registries</b></p> <p>The Review Board encourages all regulatory authorities to take a coordinated approach, to the extent practicable, to minimize duplication and promote consistency.</p> <p>The Review Board suggests that Parks Canada investigate sharing the Mackenzie Valley Land and Water Board’s public registry or developing a coordinated registry for regulatory documents related to the Project.</p>
15. Follow-up	<p><b>Suggestion 15-4: Expand the mandate of the TAC</b></p> <p>The Review Board suggests that the mandate and activities of the TAC be expanded, such that the TAC can design and approve its own Terms of Reference, including consideration of:</p> <ul style="list-style-type: none"> <li>i. the frequency, objectives and scope of site visits; and</li> <li>ii. input into adaptive management frameworks including setting appropriate and protective action levels;</li> <li>iii. ways the TAC can support or compliment the Aboriginal monitoring initiatives referred to in Measure 15-4, such as: <ul style="list-style-type: none"> <li>o ensuring that Traditional Knowledge is collected and used appropriately,</li> <li>o sharing resources, and</li> <li>o providing a venue for addressing community concerns and reporting to communities.</li> </ul> </li> </ul>

## Appendix B – Adaptive Management

In several chapters throughout this Report of EA, the Review Board has concluded that adaptive management is a necessary part of the overall mitigation strategy needed to prevent significant adverse impacts on the environment. The Review Board is not prescribing the specific details (e.g., triggers or action levels, management actions, etc.) for these adaptive management requirements. Rather, where a requirement to adaptively manage a potential impact(s) is indicated in a measure, each measure specifies that:

- a) the developer must establish and implement an adaptive management framework that satisfies the requirements set out in this Appendix; and
- b) the relevant regulators will be responsible for ensuring the frameworks are adequately developed and implemented.

The developer has the flexibility to determine, subject to regulatory approval, how to organize the various adaptive management frameworks in a way that is practical for operations; for example, whether to have separate frameworks for each of its management and monitoring plans, or to prepare a combined framework for several related plans. The Review Board expects that the level of detail of different adaptive management frameworks will vary, depending on the circumstances (e.g., impact predictions, monitoring requirements, robustness of initial mitigations, etc.), while still meeting the requirements set out below.

### **Where the Board has determined that adaptive management is necessary, as set out in a measure<sup>1</sup> in this REA, the adaptive management framework will<sup>2</sup>:**

1. Be submitted for review and approval by the appropriate regulatory authority (i.e. having jurisdiction over the part of the operation and/or environment to which each framework applies), considering the timeframe identified in each measure.
2. Include consideration of Traditional Knowledge.
3. Identify the monitoring program or mechanism that will provide information on project effects (and be used to determine when action levels are reached).
4. Set action levels that will ensure significant adverse impacts<sup>3</sup> do not occur: all action levels (e.g., low, medium, and high) must be below the threshold of a significant adverse impact.

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<sup>1</sup> These requirements could have been included within each measure in the chapters above, but have instead been consolidated here for clarity and consistency.

<sup>2</sup> These requirements are consistent with the principles described in the WLWB's Oct 2010 Draft Guidelines for Adaptive Management. These principles have been applied to monitoring and management plans for mining projects throughout the Mackenzie Valley. In the water licence for the Prairie Creek Mine, the framework is referred to as a "Response Framework", which is defined as "a systematic approach to responding when the results of a monitoring program indicate that an Action Level has been reached".

<sup>3</sup>An important requirement for adaptive management is defining, quantitatively or qualitatively, what is meant by

## Appendix B – Adaptive Management

- a. In some cases it may be acceptable to set only the low action level in advance, and to set other action levels if/when the low action level is reached.
5. Define the management actions (e.g., mitigations) that will be taken upon reaching a pre-defined level of environmental change or effect (the action level).
  - a. In some cases, it may be acceptable to describe detailed actions pertaining only to the low action level and describe options pertaining to the medium and high action levels.
6. Include a requirement for the developer to prepare a response plan, to be implemented following review and approval by the appropriate regulatory authority, in a timely manner upon meeting a low action level.<sup>4</sup> Each response plan will include an evaluation of the effectiveness of the mitigations that have been implemented to date and the expected effectiveness of new or adjusted actions that will be taken when the response plan is implemented. Each response plan will also reaffirm or define additional action levels and management actions. A response plan should be updated as needed if higher action levels are reached, or based on management action results.

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“significant adverse impacts”. This will be informed by the Review Board’s significance determination and may be refined during licensing, permitting, and other regulatory processes.

<sup>4</sup> For example, the Water Licence for the Prairie Creek Mine requires, if an action level is reached, the Licensee to: notify the MVLWB within 30 days and submit a response plan for review and approval by the MVLWB within 90 days. The need for and details of a response plan may vary depending on the circumstances at hand and how well-developed the adaptive management framework itself is.

## Appendix C – Developer’s commitments

ID	Topic	Subtopic	EA Phase	Commitment	Reference
<b>Commitments from the analytical phase (p 1 to 27)</b>					
1	Access control	Check point location	DAR	The security check-point will be moved in summer to a location on the road west of the river crossing.	PR#55 p146
2	Access control	Non-mine related vehicles	DAR	Non-mine vehicles, including all-terrain vehicles (ATVs) and snowmobiles will be prohibited on site.	PR#55 p185
3	Access Control	Remote camera	Technical Analysis	CZN will consider remote camera use for periods when the (road) checkpoint is not manned. There will be times when traffic is not on the road, at night and during the seasonal spring and fall closure periods when the ice bridge over the Liard River is in either break-up or freeze-up. Trail cameras will be considered on a limited basis for these periods as a check on other road users and caribou occurrence.	PR#370 p5
4	Access control	Reporting	Technical Analysis	CanZinc will monitor and record non-mining traffic activity on the all-season road, including the establishment of a checkpoint, and report this information annually.	PR#256 p1
5	Access control	Signage	DAR	Signs will be posted advising road users that the land is the traditional land of the NDDB, and a request that the road not be used and that no hunting should occur. Signs will also warn of the dangers posed by frequent, heavy mine traffic.	PR#55 p146
6	Air Quality	Dust management	DAR	The GNWT (1998) dust suppression guidelines will be implemented at the TTF and along portions of the road located in environments which are more prone to adverse effects from road dust accumulation (e.g. lakes, wetlands), as appropriate, to limit dust generation during the snow free months. Dust management will begin with road surfacing material which is coarse and minimally erodible, where practical. Where dust is problematic, watering will occur as and when required. Vehicles will adhere to speed limits on roads, which will help limit the re-suspension of particulate material.	PR#55 p240
7	Air Quality	Dust suppression	DAR	Dust suppression strategies (e.g., water or approved dust suppressant products) will be in accordance with the GNWT dust suppression guidelines.	PR#55 p256
8	Airstrip operations	Minimum flight altitudes	DAR	Maintain a minimum flight altitude of 600 m except during take-off and landings.	PR#55 p175
9	Airstrip operations	Wildlife mitigations	DAR	Develop standard aircraft procedures for flying into and departing from the proposed airstrip to accommodate wildlife, if present on or near the	PR#55 p175

## Appendix C – Developer’s commitments

ID	Topic	Subtopic	EA Phase	Commitment	Reference
				airstrip.	
10	Community Engagement	Engagement plan	DAR	Future engagement with aboriginal groups and government agencies will continue as described in the Engagement Plan.	PR#55 p159
11	Community well-being	Access to Nahanni Butte	DAR	CZN will restrict road crews from accessing Nahanni Butte (the only proximal community) by including this requirement in contracts for the work. The only exceptions would be if construction personnel are leaving or arriving at the Nahanni Butte airstrip, in which case they will be required to go directly to and from the airstrip only, and if personnel are invited by, and accompanied by, community members.	PR#100 p74
12	Concentrate and material transport	Diesel Fuel	Technical Analysis	Diesel fuel will be back-hauled by the concentrate trucks in dedicated tanks, 5,170 L. The tanks will be double-walled, with the capacity of the space between the walls being 110% of the inner tank, or approximately 5,700 L. The tanks will be puncture-resistant.	PR#355 p6
13	Concentrate and material transport	Sulphuric acid totes	DAR	Containers for sulphuric acid will be totes weighing approximately 1.4 tonnes.	PR#55 p190
14	Concentrate and material transport	Tracking	DAR	Measures for avoiding concentrate dust and potential tracking of concentrate off-site will be adopted (i.e. truck wheel-wash)	PR#55 p139
15	Concentrate and material transport	Transport method	Technical Analysis	CZN would either transport concentrates in bulk using the ‘Convey Ore’ system, similar to the Red Dog Mine approach, or in bags in a truck box with a lid.	PR#355 p4
16	Contractors	Full qualifications	DAR	CZN will endeavour to ensure that all service providers are fully qualified and responsible to undertake the tasks required prior to issuing contracts.	PR#55 p43
17	Contractors	Instruction and training	DAR	When hiring contractors, CZN will provide instruction and training, if necessary, to bind all contractors and sub-contractors to corporate policies.	PR#55 p51
18	Contractors	Terms and conditions	DAR	In order to ensure that its contractors and subcontractors honour and adhere to all commitments made, CZN will ensure, through written contracts, that all such parties are aware and comply with all the terms and conditions that are associated with such permits that are necessary for operations.	PR#55 p43
19	Cumulative effects monitoring	CIMP	DAR	Monitoring data will be compatible with the NWT Cumulative Impact Monitoring Program, where possible.	PR#55 p283
20	Earthquakes	Pilot vehicle inspection	DAR	If a significant seismic event occurs, it would be prudent for a pilot vehicle to inspect the road before	PR#129 p76

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ID	Topic	Subtopic	EA Phase	Commitment	Reference
				trucks resume travelling on it.	
21	Emergency response	Control points	DAR	A Control Point will be established near the mouth of Funeral Creek.	PR#55 p202
22	Emergency response	Control points	DAR	Control Points will be established on two Funeral Creek tributaries at their confluence with the main stem. Similar Control Points will also be established on Sundog Creek in two locations (one just above the main falls and one just before the creek flows onto the fluvial outwash plain), and downstream of the Polje Creek, Tetcela River and Grainger River crossings. An additional control point will be established at the toe of the Silent Hills on the west side since the road section above is considered to have a high risk of a spill.	PR#55 p29
28	Emergency response	Emergency equipment	Technical Analysis	We propose to acquire two bladders with a capacity of at least 5,000 L. One would be stationed with a pump at one of the Control Points on an upstream tributary to Funeral Creek. The other bladder would be stored with a pump on the trailer stationed at Cat Camp.	PR#282 p109
23	Emergency response	Emergency equipment	DAR	A silt or other form of curtain will be stored approximately mid-point between the Mine and Funeral Creek ready for deployment to reduce flow in part of Prairie Creek adjacent to a spill.	PR#55 p202
24	Emergency response	Emergency equipment	DAR	Equipment at the Control Points will include booms and absorbents in addition to material to create temporary dams, such as board weirs, sand bags and other inert materials that would be stored at the location. Shovels will also be left on site for use in making a dam also. A supply of soda ash will also be kept at Control Points to neutralize an acid spill.	PR#55 p203
26	Emergency response	Emergency equipment	DAR	A vacuum truck will be on stand-by at the Mine.	PR#55 p204
27	Emergency response	Emergency equipment	DAR	CZN has proposed to maintain spill equipment in portable trailers. We will ensure that these or other similar units are heli-portable.	PR#100 p61
29	Emergency response	Emergency protocols	DAR	The tractor/trailer units would provide emergency assistance if mechanical issues or adverse weather conditions occur. In addition, all trucks will have 24 hour communications with road operations and dispatch using either 2 way radio or GPS tracking devices.	PR#101 p45
30	Emergency response	Fire prevention training	DAR	Train staff in fire prevention protocols and emergency response procedures.	PR#55 p260

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ID	Topic	Subtopic	EA Phase	Commitment	Reference
31	Emergency response	Incident management system	DAR	For operations, an incident management system will be used to respond to spills.	PR#55 p201
32	Emergency response	Materials management systems	DAR	Appropriate materials management systems will minimize the risk of accidental spills or leakage of concentrate, diesel fuel/ hydrocarbons, and other hazardous materials being shipped to the mine site. This includes ensuring hydrocarbon and chemicals that are hauled along the access road or stored at the TTF are in industry standard containers with appropriate spill containment and management measures in place.	PR#50 p31
33	Emergency response	Response teams	DAR	A response team with large equipment will be stationed at the Mine. Another response team will reside at Nahanni Butte.	PR#55 p201
34	Emergency response	Response teams	DAR	For the operating period, the spill response team (at the Mine) will consist of 6 personnel: 1 Supervisor, 1 Safety Watch, and 4 Responders, one of which will be a mechanic.	PR#55 p202
36	Emergency response	Spill kits	DAR	For operations, comprehensive spill kits will be maintained at the Mine site, Cat Camp, the Tetcela Transfer Facility, Grainger Gap, and the Liard River crossing.	PR#55 p203
35	Emergency response	Spill kits	DAR	Spill kits will be carried on vehicles with materials appropriate for the loads	PR#55 p203
37	Emergency response	Spill management	DAR	Staff will be trained on the existing spill management plan and procedures to quickly respond to an accidental spill. The plan will include provision for rapid deployment of cleanup crews and for containment and cleanup of spilled material and contaminated surfaces.	PR#55 p185
38	Emergency response	Spill monitoring program	DAR	In a spill related monitoring program, samples collected for chemistry and benthic community assemblage assessment should include at least one upstream sample (for reference purposes) and multiple downstream samples. All other endpoints would normally include an upstream and downstream sample only. Any spills to Funeral Creek should include an assessment of juvenile occupancy following methodologies developed by Neil Mochnatz, DFO. However, given some spawning bull trout also have to swim past the mine’s discharge, it will be important to separate the different effects sources. Consequently, another upstream tributary to Prairie Creek known to host spawning/rearing habitat and previously characterized should be re-assessed	PR#90



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ID	Topic	Subtopic	EA Phase	Commitment	Reference
				concurrently with Funeral Creek. More detail will be provided in the AEMP.	
39	Emergency response	Spill response	DAR	Designated spill control points will occur at key locations along the road, and response materials will be stored at these locations. Trailers stocked with response equipment will also be parked at other locations so that responding crews can hook them up and move them to the spill location.	PR#55 p200
40	Emergency response	Spill response training	DAR	A maintenance crew will be working on the road somewhere between Km 40 and Km 170 (i.e. from Cat Camp to the Nahanni Butte Access Road) and will have spill response training.	PR#55 p201
41	Employment	Community well-being	DAR	CZN is required to post available employment positions with local Bands, and suitable and available NDDB members have priority. CZN has also committed to give preference to competitive and able consortia with local and northern content for procurement and business opportunities.	PR#55 p147
42	Engagement	Ongoing engagement	DAR	CZN will continue to engage First Nations throughout the EA process.	PR#55 p159
43	Environmental monitoring	General	Technical Analysis	CanZinc will have local environmental monitors on the all-season road during periods of mine traffic.	PR#355 p16
44	Erosion and sediment control	Minimizing mobilization of sediment	Technical Analysis	CanZinc commits to implementing erosion and sediment control where construction has the potential to mobilize sediment and result in transport to surface water, and include specific plans for rapid response in the event of an intense precipitation event.	PR#246 p1
45	Fish and aquatic habitat, water quality	In-stream works	DAR	All in-stream works will be performed to avoid sensitive life stages of fish. In-stream work will not occur when fish are expected to be spawning. Also, instream work will be avoided if it is predicted that work will result in significant turbidity resulting in the smothering of downstream developing fish embryos. Existing investigations of fish-bearing crossings indicates that only the habitat in the Tetcela River Tributary and Tetcela Main crossing locations occur at a location where bottom substrate is a suitable size for spawning salmonids (i.e., Arctic grayling and whitefish).	PR#90 p13
46	Fish and aquatic habitat, water quality and quantity	Avoid disruption of spawning	DAR	Avoid disruption of the only known spawning location in the area (bull trout in Funeral Creek) during the spawning period (mid-August);	PR#55 p246

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ID	Topic	Subtopic	EA Phase	Commitment	Reference
48	Fish and aquatic habitat, water quality and quantity	Blasting	Technical Analysis	At active blast sites during construction, the sites will be inspected during or immediately after rainfall to ensure sediment is either not being produced, or mitigation measures are effective. Confirmatory upstream and downstream turbidity readings will be taken to verify visual conclusions, if necessary. Depending on initial findings and results, a frequency of follow-up inspection will be decided on and implemented until the site is considered inherently stable.	PR#200 p8
47	Fish and aquatic habitat, water quality and quantity	Blasting	DAR	Blasting impacts on fish will be minimized by utilizing timing window, encouraging fish to move from the blast area, minimizing the required blast energy, and following DFO’s operational guidance for blasting.	PR#90 p13
49	Fish and aquatic habitat, water quality and quantity	Crossings	DAR	All crossings will follow DFO’s <i>Operational Statements</i> for creek crossings, including span structures and culverts.	PR#55 p244
50	Fish and aquatic habitat, water quality and quantity	Crossings	DAR	In-stream works and crossings will be avoided as much as possible.	PR#55 p244
51	Fish and aquatic habitat, water quality and quantity	Crossings	Technical Analysis	If temporary (stream crossing) structures are utilized over an extended period (> 3 months), the design flow will be based on a 10 year return period.	PR#282 p40
52	Fish and aquatic habitat, water quality and quantity	Drainage	DAR	A stable road bed will be constructed adjacent to creeks and runoff control will be provided for to minimize the dispersal of sediment during precipitation events.	PR#55 p246
53	Fish and aquatic habitat, water quality and quantity	Habitat loss offset	DAR	Replace any habitat losses to the satisfaction of DFO.	PR#55 p246
54	Fish and aquatic habitat, water quality and quantity	Minimize disturbances	DAR	Disturbance of stream banks and riparian areas at stream crossings will be minimized. Temporary crossing structures will be removed to avoid blockage and erosion.	PR#55 p246

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ID	Topic	Subtopic	EA Phase	Commitment	Reference
55	Fish and aquatic habitat, water quality and quantity	Overtopping monitoring parameters	Technical Analysis	CanZinc commits to implementing TSS/turbidity, pH, dissolved oxygen and conductivity monitoring upstream and downstream of Casket Creek during high water events if overtopping of the road surface is occurring, and at any other areas where overtopping of the road surface occurs.	PR#263 p3
56	Fish and aquatic habitat, water quality and quantity	Re-vegetation	DAR	Re-vegetation of riparian areas will be promoted to further reduce the potential for sedimentation.	PR#55 p246
57	Fish and aquatic habitat, water quality and quantity	Sundog Creek habitat loss	DAR	Fish habitat against the south bank will be lost, but would be replaced by comparable new habitat to the north. This work would be completed in the late fall when the floodplain is dry apart from isolated deep pools. Any pools would be subject to fish salvage before filling.	PR#55 p148
58	Fish and aquatic habitat, water quality and quantity	Sundog creek realignment morphology	Technical Analysis	Monitoring of the morphology of the new channel will occur to confirm that the new channel is providing habitat similar to the current channel. Monitoring will be conducted to ensure that the new channel is comparable to the existing channel. Monitoring will include field-based hydrological data collection (i.e., velocities and cross sectional profiles), supported by satellite or aerial imagery, when available. If velocities are too high, and higher than those predicted for the existing channel, CZN will make necessary adjustments to the channel during no flow periods. Once the stream has been diverted, bi-annual monitoring (during freshet and low flow) of the channel for the first two years will occur. Subsequently, monitoring will transition to monitoring every second year, or immediately after a 1 in 10 year event or greater.	PR#370 p257
59	General	Draft management plans	Technical Analysis	CZN will convert the draft management plans and designs from, or referred to, in this EA into final plans and final designs for construction and operation of the road, and follow through on the commitments and design details contained in those plans and designs.	PR#355 p1
60	General	Recommendations	Technical Analysis	All recommendations by consultants have been accepted by CanZinc and will be assumed as commitments.	PR#355
61	Heritage and cultural resources	Archeological Surveys	Technical Analysis	CZN will include local community members in pre-construction survey crews. A professional archeologist will ensure each crew has the necessary knowledge and information, provide direction and	PR#355

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ID	Topic	Subtopic	EA Phase	Commitment	Reference
				focus to the crews in the field, and undertake independent inspections and verification.	
62	Heritage and cultural resources	Road construction and maintenance plan	DAR	A brochure of photographs of heritage resources will be compiled and provided to contractors as part of the Road Construction and Maintenance Plan.	PR#55 p269
63	Nahanni National Park and Reserve	Best practices	DAR	Standard industry best practices will be adhered to during construction.	PR#55 p227
64	Reclamation	Bridges and crossings	DAR	During reclamation, bridges will be removed from stream crossings; abutments will be removed or pushed-back. Material will be pulled-back to recontour side-hill cuts. Erosion control measures will be installed as necessary. Restoration of disturbed areas will be promoted by stabilization measures and vegetation by natural invasion supplemented with available local seed and cuttings.	PR#29 p4
65	Reclamation	Disturbed areas	DAR	Once the road and crossings have been built, disturbed areas will be reclaimed by grading and providing runoff and sediment controls, as necessary.	PR#55 p245
66	Reclamation	Monitoring	DAR	The progress of reclamation in disturbed areas will be monitored.	PR#55 p246
67	Reclamation	Objective	Technical Analysis	After Mine closure, if the access road is also to be closed and reclaimed, CanZinc is committed to a reclamation goal of restoring pre-disturbance conditions, as much as possible, including the removal of structures no longer required, subject to the engagement and agreement of all parties.	PR#263 p5
68	Reclamation	Re-vegetation	Technical Analysis	Natural encroachment will be used as a re-vegetation strategy in disturbed areas, supplemented with available local seed and cuttings, to avoid the introduction of invasive species sometimes found in seed mixes.	PR#186 p3
69	Road design	Barge	Technical Analysis	A low draught vessel will be selected, big enough for at least one loaded tractor-trailer unit. Barge selection specifications will include provision for safe and easy loading/unloading and integration with the proposed ramps.	PR#371 p12
71	Road Design	Culverts	DAR	Careful culvert placement and sizing is especially important on slopes that already have significant existing slope instabilities and the potential for new instabilities.	PR#55 p33

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ID	Topic	Subtopic	EA Phase	Commitment	Reference
72	Road Design	Culverts	DAR	In areas of switchbacks, any road location that receives a culvert on an upslope reach of a stream should also receive a culvert or culverts on the road sections downslope that re-cross the same stream, and water should not be allowed to flow off the ends of switchbacks into inappropriate areas.	PR#55 p33
73	Road design	Culverts	DAR	Careful placement of culverts even where there are no obvious stream channels will help reduce the likelihood of ponding water alongside the road embankment.	PR#55 p236
70	Road Design	Culverts	DAR	Culvert crossings will be designed to avoid creating water drops on the downstream side (i.e., “perched” culverts will be avoided).	PR#90 p15
75	Road design	Cutslopes	DAR	If cutslopes in thaw-sensitive terrain are unavoidable, a much greater need for vigilance in monitoring and maintenance is required.	PR#55 p236
74	Road Design	Cutslopes	DAR	Cutslopes in thaw-sensitive terrain should be avoided if at all possible. If cutslopes in thaw-sensitive terrain are unavoidable, it may be possible to protect some cutslopes with a drainage blanket to help mitigate the effects of thaw and meltwater, or design near-vertical cutslopes to allow the organic layer to be draped over the cutslope to shade and protect it.	PR#55 p236
76	Road design	Footprint minimization	DAR	Confine all season road development activities to the approved winter road corridor to the greatest extent feasible.	PR#55 p266
77	Road Design	Grades and slopes	DAR	All reasonable options have been considered to keep maximum grades at 8% or less (preferred). However given the steep mountainous terrain and passes from KP 6 to 30, there are a number of sections with a 10% maximum grade and one short section of 12%.	PR#59 p26
78	Road Design	Grades and slopes	DAR	The subgrade will be left to settle sufficiently to mitigate winter construction risks.	PR#59 p29
79	Road Design	Ground condition	DAR	Construction will be managed such that travel across the ground does not occur when it is in its most vulnerable state.	PR#55 p235
80	Road Design	Ground condition	DAR	Summer/fall subgrade construction is proposed to take place in non-thaw sensitive ground when the ground is seasonally more likely to be relatively dry. The benefit of summer/fall construction in terrain that is not thaw-sensitive is that the construction team will be able to see more clearly where the cross-drainage installations should be placed and backfill placement and compaction will be greatly improved.	PR#55 p235
81	Road design	line of sight	Technical Analysis	CanZinc commits to installing windrows, lumber, or other brush clearing material at intersections with	PR#355 p12

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ID	Topic	Subtopic	EA Phase	Commitment	Reference
				other linear features to discourage access (and limit sightlines) to the road corridor by wildlife and humans.	
83	Road Design	Permafrost	DAR	Embankment fill-only (overlanding) techniques are proposed for thaw-sensitive permafrost areas.	PR#55 p235
82	Road Design	Permafrost	DAR	To minimize impacts related to permafrost, the standard approach taken regarding the cut slope angle will be 1:1 with some variability depending on soil type and site conditions.	PR#59 p19
84	Road Design	Pull outs	Technical Analysis	CanZinc commits to providing a pullout at approximately KP 29-30 for chain-up/chain-off, and turn-offs at approximately 10 km intervals to allow trucks with trailers to turn around.	PR#263 p3
85	Road design	Steep terrain	DAR	Proper design and construction of the access road will occur, avoiding steep terrain and hairpin turns as much as possible.	PR#55 p244
86	Road Design	Stripping placement	Technical Analysis	CanZinc commits to not placing road strippings in riparian zones	PR#246 p2
87	Road Design	Sundog Creek	Technical Analysis	Construction of the Sundog re-alignment will occur in summer or fall/early winter when the creek has no surface water. All construction would be conducted continuously and completed within one season. Construction would start at the lower portion of the re- alignment and progress upstream. All proposed stream design characteristics would be constructed continuously to avoid repeated disturbance. If surface water is encountered, the sealed off bottom exit or end would restrict surface water from discharging to other channels. The water would filter through the natural gravels. The reconstructed channel within the natural streambed material would be washed with pressurized water to allow fine sediments to settle into the reconstructed porous rock stream bed, or collect in a sump at the downstream end of the excavation for subsequent removal. Water required for the washing process will be extracted from an adjacent, stable floodplain area. A small filter berm would remain in place until the upper portion is complete and existing channel is ready to be diverted. The re-alignment will be inspected by a qualified professional during the first freshet. In addition, it will be the responsibility of the Road Operations Manager (ROM) to complete formal inspections during spring runoff and after intense summer rainfalls. It is expected that less formal, casual inspections will be done on a regular basis to ensure	PR#282 p41

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ID	Topic	Subtopic	EA Phase	Commitment	Reference
				continued stability of the re-alignment.	
89	Road Design	Sundog Creek	Technical Analysis	The final (Sundog realignment) design will be developed to provide hydraulic/sediment capacity equivalent to the geometry of the existing channel, defined by its geometry, and to mimic the substrate characteristics of the existing channel.	PR#294 p61
90	Road design	Water drainage inspections	DAR	Regular inspections will help identify areas where surface water drainage provisions need to be changed or improved.	PR#55 p236
91	Road Design	Width	Technical Analysis	CanZinc commits to a minimum 4 m wide running surface width, and a 5 m wide running surface width where possible (the width would be no less than 4.9 m in the latter areas). There will be widenings at curves.	PR#263 p4
93	Road Maintenance	Bridge and culvert inspections	Technical Analysis	For Bridge and Major Culverts Inspection, Allnorth proposes: (1) (a) ensure that a qualified person such as a road maintenance supervisor carries out a visual inspection of each bridge or major culvert associated with the road at least once every year after the bridge or major culvert is constructed, and (b) make a record of the inspection. (2) (a) ensure that a qualified person under the direction of qualified Professional Engineer carries out a detailed inspection of each bridge or major culvert associated with the road, and (b) make a record of the inspection, (i) subject to subparagraph (ii), at least once every 3 years after the bridge or major culvert is constructed, or (ii) at such intervals as specified in writing by a professional engineer. The inspection and monitoring program will reflect the crossing risk rankings. Key to the monitoring will be the detection of any changes to channel positions and the potential for erosion with respect to the crossing structures, and consideration of required adaptive management.	PR#200 p27
94	Road Maintenance	Drainage inspection an monitoring plan	Technical Analysis	CanZinc will develop a suitable inspection and monitoring plan regarding all stream crossing structures, and drainage patterns along the road alignment to maintain natural drainage and to inform adaptive management actions (including location of equipment required for these management actions such as backhoes, steamers and erosion/sediment control devices).	PR#263 p2
95	Road Maintenance	General	DAR	Long term road performance would be continually assessed following high water events and changes made accordingly. Ditches will be cleaned as required and maintained, culverts will be cleaned out and	PR#101 p14



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ID	Topic	Subtopic	EA Phase	Commitment	Reference
				restored to ensure full capacity. Additional cross drainage culverts may be installed if required. From time to time, some minor breakdown of the road subgrade may occur, and would be restored.	
96	Road Maintenance	Inspections	DAR	During road construction, operations and reclamation, there will be regular inspections by supervisory, maintenance and environmental staff, as well as community monitors. Any evidence of impacts, or conditions that might lead to impacts, will be immediately brought to the attention of the transportation manager. Any obvious problems, such as sediment dispersal, will be rectified immediately by construction/maintenance crews	PR#55 p246
97	Road Maintenance	Maintenance plan	DAR	A short and long term road maintenance program would be developed at the detailed road design stage.	PR#55 p27
98	Road Maintenance	Ongoing monitoring	DAR	Following the construction of the road, ongoing monitoring of the road structure will occur. Regular maintenance will be applied which will include rebuilding/adding additional armouring to those sections deemed insufficient as required.	PR#178 p33
100	Road Safety	Design guidelines	Technical Analysis	CanZinc commits to adhering to road design standards in the B.C. Ministry of Forests, Lands and Natural Resources Operations Engineering Manual as much as possible, and explaining and justifying where these guidelines will not be met.	PR#263 p3
101	Road safety	Driver impairment	Technical Analysis	Provisions for checking on the condition of drivers before they start their shift will be included, specifically, are they sufficiently rested and not sick, as well as provision for driver relief during their journey if they do not feel fully able to drive safely for any reason. During orientation, all drivers will be warned about the dangers of distraction and not being alert. This will be reinforced in morning meetings prior to initiation of the days' transport activities. Drug and alcohol screening is a standard procedure for all employees and contractors, and will be rigorously enforced and monitored. Any suspicion of impairment noted in morning meetings prior to initiation of the days' transport activities will result in the driver being withdrawn from work that day and subject to testing.	PR#370 p39
102	Road safety	Driver orientation	DAR	Drivers will receive an orientation package describing the road and specific sections/conditions before driving the road for the first time, and they will be required to read it. Drivers will check in and out, and be in communication with control during the journey.	PR#55 p202

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ID	Topic	Subtopic	EA Phase	Commitment	Reference
103	Road Safety	Engineering standards	Technical Analysis	At the detailed design stage, using the MOFLNR Engineering Manual standards, sections with restricted line of sight will be speed reduced accordingly and posted.	PR#364, Oboni IR#5
104	Road Safety	Management plans	Technical Analysis	Management plans developed for the winter road (See PR#55, Section 6.7) will be reviewed for use with the all season road to confirm applicability to summer conditions.	PR#355
105	Road safety	Mitigations	Technical Analysis	<p>During the detailed design phase and subsequent pre-operations planning, CZN proposes to consider the following additional mitigations: 1) Typical cab safety belts are designed to restrain occupants for forward collisions. Given the risk of an off-road excursion, which may lead to a rollover and sideways occupant motion, it is appropriate to consider additional operator restraint devices, and possibly modified seat-belt arrangements. We will also review other safeguards, such as a mechanism that prevents the operation of the unit if the seatbelt is not engaged. 2) Cargo safety, particularly anchoring, will be reviewed in detail. We will review options that stabilize the bases of items to be transported, as well as ‘top-down’ anchoring. The potential for forward and sideways energy will be considered. With respect to concentrate in bags, unless all concentrate is in bulk, we will look at a base design that will limit the opportunity for sideways, forward and backward movement, in addition to top straps to allow top-down forward and sideways anchoring. 3) For the road sections noted as requiring further review for additional mitigations, we propose to look into moderate widening (0.5-1 m) of the normal road width (5 m) in those locations considered to be specifically at risk of an off-road excursion. Widening should be feasible for the km sections 12.3-17 and 53.5-57.4. Widening of km 25.2-28.7 will be difficult because of the common occurrence of upslope rock cuts. Widening of this section in places may still be possible by steepening the downslope, for example by the use of gabions anchored onto underlying rock. CZN successfully used this approach to restore the road bed in several sections along Prairie Creek after the 2006 and 2007 floods. 4) The road sections to be reviewed for additional mitigations will be considered for perimeter barriers in locations where they are deemed necessary, which may or may not be</p>	PR#407 p9

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ID	Topic	Subtopic	EA Phase	Commitment	Reference
				the same locations selected for widening. Barriers could take the form of an earth berm if space is suitable, or narrower barriers such as cables or guardrails. 5) Following the completion of road construction, and before operations commence, an operational level risk assessment will be completed with the road team including supervisors, operators and maintenance staff. Additional risk mitigation measures will be considered	
109	Road Safety	Operations plan	Technical Analysis	The Road Operations Plan will be updated to incorporate GNWT Road Operation Guidelines, for review and approval by the regulator(s) prior to relevant operations.	PR#246 p2
106	Road Safety	Operations plan	Technical Analysis	Implement CZN’s Road Operations Plan (see PR#135)	PR#355
107	Road Safety	Operations plan	Technical Analysis	The Road Operations Plan will define how vehicle speeds will be monitored and enforced.	PR#355, as per PR#192, PCA IR 16
108	Road Safety	Operations plan	Technical Analysis	The Road Operations Plan will be revised to abide by and enforce GNWT commercial truck loading restrictions, and adequately justify any variance from these allowances with respect to truck and trailer configurations.	PR#355, as per PR#192, PCA IR 16
111	Road safety	Speed limits	DAR	Suitable speed limits will be posted on the All Season Road.	PR#55 p183
112	Road safety	Systems to regulate road safety and performance	Technical Analysis	CZN will rely on the systems which have been established by the federal and provincial authorities to regulate the safety and performance of the commercial transport industry, such as the National Safety Code Registrations, to ensure requirements with respect to: driver qualifications and regular certification; hours of service operations; vehicle inspections (Daily and semi-annually); pre-trip assessments; and maintenance records and reporting. The status of an operator will be subject to: audits; suspensions if necessary; and removal of National Safety Code Registration if necessary. CZN is committed to ensuring the safe transportation of personnel and goods, and will adopt, at a minimum, and under the responsibility of a Road Operations Manager, standard industry operating procedures for all vehicles supporting the mine operation. These standards would include: daily tailboard meetings with operators to review any specific or unique road conditions which can impact the safe and efficient	PR#370 p38

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ID	Topic	Subtopic	EA Phase	Commitment	Reference
				operation of the transportation fleet; weekly safety meetings of all personnel utilizing the road regularly; radio call procedures; daily pre and post trip inspections of all commercial vehicles, which would include brake checks, and inspection reports, completed by the operator; reporting procedures for all near misses and incidents and the appropriate actions to follow; and procedures for routine inspections of cargo and general truck conditions to be completed during the daily transportation cycle. CZN will ensure that all carriers (including its own) that are transporting dangerous goods will provide proof of Transportation of Dangerous Goods training and certification of the drivers. In addition, it will be confirmed that the operators of the unit possess appropriate TDG containment and response equipment. For the non-categorized dangerous good, CZN will ensure that all carriers are operating to the minimum standard of the National Safety Code Cargo Containment, Standard 10.	
113	Road safety	Winter chains	DAR	A winter driving policy, requiring tire chains to be used on haul trucks in the mountains (Phase 1 KP 0-29) to increase traction when necessary, will be adopted.	PR#55 p183
114	Terrain, soil, permafrost and karst topography	Avalanche recommendation follow-up	Technical Analysis	CZN will be following up on the recommendations in the (Alpine Solutions) report (re. avalanches) at the appropriate time in advance of winter road construction.	PR#178 p2
115	Terrain, soil, permafrost and karst topography	Avalanches	Technical Analysis	The avalanche assessment and map prepared previously for the road (PR#129) will be incorporated into an appropriate Road Operations Plan.	PR#355
116	Terrain, soil, permafrost and karst topography	Avalanches	Technical Analysis	CanZinc commits to considering avalanche risks in the design of bridges and crossings and the placement of construction camps, for review and approval by the regulator(s) prior to construction of each structure.	PR#246 p3
117	Terrain, soil, permafrost and karst topography	Best practices	DAR	Construction in accordance with best standard industry practices in relation to soil disturbance, hydrology maintenance and construction in permafrost areas will be employed.	PR#55 p267
120	Terrain, soil, permafrost and karst topography	Borrow source development and management	DAR	If permafrost is a factor in the general area of a borrow pit, water should not be allowed to pond on it and create a surface thaw condition leading to permafrost degradation.	PR#59 p87

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ID	Topic	Subtopic	EA Phase	Commitment	Reference
		plans			
124	Terrain, soil, permafrost and karst topography	Borrow source development and management plans	DAR	Some general guidelines for borrow sources are: minimize the surface area of the open cut; grade slopes to reduce slumping; grade material storage and working areas to promote drainage and avoid standing water; and, restore the borrow source when construction is completed by grading slopes to match the natural ground and drainage of the surrounding area, and replacing overburden.	PR#55 p33
118	Terrain, soil, permafrost and karst topography	Borrow source development and management plans	Technical Analysis	Individual borrow source development and management plans will be prepared for each borrow source that will incorporate site-specific recommendations relating to permafrost, as necessary.	PR#351 p1
125	Terrain, soil, permafrost and karst topography	Borrow source development and management plans	Technical Analysis	During detailed design, borrow sources will be sampled according to the guidance of a professional ARD geochemist. Any borrow with a positive identification of ARD/ML potential will not be used. The remaining borrows will be used only if these are considered to pose a low risk to the environment and subject to mitigation procedures that may be defined by a professional ARD/ML geochemist.	PR#200 p16
119	Terrain, soil, permafrost and karst topography	Borrow source development and management plans	Technical Analysis	A “Detailed Borrow Site Plan and Design” (DBSPD) for each selected borrow location will be completed prior to construction.	PR#350 p1
121	Terrain, soil, permafrost and karst topography	Borrow source development and management plans	DAR	If permafrost is present and cannot be avoided in the pit development area, mitigation plans must be in place for dealing with any thawing of slope materials, and for the control and filtration of any resulting melt-water.	PR#59 p87
122	Terrain, soil, permafrost and karst topography	Borrow source development and management plans	Technical Analysis	Where permafrost is encountered in borrows, either the borrow will not be used, or it will be used subject to mitigation by a professional geotechnical engineer to avoid significant impacts in terms of development and reclamation.	PR#200 p17
123	Terrain, soil, permafrost and karst topography	Borrow source development and management	Technical Analysis	CZN is committed to avoiding and minimizing exposing water tables to the surface. All borrow sources located in floodplains will not be excavated below the water table. Extracting or excavating ditch depths below normal flood plain level will be avoided.	PR#370 p124

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ID	Topic	Subtopic	EA Phase	Commitment	Reference
		plans		Borrow source investigation will be completed during the detailed design stage which would determine water table levels. A DBSPD will be completed on every selected borrow source which would include detailed, site specific extraction and reclamation plans, including borrow extraction within floodplains subject to water table influence. A minimum 50 m buffer will remain between the active portion of the floodplain (Q2) and the borrow source, or mitigation provided as necessary if this isn’t possible (e.g. Sundog talus). During the detailed design stage, borrow sources which may be impacted by high water flows (Q100) will be guarded, if deemed necessary, by a berm elevated 1 m above the determined Q100 elevation. During detailed design, borrow pit stability, potential risk from active stream channel, and potential risk from high water flows will be reviewed and appropriate protection measures such as berms will be included in the DBSPD.	
126	Terrain, soil, permafrost and karst topography	Earthquakes	Technical Analysis	CanZinc will take into account the risk of earthquakes in the design and construction of permanent infrastructure and bridges, for review and approval by the regulator(s) prior to construction of permanent infrastructure and bridges.	PR#246 p2
127	Terrain, soil, permafrost and karst topography	Environmentally sensitive areas	DAR	Any borrow pits incorporating tall cut slopes or adjacent to environmentally sensitive areas will be monitored for any evidence of slope instability during any excavation operations.	PR#59 p79
128	Terrain, soil, permafrost and karst topography	Investigation and monitoring plan	Technical Analysis	CanZinc commits to developing a permafrost monitoring plan as a permit condition, an outline of which was provided on the Tetra Tech letter dated April 3, 2017 (PR #484, p.23) informed by a detailed investigation of permafrost along the road alignment.	PR#246 p2
129	Terrain, soil, permafrost and karst topography	Permafrost investigation	Technical Analysis	CZN will undertake a suitable site investigation program to further investigate permafrost issues during the detailed design process (see Tetra Tech, April 3, 2017), and will implement appropriate mitigations during road construction activities to address those issues.	PR#320 p11
130	Terrain, soil, permafrost and karst topography	Quarry guidelines	Technical Analysis	Where excavation of borrow below the road grade cannot be avoided, CanZinc commits to applying appropriate guidelines (i.e. quarry guidelines). These considerations will be described in the development plans for these borrow sources, for review and approval by the regulator(s) prior to borrow pit development.	PR#246 p1

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ID	Topic	Subtopic	EA Phase	Commitment	Reference
131	Terrain, soil, permafrost and karst topography	Sediment influx to watercourses	Technical Analysis	The potential for sediment influx to watercourses will be considered as part of detailed terrain stability assessment.	PR#320 p25
132	Terrain, soil, permafrost and karst topography	Soil disturbance	DAR	For wet, ice rich, or permafrost sections, typical overland construction will include no disturbance of the natural ground layer and placing timber horizontally in a corduroy style to help support the road subgrade.	PR#59 p23
135	Terrain, soil, permafrost and karst topography	Stability monitoring	Technical Analysis	Areas at high-risk due to potential slope stability or ground stability issues will be monitored. A professional engineer will determine a monitoring frequency (minimum monthly) and specify the required qualifications of the inspector. Monitoring will be undertaken by local monitors under the guidance and instruction of an engineer, with inspection by the engineer on a pre-determined frequency. A major rainfall event or abnormally high spring thaw event is considered to be one that causes runoff sufficient to create erosive force, indicated by highly turbid water in local streams. A significant seismic event is considered to be one that is clearly felt either at the Mine or in neighbouring communities, and is recorded by the Geological Survey. After a significant runoff or seismic event, all sections of the road will be checked by proximal staff before the 'all clear' is given for travel.	PR#370 p5
136	Terrain, soil, permafrost and karst topography	Subsidence feature mapping	DAR	Subsidence features on the Ram Plateau between Km 59 and Km 84, within about 200 metres of the road, will be mapped. These features will be reviewed annually and any change in conditions documented.	PR#55 p225
137	Terrain, soil, permafrost and karst topography	Terrain stability assessment	Technical Analysis	CanZinc will complete a more in depth terrain stability assessment (including identification of risks and mitigations) with a focus on areas identified as unstable and potentially unstable in their terrain mapping, and will provide this information for review and approval by the regulator(s) prior to construction in those areas of focus. In the case of the Silent Hills section of the alignment from kp 95.5 to kp 101.7, if further assessment confirms there to be potential for a large rotational slope instability within the bedrock (as characterised in the risk analysis report for landslide hazards), and the area of potential slope instability can't be avoided by further amendment to the alignment, then the landslide risk management process will be supported by a site	PR#246 p3;PR#532



## Appendix C – Developer’s commitments

ID	Topic	Subtopic	EA Phase	Commitment	Reference
				investigation under the direction of a geotechnical consultant carried out as part of the detailed design. <sup>1</sup>	
138	Terrain, soil, permafrost and karst topography,	High risk area contingencies	Technical Analysis	Site-specific contingencies for high-risk areas are as follows: Carry out at least monthly visual inspections for areas designated high-risk due to potential slope stability or ground stability issues until seasonal baselines for behavior of the area are established; When the baselines are established, carry out regular visual inspections for areas designated high- risk due to potential slope stability or ground stability issues. A suggested schedule for inspection of those areas would include at least one inspection prior to spring freshet to confirm that culverts are free-draining, then monthly during the thaw season, and at least once during the winter for areas with hazards that exist also in winter (for example, for rock fall that is freeze/thaw-related); and, carry out inspections for high-risk areas within 24 hours of major rainfall events, abnormally high spring thaw events or significant seismic events, and/or prior to mine traffic travelling the road. “Where problems are detected, they would be repaired or corrected in a timely manner, and prioritized in accordance with the urgency of the problem.	PR#282 p2
139	Terrain, soil, permafrost and karst topography, fish and aquatic habitat	Rockfall measures	Technical Analysis	Locations where rock fall measures are needed and could be successfully implemented will be chosen at the time of detailed design, taking into account the likely frequency and anticipated volumes of rock fall at a particular location, as well as the likely success of other measures that could be implemented in addition to or instead of physical solutions. For example, netting may be more useful on blind corners, whereas signage may be more appropriate at locations where sight distances are good in rock fall areas. Suitable protection solutions for existing out-dipping rock slopes along the route will be developed where necessary at the time of detailed design. Debris flow/flood locations will be specifically evaluated during detailed design to determine if some benefit would be realized with the use of a deflection berm.	PR#282 p217

<sup>1</sup> Wording added by the Review Board based on the hearing commitments in PR#532. Wording confirmed with CanZinc by email.

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ID	Topic	Subtopic	EA Phase	Commitment	Reference
140	Terrain, soils, permafrost and karst topography	Borrow source development and management plans	Technical Analysis	The development, working and restoration of borrow sources will be carefully planned and carried out to reduce or avoid negative effects including permafrost thaw and soil erosion.	PR#55 p236
141	Terrain, soils, permafrost and karst topography	National Parks Caving Directive	DAR	Parks Canada is preparing a National Parks Caving Directive which may have information of value in karst terrain, and will be consulted.	PR#129 p79
142	Vegetation	Clearing	DAR	Brush and debris from clearing the right of way will be windrowed adjacent to the right of way, with breaks every 100 m. Trees felled will be bucked or removed.	PR#2 p4
143	Vegetation	Invasive Species	Technical Analysis	Access and use of the road by unauthorized persons will be deterred to the extent possible because off-road vehicles could introduce invasive species. Road use monitoring is proposed at, or west of, the Liard River crossing on the all season access road.	PR#186 p44
145	Vegetation	Invasive species management plan	Technical Analysis	The Invasive Species Management Plan is adaptive and will evolve as the project evolves and invasive species are, or are not, detected. The four key principles are prevention, detection, control and restoration.	PR#186 p2
144	Vegetation	Invasive species management plan	DAR	An invasive species management plan will be developed and implemented to ideally prevent, or if necessary, control the establishment of invasive plant species in off-site vegetation communities adjacent to the roadway.	PR#55 p185
146	Vegetation	Invasive species mitigation	Technical Analysis	Re invasive species, highway trucks and/or trailers headed for the Mine will pass through a wheel-wash during non-frozen conditions and be cleaned of any debris before leaving the Liard River crossing.	PR#186 p44
147	Vegetation	Rare plant survey	Technical Analysis	An early (spring) rare plant survey will be completed prior to construction for the flowering periods of plant families such as Ranunculaceae (buttercups) and Rosaceae (rose), for the all season road project footprint. The resulting data from the vegetation survey will be incorporated into adaptive management plans and may result in further mitigation actions. A rare plant management plan will be developed as necessary.	PR#282 p4
149	Vegetation	Stockpile placement	Technical Analysis	Stockpiles will be placed on non-vegetated or sparsely vegetated areas to minimize disturbance to vegetation, where possible.	PR#355

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ID	Topic	Subtopic	EA Phase	Commitment	Reference
150	Vehicle maintenance	Inspections for leaks	DAR	Vehicles will be properly maintained and inspected for leaks, and drip pans will be used for stationary equipment.	PR#55 p192
152	Water and sediment quality, vegetation, wildlife	Contaminant loading management plan	Technical Analysis	CanZinc commits to updating its contaminant loading management plan in consultation with ECCC and Parks, with approval required before concentrate haul commences.	PR#246 p2
151	Water and sediment quality, vegetation, wildlife	Contaminant loading management plan	DAR	Follow the existing draft Contaminant Loading Management Plan and soil sampling along the road bed both before and during haul operations.	PR#55 p184
153	Water quality and quantity	Peatland drainage	DAR	Natural drainage patterns along the haul road will be preserved to maintain the natural function and processes of peatland habitats adjacent to the haul road.	PR#55 p185
154	Water quality and quantity	Refuelling	DAR	Trucks and equipment will be refuelled away from any stream, lake, wetland or other water body, per industry standards.	PR#55 p267
155	Water quality and quantity	Water extraction volumes	Technical Analysis	Water extraction from lakes will be limited according to lake volume as follows: Mosquito and Km 70 1%; Km 115 and Km 121 5%; Km 139 and Km 141 2%. Withdrawal rates noted above are based on each summer season. Withdrawal volumes will be tracked either by using an in-line flow meter, or by recording the number of fills of tanks of known capacity. Records will be kept and can be provided at regular intervals along with other road monitoring data.	PR#355 p4
156	Water quality and quantity	Watercourse crossings	Technical Analysis	CanZinc commit to performing the geotechnical and hydrological investigations required prior to final design of the watercourse crossings	PR#200 p26
157	Water quality and quantity, aquatic habitat	Fuel	DAR	Fuel caches will be located on flat, stable terrain, or in a natural depression, away from slopes leading to water bodies, located above the Q100 high water mark, outside the defined riparian area of proximal bodies of water, will not be stored on the surface of frozen lakes or streams, will have secondary containment for stationary fuel containers with a capacity greater than 230 L, and the containment will be 10 percent greater than the capacity of the largest fuel container.	PR#59 p53
158	Water quality and quantity, aquatic habitat	Sediment control	Technical Analysis	Sediment control measures will be installed for any disturbed soils where there is a risk of sediment migration to surface water.	PR#246 p2

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ID	Topic	Subtopic	EA Phase	Commitment	Reference
159	Water quality and quantity, aquatic habitat	Stockpile placement	Technical Analysis	CanZinc commits to placing any stockpiles of rock and coarse material 50 m from flowing watercourses, and soil or fine material at least 100 m from flowing watercourses. Where this is not possible (e.g. in tight canyons or valleys), CanZinc will implement enhanced erosion and sediment control measures to avoid impacts.	PR#246 p1
160	Wildlife	Barging	DAR	Cease barging activities if Wood Bison are observed crossing the river near the barge location.	PR#55 p255
161	Wildlife	Baseline wildlife surveys	Technical Analysis	Additional baseline wildlife surveys for forest and wetland birds are planned for the May to June window, with input from ECCC and Parks Canada. The resulting data will be incorporated into adaptive management plans and may result in further mitigation actions. A suitable operations phase monitoring program will be developed with input from Parks Canada. At the time of the baseline bird survey, additional waterfowl and cliff-nesting raptor surveys may be conducted concurrently, and the black bear habitat potential maps may be updated with any new relevant information.	PR#282 p3
163	Wildlife	Bear den surveys	Technical Analysis	Pre-clearing denning surveys identified for Grizzly Bears also extends to Black Bears. Environmental Monitors will survey for wildlife dens in favourable denning habitat (e.g., borrow sources) prior to clearing.	PR#186 p9
162	Wildlife	Bear den surveys	Technical Analysis	Survey crews will conduct ground-based reconnaissance den surveys from KP 170 to KP 36. These ground-based surveys will cover the entire 134 km (KP 36 to 170) along the proposed all season road. An aerial den survey will focus on the area along the proposed all-season road (KP 36 to 170) with: 1) moderate and high denning potential, 2) known den(s) identified during the ground-based surveys, and 3) proposed winter clearing (after October 1). Ground and aerial surveys will include areas overlapping with the previously developed winter road. The aerial survey will consist of flying evenly spaced transects, with a higher survey intensity in areas of previously identified dens.	PR#341 p4
164	Wildlife	Caribou	DAR	An alert system will be used to warn personnel of Woodland Caribou and other sensitive wildlife in the local area by relaying sighting information to vehicles/aircraft and equipment operators and on-site personnel.	PR#55 p184

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ID	Topic	Subtopic	EA Phase	Commitment	Reference
165	Wildlife	Caribou	Technical Analysis	If caribou are reported on the road or within 500 m of it, traffic or activity will cease at least 500 m from (or at first observation of) the animal(s) and all headlights turned off until the animal moves off at least 100 m away from the road or 5 minutes after last visual. Once traffic resumes, speed reduced to half the posted speed limit, 30 km/hr, within 1 km of the sighting.	PR#186 p18
166	Wildlife	Caribou	Technical Analysis	If caribou are reported beyond 500 m of the road, traffic speeds are to be reduced to half the posted speed limit, 30 km/hr, within 1 km of the sighting.	PR#186 p19
167	Wildlife	Community engagement	DAR	The wildlife and wildlife habitat mitigation and monitoring plan will include annual engagement with members of the Naha Dehe Dene Band to monitor measureable parameters of effects.	PR#55 p184
168	Wildlife	Data sharing	DAR	The Dehcho Land Use Planning Committee (and others as requested) will be provided with the post-construction digital footprint of the all season access road and associated facilities to incorporate into ongoing cumulative effects monitoring across the Dehcho.	PR#55 p256
169	Wildlife	Den and nest avoidance	DAR	Project employees and contractors will avoid all known or suspected den and nest sites.	PR#55 p257
170	Wildlife	Education program	DAR	An education program of wildlife related policies and mitigation will be provided to all Project employees and contractors, including a bear awareness program to ensure employees and contractors are informed of bears and other potentially dangerous wildlife and the level of risk.	PR#55 p184
171	Wildlife	Fuel	DAR	Fuel storage facilities will meet industry standards for tank construction, location and spill containment.	PR#55 p183
172	Wildlife	Harlequin duck	Technical Analysis	Conduct any in-stream bridge construction work and in-stream Sundog re-alignment/armouring outside Harlequin duck occurrence (late April to mid-Sept) or when no flow. Should in-stream work be required during this time, the Environmental Monitor will first survey the area for the presence of Harlequin ducks within 500 m of the activity (both upstream and downstream) and in-stream work will cease if a Harlequin duck is present.	PR#186 p21
173	Wildlife	Harvesting	DAR	Prohibit hunting, trapping, harvesting, and fishing by site employees and contractors.	PR#55 p227
174	Wildlife	Measureable parameters of effects	DAR	Amend the existing draft Wildlife Mitigation and Monitoring Plan, as necessary, to include the monitoring of measureable parameters of effects.	PR#55 p256

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ID	Topic	Subtopic	EA Phase	Commitment	Reference
175	Wildlife	Pets	DAR	Pets will be prohibited along the all season access road.	PR#55 p185
176	Wildlife	Pika	Technical Analysis	Within collared pika range and where talus is present, CZN commits to avoiding talus to the extent possible, and conducting presence/not detected collared pika surveys in all borrow sources selected for development and along the proposed all-season road alignment that disturbs talus. CZN commits to conducting pika surveys to determine their presence prior to development (e.g., road alignment, borrow sources) in pika habitat. Should pika’s occupy a proposed borrow source or portion thereof, prior to development, a replacement borrow source or an unoccupied portion of the same source (as some sources are large) will be selected for use (after confirming that no pika’s occur within a sufficient buffer distance identified by a biologist).	PR#341 p13
179	Wildlife	Pika	Technical Analysis	Additional mitigation, beyond that previously identified in the DAR (e.g., low truck volumes, reduced traffic speeds, dust suppression, response to accidental spills, prohibit littering) specific to collared pika are: prohibit the storage of snow, including along roadside snow banks, on or within 10 m of talus habitat (within pika range); prohibit the disturbance of talus habitat (within pika range) year round unless pre-disturbance presence/not detected surveys have been completed and pikas were determined to be not present; and if required, determine a sufficient buffer distance from which borrow construction can occur near active pika habitat, based on guidance from a biologist.	PR#370 p85
181	Wildlife	Policy	DAR	Wildlife will have the right-of-way, obligating drivers to stop (when safe to do so) for wildlife seen on or immediately adjacent to the road, to allow them to move away.	PR#55 p184
180	Wildlife	Policy	DAR	A no hunting policy will apply for all Project employees and contractors while working and/or at the Mine site.	PR#55 p183
183	Wildlife	Problem Bears	DAR	Implement a protocol for dealing with problem bears, with a designated chain of responsibilities for ensuring worker safety and efficient and speedy resolution of incidents.	PR#55 p257
184	Wildlife	Regulatory agency notification	DAR	The appropriate regulatory agencies (i.e., GNWT ENR and Parks Canada) will be contacted to receive additional direction regarding any new wildlife issues that arise.	PR#55 p258

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ID	Topic	Subtopic	EA Phase	Commitment	Reference
187	Wildlife	Reporting	DAR	Wildlife sightings along the access road and airstrip will be reported and evaluated, and if a problem area is identified, corrective management options for traffic and Project-related activities will be considered.	PR#55 p227
186	Wildlife	Reporting	DAR	Report annual updates and results of the Wildlife Mitigation and Management Plan, Road Operations Plan, and inspections and enforcements.	PR#55 p215
188	Wildlife	Retarder Brakes	Technical Analysis	The use of engine retarders for braking will be discouraged but not prohibited since some road sections contain steeper portions, and drivers should retain the option to use any form of braking if necessary for safety.	PR#100 p47
189	Wildlife	Snow removal practices	DAR	Snow removal practices along the access road and airstrip will avoid high snow banks, so that wildlife can readily move off as vehicles/aircraft approach.	PR#55 p184
190	Wildlife	Technical advisory committee	DAR	Issues and considerations regarding wildlife populations and effects will be discussed during the Technical Advisory Committee (TAC) meetings proposed by CZN in EA0809-002. TAC meetings will include the all season road.	PR#55 p211
191	Wildlife	Trumpeter swans	DAR	Pumping water from ponds occupied by Trumpeter Swans is prohibited during nesting.	PR#55 p215
192	Wildlife	Use of explosives	Technical Analysis	Blasting is prohibited if caribou are observed within 1 km of the blast site until the animal moves out of the area.	PR#186 p17
193	Wildlife	Waste management plan	DAR	The Waste Management Plan will prohibit littering, purposely feeding wildlife, and storing attractants accessible to wildlife. All waste foods and human garbage will be incinerated consistent with current industry good management practices to minimize wildlife attraction to the local area. Adaptive management will be applied to waste management practices. If wildlife are found to be attracted to the site (i.e., problem wildlife) additional management practices, if required, will be adopted.	PR#55 p185
194	Wildlife	Waste removal	DAR	Solid waste will be organized and stored securely so that it does not attract wildlife, will be removed from the site progressively as the operation is under way, and will be incinerated using a proper manner of incineration.	PR#59 p44
195	Wildlife	Waste removal	DAR	Non-combustible solid waste will be removed from sites by the end of construction and operation.	PR#59 p44
196	Wildlife	Waste removal	DAR	Adaptive management will be applied to waste management practices. If wildlife are found to be attracted to the site (i.e., problem wildlife) additional	PR#55 p185



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ID	Topic	Subtopic	EA Phase	Commitment	Reference
				management practices, if required, will be adopted.	
197	Wildlife	Western toads	Technical Analysis	CanZinc commits to collaborating with GNWT to enable a breeding pond survey by local environmental monitors during the summer to detect the presence of Western toad in water bodies proximal to the road alignment between the Nahanni Butte access road and the Liard River. The survey will be conducted either before or after the early stage of construction (subgrade placement) to better understand the occurrence of Western toad in this area and potential need for mitigation during fall migration. If Western toad presence is confirmed in this area, the survey will be expanded progressively to other areas proximal to the road on the west side of the Liard River.	PR#263 p2
198	Wildlife	Wildlife monitoring and mitigation plan updates	DAR	The existing draft WMMP will be updated to include all season monitoring and species potentially affected by all season access road/ airstrip use. Additional considerations include: mortality thresholds for additional species at risk (e.g., Trumpeter Swan, Collared Pika), Moose, and Dall’s Sheep; monitoring, evaluating, and reporting harvest pressure, particularly along the Nahanni Range portions of the outfitter zone located outside the NNPR boundary; and, educating and promoting First Nations voluntary reporting of harvests from along the all season access road. If excessive use of the road occurs by non-residents, and hunting pressures or safety concerns result, additional access control measures will need to be considered involving local communities and government agencies.	PR#55 p34
199	Wildlife	Wildlife sighting logs	DAR	Wildlife sighting logs are to be completed by all Project employees and contractors for wildlife sightings (e.g., Dall’s Sheep, caribou, Wood Bison) with respect to species, location along the access road/ airstrip, numbers, and reaction to Project activity. If a problem area is identified, corrective measures will be considered.	PR#55 p184
200	Wildlife	Winter road management	DAR	The small portion of the winter road not used for all season access will be managed to prevent predator and non-Project related travel of the corridor, if necessary.	PR#55 p185
201	Wildlife	WMMP Revisions	Technical Analysis	The proposed mitigation measures noted in DAR Addendum, Appendix E, Appendix C will be integrated into a revised draft of the WMMP.	PR#355 p12

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ID	Topic	Subtopic	EA Phase	Commitment	Reference
202	Wildlife	Yellow Rails	Technical Analysis	<p>Re Yellow Rails, natural drainage patterns will be maintained throughout the boreal forest zone, by careful placement of culverts and regularly inspecting drainage measures to identify areas that do, or might unexpectedly, pond water. Follow best management practice (Environment Canada, 2009):</p> <ul style="list-style-type: none"> <li>• Avoid activities in areas while birds are present</li> <li>• Prevent loss and alteration of wetlands</li> <li>• Maintain year-round 100 m no-activity buffer from potential habitat</li> <li>• Avoid night-time activities (including light and noise) near breeding wetlands</li> <li>• No mowing of potential habitats when dry</li> </ul>	PR#186 p19
203	Wildlife mitigation and monitoring plan	Wildlife	DAR	ENR’s Woodland Caribou Best Management Practices for Industrial and Commercial Activities (once developed) will be incorporated into the wildlife monitoring program, where feasible, to manage or mitigate habitat impacts and sensory disturbances on Woodland Caribou.	PR#55 p185
204	Wildlife, fish and aquatic habitat	Use of machinery	DAR	Machinery used in road building will arrive on site in a clean condition, free of any fluid leaks, invasive species and noxious weeds. Machinery will be operated outside of wetted channels in such a way as to minimize disturbance of banks and channel bed. Forging of fish-bearing streams will most likely not be required, but if needed, will be limited to once-over-and-back, with prior Inspector approval. Temporary crossing structures or at minimum, swamp mats, will be applied to protect banks and stream beds if rutting is likely to result during fording. Equipment will be washed, refueled or serviced away from streams and in such a way as to prevent deleterious substances from entering the water. Fuel and other materials for machinery will also be stored in such a way as to prevent any deleterious substances from entering the water.	PR#90 p14
205	Wildlife, vegetation, fish and aquatic habitat	Sanitary and grey water	DAR	Sanitary and grey water will either be collected in tanks for subsequent transfer to trucks for off-site disposal at suitable locations, or processed locally (sumps), meeting the required standards for effluent dispersal. Specific locations will have approved plans which meet the regulatory requirements and site specific conditions.	PR#59 p44
206	Wildlife, water quantity	Policy	DAR	Significant changes to water levels while pumping water from a known Beaver pond in the fall and winter periods will be avoided.	PR#55 p185

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ID	Topic	Subtopic	EA Phase	Commitment	Reference
<b>Commitments from the hearing phase (p 28 to 37)</b>					
207	Wildlife	Harvesting	Tech Rpt response	CZN agrees to provide support to NBDB to develop a harvest monitoring program to track and report on patterns and levels of harvest associated with the road, and to include this in the WMMP.	
208	Wildlife	Caution Zones	Tech Rpt response	CZN will develop a more formal, detailed approach to identifying and communicating seasonal “wildlife caution zones. Road operations will be controlled using a Journey Management System (JMS). This system will include driver journey and incident logs which are compiled and wildlife sightings logged. Sightings will include the nature of the sighting and the location based on landmark and kilometre post (which will be sign-posted). The information will be noted by the driver at his next stop, and possibly by radio dispatch if animals are proximal to the road. Once a trend has emerged (which may occur over a few weeks), it will be discussed at pre-travel tail-gate meetings. Once an occurrence becomes common in terms of location, the road operations Supervisor will consider formalizing the caution zone with signage, although drivers will already be aware, and will have received instructions regarding caution. Road maintenance crews and environmental monitors will also be on the road, and they will also record wildlife sightings and provide the records for collation.	
209	Wildlife	Boreal caribou	Tech Rpt response	CZN will revise its WMMP to incorporate Commitment #6 from the technical session.	
210	Water Quality	ARD/ML	Tech Rpt response	All representative units will be sampled at all potential borrow source locations in order to identify any acid rock drainage and/or metal leaching potential that would impact water quality. Testing will be completed using acid-base accounting and metal leaching test methods to characterize representative units.	
211	Water Quality	Sediment	Tech Rpt response	The SECP will be reviewed and finalized before commencing construction. Erosion and sediment control measures will be in place when constructing around fish-bearing waters. Appropriate setback distances from fish-bearing waters will be determined and implemented based on site conditions for the storage of potential TSS generating materials. Monitoring will be completed during construction periods, prior to spring freshet, and	

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ID	Topic	Subtopic	EA Phase	Commitment	Reference
				when rainfall events are forecast to ensure sediment and erosion control mitigation measures are effective.	
212	Water Quality	Sediment	Tech Rpt response	Comprehensive Project monitoring of TSS and turbidity will be completed and mitigation adjusted if needed.	
213	Concentrate and material transport	Dust	Tech Rpt response	Monitoring of annual soil, snow, dustfall, and ambient dust sampling will be included in the CLMP. This will include trigger or action levels and adaptive management plans	
214	Fish and aquatic habitat, water quality and quantity	Fish Passage	Tech Rpt response	<p>CZN will implement all available best management practices to avoid, mitigate, or offset serious harm, as defined in the Fisheries Act, as a result of water crossing construction, operation, and decommissioning. This includes, but is not limited to: appropriate design of water crossings to facilitate passage at both high and low flows; bank stabilization by protecting and restoring riparian vegetation; adhering to timing windows to avoid spawning, incubation, and hatch times for all species using the water courses, and the installation and maintenance of sediment and erosion control measures.</p> <p>An appropriate water crossing maintenance and monitoring plan will be in place to ensure that barriers to fish passage do not form over time as a result of crossing damage due to ice blockage, flooding or movement of debris, such as may occur at freshet.</p>	
215	Heritage and cultural resources	Archaeological Surveys	Tech Rpt response	The Terms of Reference for the proposed all season road AIA (PRD #379) will be developed in collaboration with, and approved by, Parks Canada. The AIA will incorporate systematic shovel testing as well as ground sleuthing in areas of enhanced archaeological potential based on: (1) elevated areas of archaeological potential identified in the GIS Potential Model Categories 1-4 outlined in the AOA and further clarified in the TOR developed with Parks Canada; (2) areas of project impacts including borrow sources, water course crossings including bridge and culvert installation, borrow access roads, camps, staging areas, right of way and road realignments; and (3) incorporating traditional knowledge from Indigenous communities that may have knowledge of the project area including place names, traditional land use and harvesting in areas proximal to the footprint of an all season road.	

## Appendix C – Developer’s commitments

ID	Topic	Subtopic	EA Phase	Commitment	Reference
216	Heritage and cultural resources	Archaeological resource protection	Tech Rpt response	The Cultural Heritage Protection Plan and heritage resource booklet will incorporate the findings of the AOA and AIA. Parks Canada will have an opportunity to review the content of the Cultural Heritage Protection Plan. The Cultural Heritage Protection Plan and heritage resource booklet will be used to provide training and direction on the accidental recovery of heritage resources during the construction phase. Within the Cultural Heritage Protection Plan, mitigations associated with the accidental discovery of heritage resources in NNPR shall stipulate that all work is stopped and Parks Canada is contacted for advice prior to proceeding.	
217	Water Quality	Sediment	Tech Rpt response	CZN shall develop a detailed program to monitor the short-term effects of construction on surface water quality.	
218	Water Quality	Sediment	Tech Rpt response	CZN will develop a detailed long-term (i.e., multi-year) program to monitor water quality at a subset of road crossing sites (both upstream and downstream), at water bodies (e.g., lakes and wetlands) located adjacent to the road. This program will require a reduced sampling effort (i.e., frequency) compared to the short term program. Sampling intervals will be spring freshet and after significant summer storms.	
219	Water Quality	Grey Water	Tech Rpt response	<p>All grey water within NNPR will be managed through a septic system as outlined in the Yukon Government’s Standards and Guidelines. This will include the simple filtration of grey water to remove any solid material prior to disposal into the environment.</p> <p>CZN will provide a grey water management plan for the development, management and decommissioning of all grey water septic systems within NNPR. This plan must be approved by Parks Canada prior to construction, and will include:</p> <ol style="list-style-type: none"> <li>a. a design of the grey water septic system being proposed,</li> <li>b. the soil stratification for all proposed locations,</li> <li>c. the depth of the water table,</li> <li>d. the distance to nearest water course/ water body and potable water source.</li> </ol> <p>All camps of a temporary nature (with a wastewater system that serves a non-permanent population) will</p>	

## Appendix C – Developer’s commitments

ID	Topic	Subtopic	EA Phase	Commitment	Reference
				have a closure plan submitted as part of preliminary design. The closure plan will detail how the treatment works will be decommissioned upon camp closure.	
220	Water Quality	Brown Water	Tech Rpt response	<p>If CZN chooses to treat brown water (sewage) for camps at km 65 and 87 within NNPR rather than at an approved off site location, a sewage management plan will be completed prior to construction for the development, management, decommissioning and closure of the proposed sewage treatment systems at each site. This plan will include:</p> <ol style="list-style-type: none"> <li>a. a design of the sewage treatment system being proposed in accordance with accepted standards and guidelines,</li> <li>b. in the case of a septic system, a soil stratification for all proposed locations,</li> <li>c. the depth of the water table,</li> <li>d. the distance to nearest water course/ water body and potable water source.</li> </ol>	
221	Emergency Response	Spill plans	Tech Rpt response	Spill Contingency and Response Plans will be informed by the updated road design, operation plans and risk assessment. They will address separate phases of the project, including: construction, operations, and closure. Each Spill Contingency and Response Plan is to be developed and approved prior to each project phase.	
222	Permafrost	Monitoring	Tech Rpt response	A draft Permafrost Monitoring and Response Action Plan will be completed after detailed design and before construction, with plan review and update within 12 months of the completion of construction.	
223	Road Design	Permafrost	Tech Rpt response	<p>The detailed road design is subject to review and approval by Parks Canada for portions of the road within the NNPR prior to construction. The road design shall include:</p> <ul style="list-style-type: none"> <li>• Design report, drawings and construction specifications that are signed and stamped by a professional engineer.</li> <li>• A road design informed by industry best practices, including, Transport Association of Canada (2010). Guidelines for Development and Management of Transportation Infrastructure in Permafrost Regions. May 2010.</li> <li>• A road design that considers the construction, operations and closure phases of the project.</li> </ul> <p>Factual reports that document the site specific</p>	

## Appendix C – Developer’s commitments

ID	Topic	Subtopic	EA Phase	Commitment	Reference
				geotechnical and permafrost investigations and results utilized in the production of the road detailed design will be included.	
224	Reclamation	Plans	Tech Rpt response	<p>CZN will provide a detailed reclamation plan by vegetation / terrain type to demonstrate that ground stabilization and revegetation will be implemented in a timely manner that meets industry accepted best practices. Ripping and roughening of surfaces will be included.</p> <p>A draft detailed reclamation plan, including monitoring plan, is subject to review and approval by Parks Canada prior to construction, with an update after construction.</p> <p>The reclamation plan will include:</p> <ul style="list-style-type: none"> <li>• Detailed information on the short term (beginning during construction and continuing until properly-timed revegetation) and long term (beginning with revegetation and continuing into the post-closure phase) methods and timelines for restoration, including how borrow sources in floodplains will be addressed to ensure that bermed areas are properly reclaimed, that water is prevented from ponding, and that sediment / deleterious substances are prevented from entering watercourses.</li> <li>• Methods and materials that are consistent with ecological restoration objectives</li> <li>• Monitoring plan to evaluate the effectiveness of these mitigation and reclamation measures including targets (ex. percent cover) thresholds for adaptive management, and strategies for implementing adaptive management.</li> </ul>	
225	Wildlife	Pika	Tech rpt Att. 1	CZN will update the WMMP to include a Collared Pika monitoring program in collaboration with Parks Canada and the GNWT to monitor potential effects associated with the proposed all-season road.	
226	Wildlife	Trumpeter Swans	Tech rpt Att. 1	<p>Frequent, long-term and large disturbances, multiple sources of disturbances, and noise emissions greater than 50 dB (or greater than 10 dB above ambient) will be avoided within 800 m of observed Trumpeter Swans.</p> <p>Mitigation and monitoring efforts will be focused in</p>	



## Appendix C – Developer’s commitments

ID	Topic	Subtopic	EA Phase	Commitment	Reference
				<p>sections where the Project overlaps the Southeastern Mackenzie Mountain Key Migratory Habitat Site (NT Site 17).</p> <p>CZN will ensure mitigation and construction monitoring efforts will focus on areas where the Project overlaps key migratory bird habitat (including between KM 98 to 117), and where Trumpeter Swans are observed (including between KM 98 to 117).</p> <p>Construction activities (if critical for development, including crushing but excluding blasting) may occur within 800 m of observed Trumpeter Swans (from April 1 to September 30) with the assistance of a CZN Environmental Monitor.</p>	
227	Wildlife	Migratory birds	Tech rpt Att. 1	<p>All phases of the Project will be carried out in a manner that protects migratory birds and avoids harming, killing or disturbing migratory birds or destroying, disturbing or taking their nests or eggs.</p> <p>A scientifically sound approach to determine the likelihood of nesting birds will be used in the event that clearing or disturbance cannot be scheduled outside of the nesting season. If necessary, the use of non-intrusive search methods (e.g., point counts) could be undertaken to conduct an area search, for evidence of nesting, prior to the commencement of clearing.</p> <p>If necessary, migratory bird surveys will carried out by an avian specialist with experience with migratory birds and migratory bird behaviour indicative of nesting (e.g., singing birds, alarm calls, distraction displays, carrying nesting material or food).</p> <p>Results from all pre-clearing surveys will be reported in the annual wildlife monitoring report.</p> <p>Options such as avoiding, adapting, rescheduling or relocating activities, will be considered and implemented if there are indications of migratory bird nests where disturbance activities that have the potential to disturb or destroy nests are proposed.</p> <p>All disruptive activities in the nesting area will be</p>	

## Appendix C – Developer’s commitments

ID	Topic	Subtopic	EA Phase	Commitment	Reference
				<p>halted if migratory bird nests containing eggs or young are discovered. An appropriate buffer zone (i.e., setback distance) will be determined and observed until the young have naturally and permanently left the vicinity of the nest. Buffer zones will be appropriate for the species and take into consideration the intensity of the disturbance and the surrounding habitat. Buffer zones will also be adjusted after assessing their effectiveness.</p> <p>A buffer zone for forest songbirds will be included in Appendix C of the WMMP.</p> <p>If required, ECCC will be contacted for advice and/or additional mitigation measures.</p> <p>All of the above recommendations will be incorporated into the next revision of the WMMP.</p>	
228	Wildlife	Species at Risk	Tech rpt Att. 1	<p>Section 2.3.2 of the Updated Draft WMMP will be revised to reflect that the general prohibitions for migratory birds and aquatic species listed on Schedule 1 apply wherever these species are found.</p> <p>Table 1 of the Updated Draft WMMP will be revised to reflect current status of species listed on Schedule 1 of SARA or assessed by COSEWIC. Table 1 will be revised and included as part of the annual monitoring reports to aid in remaining aware of status changes while minimizing the number of revisions to the WMMP. The Species at Risk Registry will be consulted on a regular basis to maintain the most current information, including new COSEWIC assessments and/or species added to Schedule 1 of SARA.</p> <p>If species at risk are encountered or affected by the Project, the primary mitigation measure will be avoidance. Contact with or disturbance to each species, its habitat, and/or its residence will be avoided.</p>	
229	Wildlife	Avian Species at Risk	Tech rpt Att. 1	<p>ECCC will be consulted regarding migratory bird mitigation measures and advice for Project areas outside the Nahanni National Park Reserve.</p> <p>The absence of nesting avian species at risk (and other migratory birds) will be confirmed in borrow and gravel pits prior to commencing disruptive</p>	

## Appendix C – Developer’s commitments

ID	Topic	Subtopic	EA Phase	Commitment	Reference
				<p>activities during the general nesting period (May 1 to August 20). If work commences, monitoring for the absence of nests at borrow and gravel pits will continue throughout activities.</p> <p>Staff and contractors will be made aware of the conservation status of all species at risk that could be encountered at the Project. Staff and contractors will also be made aware of the potential of species at risk to use anthropogenic habitats and structures for nesting, the reporting protocol and all appropriate mitigation measures.</p>	
230	Wildlife	Boreal caribou	Tech rpt Att. 1	CZN will consult with the GNWT regarding the adequacy of the proposed mitigation and monitoring measures for Boreal Caribou.	
231	Wildlife	Pika	Tech rpt Att. 1	CZN will include in its final WMMP the Collared Pika commitments outlined in its response to MVEIRB IR#5 (PR 320), and will conduct long-term monitoring of Collared Pika abundance and patch occupancy in talus habits within 300 m of the road, with input on study design from the GNWT and Parks Canada. The resulting data from surveys will be incorporated into adaptive management plans and may result in further mitigation actions.	
232	Permafrost	Investigation	Tech rpt Att. 2	Detailed geotechnical investigations will be undertaken, including geophysical surveys, to better define the locations and characteristics of permafrost soils. Detailed geotechnical/geophysical investigations are required for both the road and borrow/quarry sources. The potential of icing and drainage blockage along the road will be identified during detailed design. Transport Association of Canada (2010) Guidelines for Development and Management of Transportation Infrastructure in Permafrost Regions will be followed. A design for closure will be developed that allows CZN to walk away.	
233	Fish	Authorization	Tech rpt Att. 3	CZN will apply for a Fisheries Act Authorization (Paragraph 35(2)(b) Fisheries Act Authorization [Normal Circumstances]) which will include an offset plan and monitoring plan. The aquatic habitat (below the HWM) and under the planned footprint of the diversion berm will be included in habitat accounting.	
234	Fish	Habitat	Tech rpt Att. 3	CZN will implement natural channel design principles into the proposed constructed channel. CZN will also apply natural features (e.g., boulders) at regular	

## Appendix C – Developer’s commitments

ID	Topic	Subtopic	EA Phase	Commitment	Reference
				intervals to mimic habitat currently available in the old channel, and ensure that the new channel provides similar flow capacity, velocities (throughout) and habitat as the current channel.	
235	Fish	Flows	Tech rpt Att. 4	Hydraulic modelling of the Sundog realignment will be refined during detailed design considering the hydraulic model results for the preliminary design as well as comments by others, and updated hydraulic model results will be provided. The final design will be subject to field modification to accommodate selective use and placement of larger size alluvium materials as may be encountered during construction.	
236	Fish	Habitat Offset	Tech rpt Att. 7	CZN will continue to work with DFO, Parks Canada and Aboriginal groups to identify suitable offsetting opportunities.	
237	Fish	Riparian Veg.	Tech rpt Att. 7	CZN will follow standard best management practices for the removal of riparian vegetation, where practical and feasible.	
238	Road	Design and Risk	Hearing	An independent technical review panel will be formed. The mandate of the panel would be to recommend road design principles. Improvements and/or updates to the existing risk assessments would be part of the panel’s scope. The panel would be free to make recommendations regarding the proposed road operations and maintenance requirements to promote safety and reduced risk. Panel member selection will include a short list of potential candidates who are Professional Engineers, have worked on previous road projects in the North and are free from conflict with CZN’s engineering team and Oboni Riskope. Three panel members will be selected and the scope and mandate for their work will be agreed with them, followed by the preparation of a report detailing the selection process and panel terms of reference. This report would be submitted to the Mackenzie Land and Water Board, the GNWT and Parks Canada for comment.	
239	Littoral Zone	Lake Levels	Closing	CZN will install water gauge stations at the lakes from which water will be withdrawn for dust control. CZN will create a monitoring program, with input from DFO and Parks Canada, based on the water gauge stations, specifying when lake level readings will be taken and outlining actions to be taken if recharge assumptions are not met.	

## Appendix C – Developer’s commitments

ID	Topic	Subtopic	EA Phase	Commitment	Reference
240	Water Quality	Sundog Creek	Closing	The TSS and turbidity of the Sundog Creek realignment will be monitored before and after realignment, until such time as the data supports a conclusion that water quality is no longer being affected by the realignment. The monitoring will may lead to adaptive management if thresholds or triggers are exceeded.	
241	Risk Assessment	Updated risk assessment	Hearing	Canadian Zinc will provide an updated risk assessment as part of detailed design. <sup>2</sup>	PR#532
242	Access Control	Liard crossing location	Hearing	Canadian Zinc will commit to routing the Liard River winter crossing completely through the territorial land surface lease on the north shore of the Liard River. <sup>3</sup>	PR#532
243	Access Control	Surface leases	Hearing	Canadian Zinc will exercise its right to control access on the surface leases. <sup>4</sup>	PR#532
244	Emergency Response	Plans	Hearing	Canadian Zinc commits to an emergency response plan that includes emergencies other than spills. <sup>5</sup>	PR#532

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<sup>2</sup> Added by the Review Board to the commitments table CanZinc submitted in its closing arguments (PR#533) based on the hearing commitments in PR#532.

<sup>3</sup> Added by the Review Board to the commitments table CanZinc submitted in its closing arguments (PR#533) based on the hearing commitments in PR#532.

<sup>4</sup> Added by the Review Board to the commitments table CanZinc submitted in its closing arguments (PR#533) based on the hearing commitments in PR#532. Wording confirmed with CanZinc by email.

<sup>5</sup> Added by the Review Board to the commitments table CanZinc submitted in its closing arguments (PR#533) based on the hearing commitments in PR#532.

## Appendix D – Recommendation from parties

Party	No.	Recommendation
DFN <sup>1</sup>	1	<p>DFN recommends that MVEIRB apply the following measures to prevent significant adverse effects to vehicle accidents and malfunctions along the proposed All-Season Road Alignment, prior to permitting:</p> <ul style="list-style-type: none"> <li>- Design report, drawing and construction specifications that are signed and stamped by a NAPEG engineer.</li> <li>- Detailed map of the final alignment with mapped locations of landslide and avalanche hazard.</li> <li>- Details on how man-made slopes will impact landslide and avalanche hazard along the proposed all-season road alignment.</li> <li>- Avalanche Hazard Management Plan.</li> <li>- Emergency Response Plan.</li> <li>- Spill contingency and response plan.</li> <li>- Traffic Management Plan (including how CZN will deal with non-mine traffic and CZN's Journey Management System for mine traffic).</li> <li>- Updated risk assessment of accidents and malfunctions to mitigate accident occurrence.</li> </ul>
DFN	2	<p>DFN recommends that if the project is approved, MVEIRB apply the following measure to prevent potentially significant adverse effects to lake volumes and the associated aquatic ecosystems:</p> <ol style="list-style-type: none"> <li>a. CZN will install water gauge stations at the lakes from which water will be withdrawn for dust control along the proposed All-Season Access Road.</li> <li>b. CZN will develop and implement a monitoring program based on the water gauge stations. This will include when and how many readings will be taken. The monitoring program will include thresholds for when adaptive management is applied. The program must be reviewed and approved by DFN, DFO and PCA prior to permitting.</li> </ol>
DFN	3	<p>If the project is approved, CZN will only transport lead and zinc concentrates using double containment of bagged concentrate within a container or concentrate haulage fleet with trailers that have hydraulically operated steel covers and solid sides to minimize spills or fugitive dust.</p>
DFN	4	<p>If the project is approved, DFN recommends that MVEIRB provide detailed commitments and mitigation tables for the CZN All-Season Access Road that captures ALL of the commitments and mitigation measures within the various documents for the project.</p>
DFN	5	<p>DFN recommends that the Board apply the following measures to prevent significant adverse effects to heritage resources from the All-Season Road, should the project be approved.</p> <ol style="list-style-type: none"> <li>a. The Terms of Reference for the proposed all season road AIA shall be developed in collaboration with and approved by DFN, LKFN and NBDB. The Terms of Reference will include 1.) model of archeological potential in the GIS Potential Model Categories 1-4 outlined in the AOA, 2.) assess areas of potential impacts including borrow sources, water course crossings, camps, staging areas, right-of-ways and road alignments and 3.) incorporate traditional knowledge from all communities that may have knowledge of the project area and 4.) incorporate</li> </ol>

<sup>1</sup> Dehcho First Nations' (DFNs) final recommendations 1-12 are from its closing arguments (PR#549). Earlier recommendations from DFN can be found in its technical report (PR#459).

## Appendix D – Recommendation from parties

Party	No.	Recommendation
		<p>DFN’s traditional land use information for knowledge on camping sites and harvesting areas.</p> <ul style="list-style-type: none"> <li>b. A community co-researcher will be hired to aid in collecting field archaeological data.</li> <li>c. DFN and DLUPC will decide upon the company or person that will be using DFN’s TLU information to provide CZN with information on archaeological potential. DFN/DLUPC will enter into an agreement with this company on confidentiality, data access and sharing.</li> <li>d. The local community will decide upon the company or person completing the traditional knowledge study. A community co-researcher will be hired to aid in collecting traditional knowledge information and will be selected by the local community.</li> <li>e. The local community will help determine the methods for the TEK study including the use of research, the design of the project, data agreement (about data ownership and access), who will be interviewed and what interview method will be used (group versus individual).</li> <li>f. CanZinc will conduct the AIA prior to permits or licenses being issued.</li> </ul>
DFN	6	<p>CZN shall develop a systematic monitoring program to address potential impacts to the Northern Mountain Population of Woodland Caribou from the all season road. This monitoring program must include annual aerial surveys to provide a population index and composition during rut and additional seasonal ungulate surveys as required. Track and scat surveys or the use of a camera trap design could also be implemented.</p> <p>The monitoring program needs to demonstrate how the resulting data will be incorporated into adaptive management (i.e., define thresholds and actions) and must be developed in collaboration with (and approved by) Parks Canada during the regulatory phase, should the project proceed to that phase. Further mitigations may be required, such as timing windows or identified sensitive areas with limitations on use. Parks Canada supports an adaptive management approach based on the results of the monitoring program. Until notified otherwise by Parks Canada, CZN shall provide annual monitoring updates to Parks Canada to ensure that appropriate management responses/mitigation adjustments can be implemented.</p> <p>These responses/mitigation adjustments must be approved by Parks Canada.</p>
DFN	7	<p>DFN recommends that if the project is approved, MVEIRB adopt the following Measure to help address access management issues:</p> <ul style="list-style-type: none"> <li>- CZN in consultation with PCA, GNWT, DFN and NBDB shall develop a Traffic Management Plan for approval, prior to the project permitting phase.</li> <li>- The Plan will detail CZN’s procedure for responding to unauthorized vehicle access of the All Season Road, including accident response.</li> <li>- CZN will fund an independent DFN Guardian Program comprised of members from the Naha Dehé Dene Band, Liidlii Kue First Nation and other DFN members as appropriate and needed. The Guardians Program will provide independent employees to monitor and manage access issues.</li> <li>- CZN shall outline responsibilities and mechanisms for continued access management, should the project go into Care and Maintenance.</li> </ul>



## Appendix D – Recommendation from parties

Party	No.	Recommendation
		<ul style="list-style-type: none"> <li>- CZN shall install remote camera stations along the road to monitor and quantify how many people are using the road other than CZN employees or contractors.</li> </ul>
DFN	8	<p>DFN recommends that if the project is approved, MVEIRB introduce the following measures pertaining to avalanches:</p> <p>CanZinc will provide the following information during the detailed design phase and prior to permitting:</p> <ul style="list-style-type: none"> <li>- Road layout on attached avalanche hazard maps will be reviewed and confirmed once the road alignment is finalized.</li> <li>- A helicopter based reconnaissance will be completed in order to refine avalanche path locations and hazard areas. The helicopter based access would allow for ground based assessments in select areas. This reconnaissance could be completed during summer or winter season.</li> <li>- If a more detailed risk assessment is required, a linear risk analysis should be undertaken. A typical method which can be used to compare with other industrial roads is the 'Avalanche Hazard Index' (Schaerer, 1984).</li> <li>- An avalanche hazard management plan will be prepared for the Prairie Creek winter road. The plan should specify all measures employed to reduce risk to vehicles and occupants. In addition the plan should include an emergency response plan.</li> <li>- If structures such a bridges are to be installed at creek or river crossings near avalanche paths along the mountain segment of the road, an assessment of potential avalanche impact should be undertaken.</li> <li>- If mine activities are proposed to occur in valleys and slopes surrounding the immediate mine site area, an avalanche risk assessment should be prepared for those activities.</li> </ul>
DFN	9	<p>DFN recommends that if approved, MVEIRB introduce the following measures pertaining to avalanches:</p> <p>CZN provide information on how they will detect and mitigate for high avalanche hazards from December to February.</p>
DFN	10	<p>DFN recommends that if this project is approved, MVEIRB apply the following measures to prevent potentially significant temporary adverse impacts on the rerouted section of Sundog Creek.</p> <ul style="list-style-type: none"> <li>- CZN requires a Fisheries Act authorization for off-setting along the Sundog Creek Realignment. A monitoring plan is required to assess if the created habitat is successfully functional and sustainable. DFN recommends that CZN continue to work with DFO, PC, LI&lt;FN, DFN and NDDDB on the off-setting of the Sundog Creek Realignment.</li> <li>- CZN will develop and deploy a program to monitor the duration of reductions in the ecological performance of the realigned section of Sundog Creek using benthic macroinvertebrates as a biological indicator.</li> <li>- CZN will develop an adaptive management plan for benthic macroinvertebrates to address potential impacts from the all-season road.</li> <li>- CZN will develop and deploy a program to monitor Arctic grayling in Sundog Creek before and after the realignment is complete.</li> </ul>

## Appendix D – Recommendation from parties

Party	No.	Recommendation
		- CZN will develop an adaptive management plan for Arctic grayling to address potential impacts from the all-season road.
DFN	11	<p>In order to ensure that the measures that CZN is responsible for are fully and effectively implemented, and significant adverse impacts on the environment are mitigated, throughout all phases of the development, CZN will:</p> <ol style="list-style-type: none"> <li>1. Establish and implement monitoring programs to fulfill the following objectives: <ol style="list-style-type: none"> <li>a. To measure the effects of the Prairie Creek All-season road on the environment</li> <li>b. To assess the implementation and effectiveness of the measures in this report of EA to prevent or minimize impacts on the environment</li> <li>c. To assess the accuracy of CZN’s predictions made during the environmental assessment, regarding the impacts of the Prairie Creek All season road on the environment and,</li> <li>d. To provide relevant data and information to support regional monitoring initiatives.</li> </ol> </li> </ol> <p>Implement adaptive management processes that use the results of monitoring programs to systematically adjust mitigation actions in order to minimize adverse impacts on the environment.</p>
DFN	12	DFN recommends that if the project is approved, MVEIRB will provide detailed mitigation measure and commitments related to Boreal Caribou and Northern Mountain Caribou (see full table in PR#549).
DFO <sup>2</sup>	3.1.1	High water mark: The Program recommends that the Developer submit a Request for Review and/or apply for a Fisheries Act Authorization for the Project. When submitting, in order to avoid confusion, DFO-FPP recommends habitat within the 1:2 year High Water Mark is not divided into categories as outlined by Hatfield.
DFO	3.1.2	High water mark: DFO-FPP recommends that CZN utilize the terms serious harm, permanent alteration, and destruction as provided in the Fisheries Protection Policy Statement (defined above in Section 2.0 Mandate) instead of using terms such as habitat categories A, B, C, and habitat of low/medium/high importance.
DFO	3.2.1	Sundog Creek channel realignment: The Program recommends that the Developer submit a request for Review and/or apply for a Fisheries Act Authorization so that DFO-FPP can review proposed mitigation.
DFO	3.2.2	Sundog Creek Channel Realignment: DFO-FPP recommends that hydrographs, modelling, and detailed designs for the existing channel and the proposed channel are submitted to DFO-FPP during the regulatory phase.
DFO	3.2.3	Sundog Creek Channel Realignment: DFO-FPP recommends that the Developer implement natural channel design principles into the proposed constructed channel.
DFO	3.3.1	Water crossings: DFO-FPP recommends that the Developer implement all available best management practices to avoid, mitigate, or offset serious harm as defined in the Fisheries Act as a result of water crossing construction, operation, and decommissioning. This includes, but is not limited to: appropriate design of water crossings to facilitate

<sup>2</sup> Fisheries and Oceans Canada’s (DFOs) recommendations 3.1.1 to 3.7.1 were originally provided in its technical report (PR#449). DFO provided more detail on each recommendation in its closing arguments (PR#545).

## Appendix D – Recommendation from parties

Party	No.	Recommendation
		passage at both high and low flows; bank stabilization by protecting and replanting riparian vegetation; adhering to timing windows to avoid spawning, incubation, and hatch times for all species using the water courses, and the installation and maintenance of sediment and erosion control measures.
DFO	3.3.2	Water crossings: DFO-FPP recommends that an appropriate water crossing maintenance and monitoring plan be in place to ensure that barriers to fish passage do not form over time as a result of crossing damage due to ice blockage, flooding or movement of debris, such as may occur at freshet.
DFO	3.3.1	Water Crossings: DFO-FPP recommends that the Developer provide DFO with detailed engineering plans of all water crossings that are fish bearing, supported by measured or modeled stream flow data, for review prior to construction.
DFO	3.4.1	Liard River Crossings: DFO-FPP recommends that standard best practices are utilized for the design, construction, and decommissioning of the Liard River crossing and consistent terminology.
DFO	3.5.1	Flow in Sundog Creek Realignment: To avoid stranding of fishes, DFO-FPP recommends the Developer incorporate a barrier to upstream fish passage (e.g. steps) into their designs. The barrier would be located upstream of the offsetting pool proposed in the approximate location of km 36.9.
DFO	3.5.2	Flow in Sundog Creek Realignment: DFO-FPP recommends the Developer consider the possibility of a channel readjustment phase and develop a plan to mitigate these potential adverse effects.
DFO	3.5.3	Flow in Sundog Creek Realignment: DFO-FPP recommends that the Developer implement all available best management practices in the design of the proposed constructed channel to avoid and mitigate serious harm to fish as a result of the realignment. This includes, but is not limited to, appropriate design of the new channel to facilitate fish passage at both high and low flows for Arctic Grayling and any other species of fish that may use Sundog Creek at all relevant life stages. Such fish may have different capacities for swimming performance (Gervais & Katopodis, 2015), which may affect the design of the new channel.
DFO	3.6.1	Blasting: DFO-FPP recommends that the Developer utilize an instantaneous pressure threshold limit of 50 kPa [as per Cott & Hanna, 2005], which may require appropriate setback distances, in order to develop adequate mitigation measures to address the effects of blasting on fish and reduce the risk of <i>serious harm</i> to fish as a result of the Project.
DFO	3.6.2	Blasting: DFO-FPP recommends that the Developer avoid blasting during sensitive spawning periods as per DFO's NWT fish spawning timing windows.
DFO	3.7.1	Offsetting: The Program recommends that the Developer submit a Request for Review and/or apply for a Fisheries Act Authorization so that offsetting and monitoring plans can be reviewed in more detail.
DFO <sup>3</sup>	S3.1.1	Habitat Mitigation of the Side Channel: DFO-FPP recommends that the Developer submit

<sup>3</sup> DFOs recommendations S3.1.1 to S3.7.2 were originally provided in its technical report supplement (PR#466). DFO provided more detail on each recommendation in its closing arguments (PR#545).

## Appendix D – Recommendation from parties

Party	No.	Recommendation
		a Request for Review and/or apply for a Fisheries Act Authorization for their Project.
DFO	S3.2.1	Impact on Littoral Habitat: DFO-FPP recommends that the Developer confirm that the water withdrawal calculations in Table A1.7 "Littoral habitat lost as a result of water withdrawal" reflect the rates proposed (1% at Mosquito and Km 70 lakes; 2% at Km 139 and 141 lakes; and S% at Km 115 and 121 lakes) in the letter to MVEIRB submitted on August 11, 2016.
DFO	S3.2.2	Impact on Littoral Habitat): DFO-FPP recommends that the Developer clarify if water withdrawal, including winter withdrawal, is proposed to occur throughout the construction, operation, maintenance and decommissioning of the road. If so, DFO-FPP requests that the Developer quantify cumulative anticipated water withdrawal and littoral losses for the construction, operation, maintenance and decommissioning of the road, taking into consideration that the Developer quantify cumulative anticipated water withdrawal and littoral losses for the construction, operation, maintenance and decommissioning of the road, taking into consideration that lake discharge and recharge rates may vary from year to year.
DFO	S3.2.3	Impact on Littoral Habitat: DFO-FPP recommends that the Developer install water level gauges at Mosquito Lake and lakes at Km 70, Km 139, Km 141, Km 115, and Km 121, and any other lake to be withdrawn from in order to monitor baseline conditions, and discharge and recharge rates.
DFO	S3.2.4	Impact on Littoral Habitat): DFO-FPP recommends that the Developer provide information on littoral habitat (e.g. suitable nursery, rearing, spawning, and foraging habitat) for any fish species that might use the area at any point during their life cycle. This information is to be provided for Mosquito Lake and lakes at Km 70, Km 139, Km 141, Km 115, and Km 121. DFO-FPP also recommends that the Developer provides information on the risk of the formation of barriers to fish passage between lakes, if applicable. This information may be provided during the regulatory phase.
DFO	S3.2.5	Impact on Littoral Habitat: FO-FPP recommends that the Developer submit a Request for Review and/or apply for a Fisheries Act Authorization for the Project.
DFO	S3.3.1	Crossings: DFO-FPP recommends that the Developer include in Table A1.9 all impacts to fish and fish habitat that may cause serious harm to fish, including but not limited to water crossings.
DFO	S3.4.3	Offsetting: If a Fisheries Act Authorization is required, DFO-FPP recommends that the proponent submits an offsetting plan, and a monitoring plan, which are requirements under the Fisheries Act.
DFO	S3.5.1	Habitat Delineation: DFO-FPP recommends that the Developer clarify which return year was used to calculate anticipated serious harm to fish that may result from the construction, operation, maintenance and decommissioning of all water crossings.
DFO	S3.6.1	Partial Dewatering: DFO-FPP recommends that the Developer utilizes terminology provided in the Fisheries Protection Policy Statement for example, serious harm, permanent alteration, and destruction.
DFO	S3.6.2	Partial Dewatering: If the Developer intends to dewater (pump) while constructing the Sundog Creek diversion channel, DFO-FPP recommends that the Developer submit a dewatering plan to the Program. DFO-FPP recommends that all best management practices be incorporated in the dewatering plan, including but not limited to the use of appropriately-sized fish screens as per DFO's Freshwater Intake End-of-Pipe Fish Screen Guideline (1995).

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Party	No.	Recommendation
DFO	S3.6.3	Partial Dewatering: DFO-FPP recommends that the Developer submit a Request for Review and/or apply for a Fisheries Act Authorization to DFO-FPP.
DFO	S3.7.1	Improvement to existing road between KPO and KP17: DFO-FPP recommends that the Developer confirm that the riparian vegetation to be removed between km 0 and km 17 is above the High Water Mark.
DFO	S3.7.2	Improvement to existing road between KPO and KP17: The Program recommends that the Developer incorporate standard best management practices for the removal of riparian vegetation, including but not limited to: minimize the removal of riparian vegetation where practical; install and maintain sediment and erosion controls, and re-stabilize the site immediately.
ECCC <sup>4</sup>	1	<ol style="list-style-type: none"> <li>1. All representative units should be sampled at all potential borrow source locations in order to identify any acid rock drainage and/or metal leaching potential that would impact water quality.</li> <li>2. Testing should be completed using acid-base accounting and metal leaching test methods to characterize representative units.</li> <li>3. Acid-base and leaching testing should be overseen by a qualified professional geochemist for acid rock drainage and/or metal leaching management.</li> <li>4. Units classified or identified as marginal borrow material, for sources for construction, should be avoided.</li> </ol>
ECCC	2	<ol style="list-style-type: none"> <li>1. The Sediment and Erosion Control Plan should be reviewed and finalized before commencing construction.</li> <li>2. Erosion and sediment control measures should be put in place when constructing around fish-bearing waters.</li> <li>3. Appropriate setback distances from fish-bearing waters should be determined and implemented based on site conditions for the storage of potential Total Suspended Sediment (TSS) generating materials.</li> <li>4. Monitoring should be completed during construction periods, prior to spring freshet, and when rainfall events are forecast to ensure sediment and erosion control mitigation measures are effective.</li> </ol>
ECCC	3	<ol style="list-style-type: none"> <li>1. Comprehensive Project monitoring of TSS and turbidity should be completed and mitigation should be adjusted if needed.</li> <li>2. Baseline turbidity and TSS monitoring to support development of linear regression with TSS should be completed.</li> <li>3. Engagement with ECCC, to develop monitoring program details up to and throughout the permitting phase, should continue.</li> </ol>
ECCC	4	<ol style="list-style-type: none"> <li>1. Mitigation approaches to prevent potential contaminant loading should be identified and implemented at the Prairie Creek mine and along the access road.</li> <li>2. Description of the monitoring program, including both baseline monitoring, monitoring during mining operations and along the access road, should be provided.</li> <li>3. Description of trigger or action levels above which adaptive management and contingency plans need to be implemented should be provided.</li> <li>4. Description of adaptive management and contingency plans to be employed if trigger or action levels are exceeded should be provided.</li> </ol>

<sup>4</sup> Environment and Climate Change Canada's (ECCCs) recommendations 1-10 were originally provided in its technical report (PR#448) and reiterated in its closing arguments (PR#544).

## Appendix D – Recommendation from parties

Party	No.	Recommendation
		5. Monitoring of annual soil, snow, dustfall, and ambient dust sampling should be included in the Contaminant Loading Management Plan.
ECCC	5	<ol style="list-style-type: none"> <li>1. A robust monitoring program, including pre-construction information, should be implemented for migratory birds and avian species at risk along the proposed road alignment. This recommendation is consistent with the recommended monitoring described in the Parks Canada Agency letter dated September 30, 2016 (Public Registry 308).</li> <li>2. Information should be collected to obtain a minimum of one year of baseline conditions. Survey protocols should optimize delectability and sufficient survey effort should be provided to obtain comprehensive coverage of habitat types.</li> <li>3. Results of monitoring programs should be summarized in annual wildlife monitoring reports.</li> </ol>
ECCC	6	<ol style="list-style-type: none"> <li>1. Frequent, long-term, and large disturbances, multiple sources of disturbances, and noise emissions greater than 50 dB (or greater than 10 dB above ambient) should be avoided within 800 m of observed Trumpeter Swans.</li> <li>2. Mitigation and monitoring efforts should be focused in sections where the Project overlaps the Southeastern Mackenzie Mountain Key Migratory Habitat Site (NT Site 17).</li> </ol>
ECCC	7	<ol style="list-style-type: none"> <li>1. All phases of the Project should be carried out in a manner that protects migratory birds and avoids harming, killing or disturbing migratory birds or destroying, disturbing or taking their nests or eggs. In this regard, the Proponent should take into account ECCC's guidelines (<a href="http://www.ec.gc.ca/paom-itmb/">http://www.ec.gc.ca/paom-itmb/</a>).</li> <li>2. A scientifically sound approach to determine the likelihood of nesting birds should be used in the event that clearing or disturbance cannot be scheduled outside of the nesting season. If necessary, the use of non-intrusive search methods (e.g., point counts) could be undertaken to conduct an area search, for evidence of nesting, prior to the commencement of clearing.</li> <li>3. Migratory bird surveys should be carried out by an avian specialist with experience with migratory birds and migratory bird behaviour indicative of nesting (e.g., singing birds, alarm calls, distraction displays, carrying nesting material or food).</li> <li>4. Results from all pre-clearing surveys should be reported in the annual wildlife monitoring report.</li> <li>5. Options such as avoiding, adapting, rescheduling or relocating activities, should be considered and implemented if there are indications of migratory bird nests where disturbance activities that have the potential to disturb or destroy nests are proposed.</li> <li>6. All disruptive activities in the nesting area should be halted if migratory bird nests containing eggs or young are discovered. An appropriate buffer zone (i.e., setback distance) should be determined and observed until the young have naturally and permanently left the vicinity of the nest. Buffer zones should be appropriate for the species and take into consideration the intensity of the disturbance and the surrounding habitat. Buffer zones should also be adjusted after assessing their effectiveness.</li> <li>7. A buffer zone for forest songbirds should be included in Appendix C of the WMMP.</li> <li>8. If required, ECCC (ec.eenordrptno-eanorthpnrnw.ec@canada.ca) should be contacted for advice and/or additional mitigation measures.</li> </ol>

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Party	No.	Recommendation
		9. All of the above recommendations should be incorporated into the next revision of the WMMP.
ECCC	8	<ol style="list-style-type: none"> <li>1. Section 2.3.2 of the Updated Draft WMMP should be revised to reflect that the general prohibitions for migratory birds and aquatic species listed on Schedule 1 apply wherever these species are found.</li> <li>2. Table 1 of the Updated Draft WMMP should be revised to reflect current status of species listed on Schedule 1 of SARA or assessed by COSEWIC. Table 1 should be revised and included as part of the annual monitoring reports to aid the Proponent in remaining aware of status changes while minimizing the number of revisions to the WMMP. The Proponent should consult the Species at Risk Registry on a regular basis (<a href="https://www.registrelep.sararegistry.gc.ca/default.asp?lang=En&amp;n=24F7211B-1">https://www.registrelep.sararegistry.gc.ca/default.asp?lang=En&amp;n=24F7211B-1</a>) to maintain the most current information for their operations including new COSEWIC assessments and/or species added to Schedule 1 of SARA.</li> <li>3. If species at risk are encountered or affected by the Project, the primary mitigation measure should be avoidance. The Proponent should avoid contact with or disturbance to each species, its habitat, and/or its residence.</li> </ol>
ECCC	9	<ol style="list-style-type: none"> <li>1. ECCC (ec.eenordrptntno-eanorthpnmwt.ec@canada.ca) should be consulted regarding migratory bird mitigation measures and advice for Project areas outside the Nahanni National Park Reserve.</li> <li>2. The absence of nesting avian species at risk (and other migratory birds) should be confirmed in borrow and gravel pits prior to commencing disruptive activities during the general nesting period. If work commences, monitoring for the absence of nests at borrow and gravel pits should continue throughout activities.</li> <li>3. Staff and contractors should be made aware of the conservation status of all species at risk that could be encountered at the Project. Staff and contractors should also be made aware of the potential of species at risk to use anthropogenic habitats and structures for nesting, the reporting protocol and all appropriate mitigation measures.</li> </ol>
ECCC	10	<ol style="list-style-type: none"> <li>1. The Proponent should review disturbance estimates for the Project, and may wish to consult the GNWT on these and the adequacy of proposed mitigation and monitoring measures to minimize Project effects on Boreal Caribou.</li> </ol>
GNWT <sup>5</sup>	1	<p>The GNWT recommends that the developer:</p> <ul style="list-style-type: none"> <li>• review its commitments regarding road access and use from the current proceeding and from EA0809-002 to ensure that they are consistent with the legislative and regulatory framework; and</li> <li>• include any necessary revisions in its response to other parties' technical reports.</li> </ul>
GNWT	2	The GNWT recommends that the developer continue to work with the GNWT and INAC to clarify lease requirements related to proposed facilities and activities in the Liard River crossing area.
GNWT	3	The GNWT recommends that the developer conduct a preconstruction Archeological Impact Assessment (AIA) to assess potential impacts to archaeological sites from the proposed development. Specific targets for the AIA will be based on the results of the

<sup>5</sup> Government of the Northwest Territories' (GNWTs) final recommendations 1-11 are from its closing arguments (PR#551). Earlier versions of the recommendations from GNWT can be found in its technical report (PR#455).



## Appendix D – Recommendation from parties

Party	No.	Recommendation
		Archeological Overview Assessment (AOA) and cover areas of elevated archaeological potential within the 60 m road right of way (identified by the GIS Potential Model) that were not included in previous AIAs.
GNWT	4	The GNWT acknowledges the developer's commitments concerning harvest monitoring and recommends that the Review Board recognize these commitments as developer's commitments to be included in the scope of development for this EA and captured in the Report of Environmental Assessment. The GNWT also recommends that Canadian Zinc commit to expanding existing environmental monitoring programs under the WMMP to include formal collection and reporting of harvest information by the environmental monitors. The GNWT is willing to be a part of discussions on the design of such a program.
GNWT	5	To support an adaptive approach to minimizing collision risks along the proposed road, the GNWT recommends that Canadian Zinc develop a more formal, detailed approach to identifying and communicating seasonal "wildlife caution zones" in its WMMP that includes: <ul style="list-style-type: none"> <li>• How information collected by drivers will be collected and recorded;</li> <li>• Which datasets will be used to identify "wildlife caution zones," and how often they will be combined and analyzed;</li> <li>• Tools that might be used to facilitate recording and georeferencing; and</li> <li>• How often the need to add, remove or change signage will be assessed and reported on (seasonally, annually).</li> </ul>
GNWT	6	The GNWT acknowledges the developer's commitments with regard to Collared Pika and recommends that the MVEIRB recognize these commitments as developer's commitments to be included in the scope of development for this EA and captured in the Report of Environmental Assessment. The GNWT agrees that the specifics of this monitoring can be discussed during the regulatory phase.
GNWT	7	The GNWT recommends that Canadian Zinc consider designing and implementing as part of its WMMP a trail camera study along the Territorial Lands portion of the all season road alignment west of the Liard River to confirm presence of boreal caribou and evaluate the need for further monitoring of boreal caribou in this area. This program, including the identification of appropriate study locations, can also help to confirm the effectiveness of mitigations to deter public access on the road.
GNWT	8	The GNWT acknowledges the developer's commitments concerning boreal caribou habitat and to revise the WMMP to incorporate Commitment #6 from the technical sessions. GNWT recommends that the MVEIRB recognize these commitments as developer's commitments to be included in the scope of development for this EA and captured in the Report of Environmental Assessment.
GNWT	9	The GNWT acknowledges the developer's commitments to establish a watercourse monitoring program during construction and road operation and recommends that the MVEIRB recognize these commitments as developer's commitments to be included in the scope of development for this EA and captured in the Report of Environmental Assessment. The GNWT agrees that the specifics of this monitoring can be discussed during the regulatory phase.
GNWT	10	The GNWT acknowledges the developer's commitments to establish a permafrost monitoring plan prior to the start of construction and to implement this plan during construction and road operation. The GNWT recommends that the MVEIRB recognize

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Party	No.	Recommendation
		these commitments as developer’s commitments to be included in the scope of development for this EA and captured in the Report of Environmental Assessment. The GNWT agrees that the specifics of this monitoring can be discussed during the regulatory phase.
GNWT	11	The GNWT recommends that the developer continue to work with the Department of Infrastructure regarding proposed hauling schedules and weights and other matters related to the public transportation system.
INAC <sup>6</sup>	1	INAC recommends that the Nahanni Butte Dene Band relinquish their interest in the IAB parcel by a Band Council Resolution for the road and the barge landing area at the Liard River.
INAC	2	INAC recommends that the Band Council Resolution be a part of the CZN applications for surface tenure in order for them to be considered, should the development be approved to proceed to the regulatory process.
LKFN <sup>7</sup>	1	The Review Board should consider a measure that the detailed road design be independently reviewed prior to the approval of construction, and that the proponent be given specific directions to obtain adequate site specific data respecting ground composition, soil structure, etc., to ensure the adequacy and effectiveness of the design to mitigate impacts to karst and permafrost, maintain embankment integrity, and avoid other environmental impacts associated with permafrost thawing.
LKFN	2	The Review Board should also consider measures consistent with Tetra Tech’s recommendations in their summary report specifically: <ul style="list-style-type: none"> <li>- Selecting suitable embankment design and construction techniques where there is the potential for differential settlement of embankment material due to bog peat</li> <li>- Natural surface water drainage paths should be preserved and diverted if/where necessary to avoid water from pooling along road embankments</li> <li>- Drainage structures designed to reduce the likelihood of thermokarst development</li> <li>- Diversions should direct surface water toward and along existing natural drainage paths</li> <li>- Flatter fill slope gradients need to be considered to reduce the likelihood of snow drifting against the road embankment resulting in the thawing of permafrost.</li> </ul>
LKFN	3	LKFN also recommends the Review Board establish measures that require affected First Nations, including LKFN, to be included in the review of the road design and monitoring during construction.
LKFN	4	LKFN supports the recommendations of Environment and Climate Change Canada as outlined in their report.
LKFN	5	LKFN requests the Review Board to require measures to ensure that baseline studies on TSS and turbidity be completed before construction and throughout the permitting phase.
LKFN	6	The Review Board should further require that First Nations, including LKFN, be involved

<sup>6</sup> Indigenous and Northern Affairs Canada’s (INACs) final recommendations 1 and 2 are from its closing arguments (PR#552). Earlier recommendations from INAC can be found in its technical report (PR#450).

<sup>7</sup> Liidlii Kue First Nation’s (LKFNs) recommendations 1-22 are from its closing arguments (PR#550).

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Party	No.	Recommendation
		in the studies and monitoring of the vegetation.
LKFN	7	LKFN supports Parks Canada's recommendations as outlined in their report.
LKFN	8	LKFN requests the Review Board to require that studies be conducted on vegetation along the final road alignment prior to construction, and that such studies include assessments of the potential for significant adverse impacts from invasive species on riparian habitat within the project.
LKFN	9	LKFN further recommends that the Board require a measure for an ongoing monitoring of vegetation and impacts to vegetation in the area of final alignment during construction and operations.
LKFN	10	LKFN requests the Board to recommend that First Nations, including LKFN, be involved in the above studies and monitoring of the vegetation.
LKFN	11	LKFN strongly supports Parks Canada's recommendation that CanZinc develop a caribou monitoring program, and recommends that the Review Board require a measure to ensure that studies on the presence of sentinel and migratory mountain caribou herds within the project area are carried out prior to road construction.
LKFN	12	LKFN also requests the Review Board to require measures that CanZinc develop a monitoring program to address potential impacts to the caribou from the construction and operation of the all-season road throughout the project area. LKFN supports Parks Canada recommendation that the monitoring program "...must include annual aerial surveys to provide a population index and composition during rut and additional seasonal ungulate surveys as required. Track and scat surveys or the use of a camera trap design could also be implemented. Monitoring that would include local Denendeh Resource monitors."
LKFN	13	The Review Board should also require a measure that local resource monitors from the affected First Nations, including LKFN, be involved in the development of a monitoring program and throughout the monitoring program.
LKFN	14	LKFN supports the Fisheries and Oceans recommendations outlined in their report.
LKFN	15	LKFN requests the Board require a measure to ensure that baseline studies are completed by the proponent in advance of construction to quantify fish and fish habitat along the proposed alignment.
LKFN	16	LKFN requests the Review Board require the proponent to conduct an independent review of proposed methods to mitigate the risk for significant adverse impacts to the fish and fish habitat prior to the approval of the final road design.
LKFN	17	The Review Board should establish a measure requiring First Nations, including the LKFN, be involved in all studies, review and monitoring related to fish and fish habitat.
LKFN	18	LKFN recommends the Review Board to consider measures, consistent with CanZinc's commitment above, to require an independent technical review panel to assess the risks and consequences of the proposed road prior to approval of construction.
LKFN	19	The Review Board should further require the proponent to generate additional data prior to road construction, particularly in the portions of the road noted as having high potential for significant adverse impacts, and provide such data to the independent technical review panel.
LKFN	20	The Review Board should require a measure under which the proponent will undertake detailed heritage resources field surveys of the final road alignment prior to construction, and develop mitigation measures in respect of any heritage resources identified during those studies.

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Party	No.	Recommendation
LKFN	21	The Review Board should establish a measure requiring First Nations, including LKFN, be involved in all studies and in the review of any proposed mitigation and monitoring related to heritage resources.
LKFN	22	LKFN recommends that the Review Board establish a measure requiring the proponent to fund and support a study by LKFN on the impacts of the proposed development on the Dene way of life prior to construction, and to engage in discussions with LKFN to identify mitigation measures in respect of such impacts.
NBDB <sup>8</sup>	C	We seek that you place only one condition on your approval of the project - that being prior to commencement of construction a fully negotiated and executed Traditional Land Use Agreement be completed. The proponent has stated in your hearings that they are in agreement with such a condition. Our community and the proponent have been working on such an agreement.
NBDB	D	A second possible condition, which we do not know if the Review Board is authorized to make, would be that Parks Canada and other departments and agencies of government be made to cost share some of the base line studies which many parties have spoken about as being necessary. We believe that the value of such work would be of benefit to many, including the proponent.
NRCan <sup>9</sup>	1	NRCan continues to recommend that the Developer carry out site investigations to identify additional areas where obstruction of cross drainage may occur, confirm permafrost and subsurface conditions in areas where ground ice conditions occur, and conduct qualitative analysis in highly sensitive areas to better assess how permafrost conditions might change as a result of climate change.
PCA <sup>10</sup>	1	CZN shall include mitigations for impacts to Arctic Grayling during construction of km 25-32 of the proposed all season road.
PCA	2	<p>CZN shall develop a systematic monitoring program to address potential impacts to the Northern Mountain Population of Woodland Caribou from the all season road. This monitoring program must include annual aerial surveys to provide a population index and composition during rut and additional seasonal ungulate surveys as required. Track and scat surveys or the use of a camera trap design could also be implemented.</p> <p>The monitoring program <u>needs to demonstrate how the resulting data will be incorporated into adaptive management</u> (i.e., define thresholds and actions) and must be developed in collaboration with (and approved by) Parks Canada during the regulatory phase, should the project proceed to that phase. Further mitigations may be required, such as timing windows or identified sensitive areas with limitations on use. Parks Canada supports an adaptive management approach based on the results of the monitoring program. Until notified otherwise by Parks Canada, CZN shall provide annual monitoring updates to Parks Canada to ensure that appropriate management responses/mitigation adjustments can be implemented. These responses/mitigation</p>

<sup>8</sup> Nahanni Butte Dene Band's (NBDBs) recommendations C and D are from its closing arguments (PR#548).

<sup>9</sup> Natural Resources Canada's (NRCans) final recommendation 1 is from its closing arguments (PR#547). Earlier recommendations from NRCan can be found in its technical report (PR#451).

<sup>10</sup> Parks Canada's (PCAs) recommendations 1-33 are from its technical report (PR#452) and recommendation 34 is from its closing arguments (PR#546), which also reiterate recommendation 1-33.

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Party	No.	Recommendation
		<p>adjustments must be approved by Parks Canada.</p> <p>The program implemented by Selwyn-Chihong Mining Ltd. could provide an example (minimum of annual rut and winter surveys).</p>
PCA	3	<p>The proposed all season road alignment, and proposed borrow sources, from approximately KP 12 – 39, shall be surveyed to determine species presence, distribution and relative abundance of Collared Pika.</p> <ul style="list-style-type: none"> <li>• Survey methodology shall use recognized and standard methods</li> <li>• Survey methods and overall sampling design shall be developed in collaboration with, and approved by, Parks Canada</li> </ul> <p>The necessary field surveys shall be conducted to gather this information <u>prior to permits or licences being issued</u>, should the project proceed to the regulatory phase.</p>
PCA	4	<p>Based on collection of baseline information outlined in Measure 3, CZN shall provide an updated effects assessment on Collared Pika. This assessment shall identify specific mitigations that will be implemented.</p> <p>CZN shall provide the updated effects assessment <u>prior to permits or licences being issued</u>, should the project proceed to the regulatory phase.</p>
PCA	5	<p>CZN shall develop a systematic monitoring program to address potential impacts to Collared Pika from the all season road. The monitoring <u>program needs to demonstrate how the resulting data will be incorporated into adaptive management</u> (i.e., define thresholds and actions) and shall be developed in collaboration with (and approved by) Parks Canada during the regulatory phase, should the project proceed to that phase. The baseline information outlined in the Measure 3 can be used to inform the extent and design of the required program. Until notified otherwise by Parks Canada, CZN shall provide annual monitoring updates to Parks Canada to ensure that appropriate management responses/mitigation adjustments can be implemented. These responses/mitigation adjustments must be approved by Parks Canada.</p>
PCA	6	<p>CZN shall collect baseline data as outlined in the Terms of Reference (Sections 3.2.3, 5.1.4 and 5.1.6) (PRD #42), for the following: species presence, distribution, relative abundance, use of the project area by species, and use of habitat in the project area for forest bird communities, waterfowl, migratory birds and avian species at risk (population characteristics and habitat use of the project area by forest bird communities, waterfowl, migratory birds and avian species at risk).</p> <ul style="list-style-type: none"> <li>• PCA defines population characteristics as including species presence, distribution and relative abundance</li> <li>• PCA defines habitat use as including use of habitats for foraging, reproduction and rearing of offspring and that includes seasonality in their use.</li> <li>• Data describing population characteristics and habitat use can be collected, simultaneously, through the use of automatic recording units, which can be deployed in the field and later retrieved, then transcribed and analyzed.</li> <li>• Survey methodology shall include the appropriate spatial distribution and seasonal timing for adequate representation of species along <u>the entire proposed all season road alignment</u> (not just the realignments that go beyond the approved winter road alignment).</li> </ul>

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Party	No.	Recommendation
		<ul style="list-style-type: none"> <li>Survey methods and overall sampling design shall be developed in collaboration with, and approved by, both Parks Canada and Environment and Climate Change Canada.</li> </ul> <p>The necessary field surveys shall be conducted to gather this information <u>prior to permits or licences being issued</u>, should the project proceed to the regulatory phase.</p>
PCA	7	<p>Based on collection of baseline information outlined in Measure 6, CZN shall provide an updated effects assessment on Forest Birds, Waterfowl, Migratory Birds and Avian Species at Risk. This assessment shall identify specific mitigations that will be implemented.</p> <p>CZN shall provide the updated effects assessment <u>prior to permits or licences being issued</u>, should the project proceed to the regulatory phase.</p>
PCA	8	<p>CZN shall develop a systematic monitoring program for migratory birds, including avian species at risk, to address potential impacts from the all season road. The monitoring program needs to <u>demonstrate how the resulting data will be incorporated into adaptive management</u> (i.e., define thresholds and actions) and shall be developed in collaboration with (and approved by) Parks Canada during the regulatory phase, should the project proceed to that phase. Until notified otherwise by Parks Canada, CZN shall provide annual monitoring updates to Parks Canada to ensure that appropriate management responses/mitigation adjustments can be implemented. These responses/mitigation adjustments must be approved by Parks Canada.</p> <p>The baseline information outlined in the Measure 6 can be used to inform the extent and design of the required program. If multiple years of data can be collected prior to construction, this would allow some understanding of inter-annual variation within the bird community, and improve the monitoring program and potential mitigations / adaptive management actions.</p>
PCA	9	<p>CZN shall conduct baseline vegetation surveys within NNPR to accurately describe vegetation within the proposed project area, including the presence and characteristics of rare plants and assemblages. The necessary field surveys shall be conducted to gather this information <u>prior to permits or licences being issued</u>, should the project proceed to the regulatory phase.</p> <p>The baseline data on vegetation shall include:</p> <ol style="list-style-type: none"> <li>1. A desktop or pre-survey assessment of rare plant and rare community potential across the study area to inform a comprehensive rare plant assessment. This assessment would take the following information into consideration; the ground-truthed vegetation classification (Tetra Tech EBA July 2016), tracking and watch lists of designated species (GNWT, COSEWIC, SARA), relevant literature on the habitat of rare and designated species, information on rare and uncommon terrain features in the project area from analysis of remotely sensed images (ex. air photos, SPOT, etc.) and other information sources (ex. Parks Canada and other reports on karst, unglaciated terrain, permafrost, etc.).</li> </ol>

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Party	No.	Recommendation
		<p>These sources of information shall be used to assess the presence of rare plant species and rare assemblages that could occur along the project alignment, and shall be used to identify high priority areas for field surveys. This desktop assessment shall describe any rare plants or plant assemblages that may occur along the route including areas of high potential i.e. sensitive areas (wetlands, alluvial, permafrost), glacial refugia, unusual landforms (karst) or unusual substrates. Where there are no assemblages listed or designated, CZN shall evaluate plants and assemblages that may occur in the study area by ecotype, and generate a list of potential rare or valued (locally significant) assemblages.</p> <p>2. Survey data to describe areas of high rare plant potential and high rare vegetation assemblage potential.</p> <p>Note: For the assessment of rare species and vegetation communities, assessment of methodologies shall be consistent with best practices outlined by Alberta Native Plant Council (2012) and for rare ecological communities by Allen (2011). Additionally, survey methodology shall include an appropriate spatial distribution and replication of sample sites to be an adequate representation of ecosystems along the proposed alignment.</p>
PCA	10	<p>Based on collection of baseline information outlined in Measure 9, CZN shall provide an updated effects assessment on vegetation. The effects assessment shall identify specific mitigations that will be implemented and any thresholds for the implementation of adaptive management.</p> <p>CZN shall provide the updated effects assessment <u>prior to permits or licences being issued</u>, should the project proceed to the regulatory phase.</p>
PCA	11	<p>The Terms of Reference for the proposed all season road AIA (PRD #379) shall be developed in collaboration with, and approved by, Parks Canada. The AIA shall incorporate systematic shovel testing as well as ground sleuthing in areas of enhanced archaeological potential based on #s 1- 3 below.</p> <p>The AIA shall: (1) be based on elevated areas of archaeological potential identified in the GIS Potential Model Categories 1-4 outlined in the AOA and further clarified in the TOR developed with Parks Canada; (2) assess areas of project impacts including borrow sources, water course crossings including bridge and culvert installation, borrow access roads, camps, staging areas, right of way and road realignments; and (3) incorporate traditional knowledge from all Indigenous communities that may have all season knowledge of the project area including place names, traditional land use and harvesting in areas directly impacted by the expanded footprint of an all season road.</p> <p>CZN shall conduct the AIA prior to permits or licences being issued, should the project proceed to the regulatory phase.</p>
PCA	12	<p>The Cultural Heritage Protection Plan and heritage resource booklet proposed by CZN, or any other product developed to educate the contractor on cultural resources, will incorporate the findings of the AOA and AIA. Parks Canada will have an opportunity to review the content of the Cultural Heritage Protection Plan. The Cultural Heritage Protection Plan and heritage resource booklet will be used to provide training and</p>



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		direction on the accidental recovery of heritage resources during the construction phase and will not be used to replace an AIA conducted by a qualified archaeologist. Within the Cultural Heritage Protection Plan, mitigations associated with the accidental discovery of heritage resources in NNPR shall stipulate that all work is stopped and Parks Canada is contacted for advice prior to proceeding.
PCA	13	CZN shall provide at least one supplementary hydrotechnical calculation (based on existing information) for Sundog Creek as a check to support or correct the hydraulic model utilised for Sundog Creek. This calculation shall be provided during the regulatory phase, should the project proceed to that phase.
PCA	14	CZN shall install water gauge stations at the lakes from which water will be withdrawn for dust control within NNPR.
PCA	15	CZN shall create a monitoring program based on the water gauge stations, specifying when lake level and recharge readings will be taken and outlining actions to be taken if the recharge assumptions are not met. The program must be reviewed and approved by Parks Canada during the regulatory phase, should the project proceed to that phase.
PCA	16	<p>To support the monitoring programs requested in Measures 15 and 16, CZN shall undertake a comprehensive baseline of turbidity measurements at all road crossing sites (both upstream and downstream), the Sundog Creek realignment, and at all water bodies (e.g., lakes and wetlands) located adjacent to the road. This information will be used to support the development of a linear regression model of the TSS – Turbidity relationship that may serve as a surrogate measure of TSS. CZN shall provide Parks Canada and Environment and Climate Change Canada (ECCC) an opportunity to review the data and agree that turbidity is a suitable surrogate for TSS.</p> <p>Parks Canada encourages CZN to consider developing a linear regression between TSS and turbidity so that TSS levels can be inferred from field measures of turbidity. Assuming that the linear regression between turbidity and TSS is rigorous (coefficient of determination is high [e.g., .90%] and relationship is linear), the use of turbidity as a real time surrogate for TSS would provide cost savings to CZN and avoid time delays of days to weeks for laboratory analysis while not compromising estimates of TSS.</p>
PCA	17	<p>CZN shall develop a detailed program to monitor the <u>short-term</u> effects of construction on surface water quality. This program shall include:</p> <ul style="list-style-type: none"> <li>• At all waterbody crossings: <ul style="list-style-type: none"> <li>○ At least two sampling sites located upstream beyond the potential influence of the construction to define the unimpacted, reference condition.</li> <li>○ At least three sampling sites located downstream of the construction representing: “near-field”, “intermediate-field”, and “far field”.</li> </ul> </li> <li>• At the Sundog Creek realignment: <ul style="list-style-type: none"> <li>○ 3 sites located upstream beyond the potential influence of the realignment to define the unimpacted, reference condition.</li> <li>○ 3 sites, located downstream of where the realign channel reconnects with the existing channel.</li> <li>○ At least 2 sites, located within the lower half of the new channel.</li> <li>○ Reference sites may also be required upstream in the tributary that enters Sundog Creek from the north shortly after the realigned channel</li> </ul> </li> </ul>

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		<p>if suitable downstream sites are not available prior to its influence</p> <ul style="list-style-type: none"> <li>• Specific locations of all monitoring sites, determined by a qualified aquatic specialist (retained by the proponent) based on a field assessment and upon review from PCA and ECCC.</li> <li>• Sampling frequency and intensity during and following construction, and when monitoring would commence</li> <li>• Measurements of TSS, turbidity, dissolved oxygen, conductivity and water pH. If initial measurements of dissolved oxygen, conductivity and water pH indicate that levels are only minimally influenced by construction activities (based on comparisons with data collected at the two upstream sites) then measurement of these variable can cease.</li> <li>• Assessments of deterioration in water quality due to the stream realignment shall be based on comparisons between the upstream with those in the realigned channel and downstream of the realignment.</li> <li>• A comparison of results to the CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life (CWQG PAL). If these thresholds are exceeded in the realignment or downstream, but not the reference sites, adaptive management efforts to reduce impacts will need to be identified or, if construction occurs during the open water period (albeit this is unlikely), a temporary stop work order will come into effect.</li> </ul> <p>The duration of this <u>short-term</u> monitoring program will be determined by the magnitude of difference between the upstream reference sites and the downstream exposed sites water quality variables, but should at a minimum extend for several months following construction. The program is subject to review and approval by Parks Canada during the regulatory phase, should the project proceed to that phase.</p>
PCA	18	<p>CZN shall develop a detailed <u>long-term</u> (i.e., multi-year) program to monitor water quality at a subset of road crossing sites (both upstream and downstream), at water bodies (e.g., lakes and wetlands) located adjacent to the road, and in the realigned Sundog Creek channel. This program requires a reduced sampling effort (i.e., frequency) compared to the short term program and will include:</p> <ul style="list-style-type: none"> <li>• Sampling frequency: Parks Canada recommends samples be taken three times a year at all sites, one during each of spring freshet (June), fall recession (September) and winter base flow (March) or following significant storm events.</li> <li>• Measurements of TSS, turbidity, dissolved oxygen, conductivity and water pH.</li> <li>• A comparison of results to the CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life (CWQG PAL). If these thresholds are exceeded, adaptive management efforts to reduce impacts will need to be identified or, if construction occurs during the open water period (albeit this is unlikely), a temporary stop work order will come into effect.</li> <li>• This monitoring program <u>needs to demonstrate how the resulting monitoring data will be incorporated into adaptive management</u>. The program is subject to review and approval by Parks Canada during the regulatory phase, should the project proceed to that phase.</li> </ul>

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Party	No.	Recommendation
		NOTE: Parks Canada supports DFO's technical analysis and recommendations as they relate to fish and fish habitat.
PCA	19	CZN shall develop and deploy a program to monitor the duration of reductions in the ecological performance of the realigned section of Sundog Creek using benthic macroinvertebrates as a biological indicator. Benthic macroinvertebrate samples shall be collected in the fall at the sites established for monitoring the water quality of Sundog Creek as outlined in Measures 15 and shall follow the rapid bioassessment protocols described by Canadian Aquatic Biomonitoring Network (CABIN). Comparisons of the benthic macroinvertebrate communities upstream of the realignment, within the realignment, and downstream can be assessed using the existing reference condition approach model derived for the South Nahanni watershed by Scrimgeour et. al., 2012.
PCA	20	<p>CZN shall develop an adaptive management plan for benthic macroinvertebrates to address potential impacts from the all season road. The plan is subject to review and approval by Parks Canada during the regulatory phase, should the project proceed to that phase. The baseline information outlined in the Measure 17 can be used to inform the extent and design of the required plan.</p> <p>Until notified otherwise by Parks Canada, CZN shall provide annual monitoring updates to Parks Canada to ensure that appropriate management responses/mitigation adjustments can be implemented. These responses/mitigation adjustments must be approved by Parks Canada.</p>
PCA	21	CZN shall offset or compensate for the short-term habitat losses and reductions in fish habitat incurred by the rerouting of a portion of Sundog Creek. Any offsetting or compensation plans must be approved by Parks Canada.
PCA	22	All grey water within Nahanni National Park Reserve shall be managed through a septic system as outlined in the Yukon Government's Standards and Guidelines. This will include the treatment of grey water to remove waste materials prior to disposal into the environment.
PCA	23	<p>CZN shall provide a grey water management plan for the development, management and decommissioning of all grey water septic systems within NNPR. This plan must be approved by Parks Canada during the regulatory phase, should the project proceed to that phase, and will include:</p> <ol style="list-style-type: none"> <li>a. a design of the grey water septic system being proposed,</li> <li>b. the soil stratification for all proposed locations,</li> <li>c. the depth of the water table,</li> <li>d. the distance to nearest water course/ water body and potable water source.</li> </ol> <p>All camps of a temporary nature (with a wastewater system that serves a non-permanent population) must have a closure plan submitted as part of preliminary design. As with the design for site facilities, the closure plan must be prepared by a qualified professional and detail how the treatment works will be decommissioned upon camp closure.</p>
PCA	24	Preferentially, CZN shall store all sewage (brown water) within NNPR in holding tanks for removal and treatment off site at an approved location. Details on the storage, removal and transportation must be provided.
PCA	25	If CZN chooses to manage sewage for camps at km 65 and 87 within NNPR rather than at

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		<p>an approved off site location, a sewage management plan shall be completed for the development, management and decommissioning of the proposed sewage treatment systems at each site. This plan must be approved by Parks Canada during the regulatory phase, should the project proceed to that phase, and will include:</p> <ol style="list-style-type: none"> <li>a. a design of the sewage treatment system being proposed in accordance with accepted standards and guidelines,</li> <li>b. in the case of a septic system, a soil stratification for all proposed locations,</li> <li>c. the depth of the water table,</li> <li>d. the distance to nearest water course/ water body and potable water source,</li> <li>e. depending on the choice of sewage treatment system, a ground water quality monitoring program may also be required which will include thresholds for active management.</li> </ol> <p>All camps of a temporary nature (with a wastewater system that serves a non-permanent population) must have a closure plan submitted as part of preliminary design. As with the design for site facilities, the closure plan must be prepared by a qualified professional and detail how the treatment works will be decommissioned upon camp closure.</p> <p>The plans for km 65 and 87 will be evaluated on a case by case basis; should the risks be deemed too high, Parks Canada will require that the sewage be removed and treated off site</p>
PCA	26	<p>Spill Contingency and Response Plans shall be informed by the updated risk assessment of accidents and malfunctions to mitigate the potential impacts on the environment, as well as, the updated road design and operation plans. They shall address each phase of the project, including: construction, operations, and closure. Due to the time span between construction to closure, it is recommended that a separate Spill Contingency and Response Plan be developed for each project phase to ensure the environmental setting, response resources (equipment and personnel), and types of spills best reflect the project at the time of implementation.</p> <p>The updated Spill Contingency and Response Plans are subject to review and approval by Parks Canada for portions of the road within NNPR during the regulatory phase and prior to construction.</p>
PCA	27	<p>The detailed design and operations of the road shall be informed by an updated risk assessment of accidents and malfunctions to mitigate accident occurrence and the associated consequences. The updated risk assessment shall conform to the Terms of Reference 7.2.2 Effects of Potential Accidents and Malfunctions and address each phase of the project (construction, operation and closure).</p> <p>The updated risk assessment shall be completed during to the regulatory phase prior to construction of the road. The updated risk assessment, road design and road operations plans are subject to review and approval by Parks Canada for portions of the road within NNPR during the regulatory phase and prior to construction.</p>
PCA	28	<p>Complete geotechnical and permafrost intrusive investigation is required prior to completion of each borrow source management plan and prior to any development of</p>

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		the borrow source.
PCA	29	<p>The Borrow Source Management Plans for each borrow source would include/consider the following, without limitation:</p> <ul style="list-style-type: none"> <li>• Frequency and location of monitoring and the parameters to monitor.</li> <li>• All mitigation and monitoring plans, including permafrost protection/management.</li> <li>• Informed by industry best practices, including, Indian and Northern Affairs Canada (2009) Northern Land Use Guidelines: Pits and Quarries.</li> <li>• Factual reports that documents the site specific geotechnical and permafrost investigations and results</li> </ul> <p>Each Borrow Source Management Plan is subject to review and approval by Parks Canada during the regulatory phase and prior to construction.</p>
PCA	30	<p>To protect against permafrost degradation and/or thaw settlement of the soils located below the material extraction zone within a borrow, the following additional mitigations are to be considered:</p> <ul style="list-style-type: none"> <li>• Geotechnical and permafrost characterization completed beyond the extents of the extraction zone within each borrow.</li> <li>• Maintaining proper thermal insulating layer between the base/extents of the extraction zone and the soils requiring protection against thaw settlements.</li> </ul> <p>NOTE: Parks Canada supports ECCC's conclusion, rationale and recommendations related to borrow sources potential for acid rock drainage and metal leaching (Issue 4.1, ECCC Technical Report. March 10, 2017).</p>
PCA	31	<p>The detailed road design is subject to review and approval by Parks Canada for portions of the road within the NNPR during the regulatory phase and prior to construction. The road design shall include, without limitation:</p> <ul style="list-style-type: none"> <li>• Design report, drawings and construction specifications that are signed and stamped by a NAPEG engineer.</li> <li>• The road design be informed by industry best practices, including, Transport Association of Canada (2010). Guidelines for Development and Management of Transportation Infrastructure in Permafrost Regions. May 2010.</li> <li>• The road design considers the construction, operations and closure phases of the project.</li> <li>• Factual reports that document the site specific geotechnical and permafrost investigations and results that is utilized in the production of the road detailed design.</li> </ul>
PCA	32	<p>A Permafrost Monitoring and Response Action Plan for the road shall be developed that includes at a minimum the following:</p> <ul style="list-style-type: none"> <li>• Frequency and location of monitoring and the parameters to monitor.</li> <li>• Addresses the construction and operation phases of the project and updated a minimum of 2 years prior to closure to address the closure phase of the project.</li> <li>• Triggers and response actions to mitigate against signs of potential permafrost degradation.</li> <li>• Response actions to correct the occurrence of permafrost degradation.</li> </ul>

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Party	No.	Recommendation
		<ul style="list-style-type: none"> <li>• Site specific factors.</li> </ul> <p>The Permafrost Monitoring and Response Action Plan is subject to review and approval by Parks Canada during the regulatory phase and prior to construction.</p>
PCA	33	<p>CZB shall commit to providing detailed reclamation plans by vegetation / terrain type to demonstrate that ground stabilization and revegetation to restore ecological integrity will be implemented in a timely manner that meets Parks Canada standards and industry accepted best practices. For example, rather than just scarification, ripping and roughening of surfaces is more effective at promoting natural regeneration (Polster, 2016).</p> <p>Each detailed reclamation plan, including the monitoring plan, is subject to review and approval by Parks Canada during the regulatory phase and prior to construction.</p> <p>Each reclamation plan shall include:</p> <ul style="list-style-type: none"> <li>• The collection of baseline information for the system that is being replicated. This baseline work will need to be done before the system is disturbed by construction and road operations.</li> <li>• Detailed information on the short term (beginning during construction and continuing until properly-timed revegetation) and long term (beginning with revegetation and continuing into the post-closure phase) methods and timelines for restoration. It will be important to provide specific information on how the relevant reclamation plans will address areas around borrow sources in floodplains to ensure that bermed areas are properly reclaimed, that water is prevented from ponding, and that sediment / deleterious substances are prevented from entering watercourses.</li> <li>• Methods and materials that are consistent with ecological restoration objectives.</li> <li>• Monitoring plan to evaluate the effectiveness of these mitigation and reclamation measures including targets (ex. percent cover, species diversity, community composition) thresholds for adaptive management, and strategies for implementing adaptive management.</li> <li>• Details on how the loss of high and medium quality riparian habitat, as defined by the proponent in PRD # 368 and Hatfield memo (Sept 6, 2016), will be compensated for.</li> </ul> <p>Preventing the introduction of non-native seed stock is critical in national parks. As such, seed stock must be obtained by collecting and planting local seeds and cuttings. The restoration approach should follow best practices outlined in the Principles and Guidelines for Ecological Restoration of Canada's Natural Protected Areas (public registry document 342), and techniques and prescriptions should reference the Yukon Revegetation Manual (public registry document 340), Densmore et al (2000), or other appropriate studies.</p>
PCA	34	<p>CZN shall establish an independent panel to provide an independent review of the updated risk assessment, road design and road operations plans, road closure and reclamation plans, and advise on the permitting/licensing, design, construction,</p>

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		<p>operation and maintenance of the road over the life of the Project, inclusive of the design, construction, operation, closure and post-closure phases. The panel will provide recommendations to CZN to ensure that impacts from the road are minimized and the road is safe. The panel at a minimum will:</p> <ul style="list-style-type: none"> <li>• review and provide recommendations for the risk assessment, road design and road operations plans;</li> <li>• review the road operation, and</li> <li>• review the closure design and performance.</li> </ul> <p>CZN will engage with PC and other pertinent stakeholders on the panel composition and tasks. CZN will submit the review panel's terms of reference to PC for review and approval.</p> <p>The panel is to advise CZN on the project. The panel shall not replace any review and approval process required as part of the licensing/permitting of the project. The panel cannot create any new legal powers or duties and cannot alter the power and duties established by the National Parks Act and other relevant Acts. Thus, the Panel does not approve any plans that may be requirements of CZN permits/licenses/authorizations. The panel is also not responsible for the design, management or supervision of the Project or any activities related to the Project.</p>

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PR#	Document Name	Originator	Date
1	Referral letter from MVLWB	Other	22-May-14
2	Land Use Permit and Water Licence Application & PDR	Other	16-Apr-14
3	Referral letter to CanZinc	Review Board	23-May-14
4	Notice of referral to distribution list	Review Board	23-May-14
5	SARA notification to Environment Canada	Review Board	27-May-14
6	Can Zinc draft Terms of Reference - All Season Road	Developer	4-Jun-14
7	Note_to_File_scoping_dates	Review Board	2-Jun-14
8	Letter NPMO to ADK re participation in the EA	Federal or responsible minister	5-Jun-14
9	Letter_NPMO_to_DFN	Parties/Public	5-Jun-14
10	Canzinc All Season Road Scoping Jun 2014	Developer	9-Jun-14
11	Prairie_creek_rd_alignment_Jun 2014	Developer	13-Jun-14
12	CanZinc_haulage_rte	Developer	13-Jun-14
13	Note to File_Tech Scoping and dates	Review Board	17-Jun-14
14	EC_Notification Pursuant to ss-79 1 of the SAR Act Letter	Parties/Public	18-Jun-14
15	Dene_traditional_harvesting_protocols	Parties/Public	11-Jun-14
16	Community Scoping Summary Report	Review Board	24-Jun-14
17	Notice of timeline requirements under 2014 MVRMA	Review Board	26-Jun-14
18	TK_Assessment_Report_Addendum	Parties/Public	25-Jun-14
19	Note to File_TK Assessment	Review Board	26-Jun-14
20	NDDDB Letter to MVEIRB re TK Study June 2014	Parties/Public	24-Jun-14
21	GNWT Letter to MVEIRB - Request to Review NDDDB TK Assessment_06-30-14 -	Parties/Public	30-Jun-14
22	Issues Scoping Agenda_Yellowknife_8July2014	Review Board	2-Jul-14
23	ADK Briefing Report from Community Scoping June 10 2014	Parties/Public	2-Jul-14
24	Issues Scoping Agenda_Yellowknife_8July2014_v2	Review Board	3-Jul-14
25	LUP_Parks2012-L001_CZN	Parties/Public	27-Jun-14
26	WL_Parks2012_W001_CZN	Parties/Public	27-Jun-14
27	Note to File_TK Video_3July2014	Review Board	3-Jul-14
28	MVLWB Letter RE amended LUP application	Parties/Public	8-Jul-14
29	Amended LUP application June 2014	Developer	8-Jul-14
30	CanZinc All Season Road Scoping Presentation July 8 2014	Developer	8-Jul-14
31	ORS documents for the DpToR	Review Board	30-Jul-14
32	Parks Canada Agency Speaking Notes	Parties/Public	11-Jul-14
33	Technical Issues Scoping Summary	Review Board	17-Jul-14
34	Note to File_LiDAR	Review Board	18-Jul-14
35	MVEIRB_Draft Terms of Reference	Review Board	31-Jul-14



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37	GNWT ITI letter to CanZinc	Parties/Public	25-Jul-14
38	CanZinc Letter to GNWT ITI	Developer	14-Aug-14
39	Party Status Application	Review Board	21-Aug-14
40	Draft Work Plan	Review Board	12-Sep-14
41	ORS Review of Draft ToR	Review Board	12-Sep-14
42	Terms of Reference	Review Board	12-Sep-14
43	CanZinc Lease	Review Board	22-Dec-13
44	Reasons for Decision for Scope of EA	Review Board	29-Sep-14
45	Federal Roles in Prairie Creek EA	Parties/Public	3-Oct-14
46	Note to File - Telecon with Parks Canada	Review Board	7-Oct-14
47	Parks Canada letter to MVEIRB RE: reasons for decision on scope	Parties/Public	8-Dec-14
48	Review Board response to PC letter	Review Board	8-Jan-15
49	Letter to MVEIRB from Can Zinc re DAR submission	Developer	31-Jan-15
50	Fort Liard_attendance	Review Board	10-Jun-14
51	FtSimpson_attendance	Review Board	11-Jun-14
52	NahanniButte_attendance	Review Board	9-Jun-14
53	GNWT Letter to MVEIRB - Participation and Status	Parties/Public	18-Feb-15
54	Parks Canada letter regarding the airstrip	Parties/Public	8-Apr-15
55	EA1415-01 Developer's Assessment Report	Developer	23-Apr-15
56	EA1415-01_DAR Appendix 1 Vol 2	Developer	23-Apr-15
57	EA1415-01_DAR Appendices 2-14 Vol 3	Developer	24-Apr-15
58	Note to File_DAR Submission_24April2015	Review Board	24-Apr-15
59	Appendix 1_A	Developer	23-Apr-15
60	Appendix 1_B	Developer	23-Apr-15
61	Appendix 1_C	Developer	23-Apr-15
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70	GNWT Letters to Aboriginal Groups	Parties/Public	1-May-15
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72	Work Plan_7May2015	Review Board	7-May-15

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74	Review Board email to CanZinc RE: DAR submission and adequacy review	Review Board	13-May-15
75	email_12May2015_CanZinc response to consultant questions	Review Board	12-May-15
76	Adequacy Review cover letter	Review Board	22-May-15
77	EA1415-01_CanZinc DAR Adequacy Review_Final	Review Board	22-May-15
78	email_28May2015_DHarpley_clarification_re_DAR_content	Developer	28-May-15
79	Note to File May 28 Telecon with CZN	Review Board	28-May-15
80	Email re DAR content clarification submitted by CZN	Developer	1-Jun-15
81	Note to File_Adequacy Review Meeting_15June2015	Review Board	16-Jun-15
82	CanZinc letter to MVEIRB RE: Adequacy Review	Developer	16-Jun-15
83	Note to File_Consideration of Airstrip_19June2015	Review Board	19-Jun-15
84	MVEIRB response to CanZinc Adequacy letter	Review Board	24-Jun-15
85	Note to File_Adequacy Review Meeting with TetraTech	Review Board	24-Jun-15
86	Note to File_update for work plan	Review Board	26-Jun-15
87	combined_29-July-2015 emails RE Adequacy Review clarification	Review Board	29-Jul-15
88	email 17-Aug-2015_update on progress	Developer	17-Aug-15
89	App B - Tetra Tech flood estimation	Developer	9-Sep-15
90	App C - Hatfield aquatics	Developer	9-Sep-15
91	App D - Golder Air Quality Assessment	Developer	9-Sep-15
92	App G - Analytical Certificates	Developer	9-Sep-15
93	11.9.81 Vegetation&Wildlife Studies Jan-Jul.,81 Beak Consul. Sept, 1981	Developer	9-Sep-15
94	11.10.82 Wildlife Studies 1982 Addendum, Beak Consultants October 1982	Developer	9-Sep-15
95	11.12.94 Vegetation & Wildlife Initial Environmental Evaluation	Developer	9-Sep-15
96	Chillborne April_2007_Wildlife_Road and Alternate Route	Developer	8-Sep-15
97	Golder Caribou Occupancy Survey 25 JUN 2014	Developer	9-Sep-15
98	Letter to CanZinc_DAR Addendum_9Sept2015	Review Board	9-Sep-15
99	App F Tetra Tech Terrain	Developer	9-Sep-15
100	DAR Addendum	Developer	9-Sep-15
101	App A - Allnorth Road Eng	Developer	9-Sep-15
102	App E - Tera Tech Wildlife & Veg Report	Developer	9-Sep-15
103	Letter to CanZinc_DAR AddendumAdequacy	Review Board	2-Oct-15
104	CanZinc response to MVEIRB 2-Oct-2015 letter	Developer	13-Oct-15
105	Letter to Parks Canada_RE Airstrip_6Nov2015	Review Board	6-Nov-15
106	Parks Canada response to MVEIRB re Airstrip	Parties/Public	24-Nov-15
107	Tetra Tech EBA Mapping Summary Report 2015-12-03 IFU (1)	Developer	3-Dec-15
108	CZN Letter to MVEIRB re Airstrip Dec 11 2015	Developer	11-Dec-15
109	email Request for Board Consideration - Dec 17, 2015	Developer	17-Dec-15

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112	Reasons for Decision on the adequacy of the DAR	Review Board	21-Dec-15
113	Note to File_Final statement on airstrip	Review Board	8-Jan-16
115	NBDB Chief letter to MVRB, Jan08,2016	Parties/Public	8-Jan-16
116	Final DFN CZN Letter Extension Request 2016	Parties/Public	12-Jan-16
117	Note to File_Request for extension for party comments on DAR	Review Board	13-Jan-16
118	Appendix 4	Developer	23-Apr-15
119	Appendix 5	Developer	23-Apr-15
120	Appendix 6	Developer	25-Apr-15
121	Appendix 7	Developer	23-Apr-15
122	Appendix 8	Developer	23-Apr-15
123	Appendix 9	Developer	23-Apr-15
124	Appendix 10	Developer	23-Apr-15
125	Appendix 11	Developer	23-Apr-15
126	Appendix 12	Developer	25-Apr-15
127	Appendix 13	Developer	23-Apr-15
128	Appendix 14	Developer	23-Apr-15
129	Appendix 2	Developer	23-Apr-15
130	Note to File_Teleconference with CanZinc_22Jan2016 FINAL	Review Board	22-Jan-16
131	Note to File_Extension of Information Request deadline	Review Board	22-Jan-16
132	Air Quality and Emissions Monitoring and Management Plan, Oct 2012	Developer	27-Jan-16
133	Contaminant Loading Management Plan, August 2012	Developer	27-Jan-16
134	Flight Impact Management Plan, August 2012	Developer	27-Jan-16
135	Road Operations Plan (winter), 2012	Developer	27-Jan-16
136	Spill Contingency Plan - Access Road (winter) 2012	Developer	27-Jan-16
137	Waste Management Plan Access Road and TTF-LTF, 2012	Developer	27-Jan-16
138	Wildlife management plan (draft) February 2011	Developer	27-Jan-16
139	Hazardous Substances Plan (draft) September 2012	Developer	27-Jan-16
140	AEMP Design Plan - 31 January 2014	Developer	27-Jan-16
141	Letter CZN to MVEIRB re DAR Adequacy RfD Jan 2016	Developer	29-Jan-16
142	Third Party Risk Assessor Scope of Work and CVs	Review Board	2-Feb-16
143	CZN Update on Adequacy items 2-Feb-2016	Developer	2-Feb-16
144	GNWT comment on Risk Assessor SOW Feb-2-2016	Parties/Public	5-Feb-16
145	CanZinc comments on Risk Assessor SOW	Developer	5-Feb-16
146	Finalized Oboni Scope of Work	Review Board	11-Feb-16
147	Letter to CanZinc- Update to Adequacy Requirements for DAR	Review Board	11-Feb-16

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PR#	Document Name	Originator	Date
148	Note to File_Round 1 Information Requests to parties	Review Board	12-Feb-16
149	email_CanZinc update on adequacy material submission	Developer	12-Feb-16
150	LKFN letter to MVEIRB Feb-12-16	Parties/Public	12-Feb-16
151	NBDB Chief letter to MVRB, Feb12, 2016	Parties/Public	12-Feb-16
152	Northern Land Use Guideline_Camps	Parties/Public	15-Feb-16
153	Northern Land Use Guideline_pits and quarries	Parties/Public	15-Feb-16
154	Northern Land Use Guideline_roads and trails	Parties/Public	15-Feb-16
155	Draft winter road wildlife management plan April 2012	Developer	27-Jan-16
156	CanZinc report on water sources - winter road - 28Dec2012	Developer	16-Feb-16
157	Management Plans Hyperlinked	Review Board	27-Jan-16
158	Notice of proceeding- Technical session timing	Review Board	17-Feb-16
159	Preliminary Data Report- Prairie Creek Caribou Research	Parties/Public	12-Feb-16
160	Ecological impacts of roads in Canada's North	Parties/Public	19-Feb-16
161	email_CZN_engagement with Nahanni Butte	Developer	22-Feb-16
162	CanZinc letter to MVEIRB regarding Feb12 letter from NDDB	Developer	24-Feb-16
163	Canzinc response to LKFN letter on engagement (Feb 12)	Review Board	26-Feb-16
164	NPMO reponse to LKFN_29Feb2016	Parties/Public	29-Feb-16
165	GNWT response to consultation questions_combined_2Mar2016	Parties/Public	2-Mar-16
166	CanZinc letter to MVEIRB re Board IR's 3Mar2016	Developer	3-Mar-16
167	Note to File_Update to MVEIRB Round 1 IR#2	Review Board	7-Mar-16
168	Note to File-Change in MVEIRB Personnel for EA 1415-01	Review Board	7-Mar-16
169	Direction on Procedure for IR Process_EA1415-01	Review Board	16-Mar-16
170	Letter to NDDB from MVEIRB re Feb 12 letter	Review Board	16-Mar-16
171	email from CanZinc about the boreal caribou range_18Mar2016	Developer	18-Mar-16
172	Engagement record from CanZinc's meeting with NDDB on 1Mar2016	Developer	21-Mar-16
173	Letter to CZN - MVEIRB response to CZN comments on Round 1 IRs- March 24_2016	Review Board	24-Mar-16
174	Letter from CanZinc re: Invasive Plant Management Plan	Developer	11-Sep-15
175	DAR Appendix 1_E v2 combined n and s shore Liard River barge ramps)	Developer	29-Mar-16
176	CanZinc letter to MVEIRB re Concentrate Haul	Developer	1-Apr-16
177	email between GNWT and CanZinc RE mapping files	Parties/Public	4-Apr-16
178	CanZinc responses to outstanding adequacy items	Developer	12-Apr-16
179	NDDB letter to MVEIRB_RE IR round 1 and TK assessment	Parties/Public	19-Apr-16
180	Note to File_Final_Adequacy materials received_20April2016	Review Board	20-Apr-16
181	email CanZinc to MVEIRB re timing of responses to IRs	Developer	2-May-16
182	All-season road google earth files May 6, 2016	Developer	6-May-16
183	Notice of proceeding- technical sessions June 13-16	Review Board	9-May-16
184	Allnorth Responses to Information Requests	Developer	11-May-16

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185	Hatfield memo_fish IR responses	Developer	22-Apr-16
186	TetraTech EBA Wildlife Veg IR1 responses	Developer	28-Apr-16
187	TetraTech EBA_Risk analysis -landslide hazards	Developer	4-May-16
188	Compiled attachment responses to individual IRs	Developer	9-May-16
189	PCA_Response_MVEIRB_IRs_Mar2016	Parties/Public	10-Mar-16
190	Recovery strategy for woodland caribou_ECCC	Parties/Public	11-Mar-16
191	GNWT response to MVEIRB IRs 42-45_11Mar2016	Review Board	11-Mar-16
192	summary table of round one IRs	Review Board	17-May-16
193	NNPR management plan_June2010	Parties/Public	11-May-16
194	Work Plan_11May2016	Review Board	11-May-16
195	Archaeology Report - Golder 2013	Developer	9-May-16
196	Archaeology Report Dec 2009	Developer	9-May-16
197	CanZinc responses to January 2016 IRs from MVEIRB	Developer	21-Jan-16
198	GNWT Response letter to CanZinc RE:Management and Control of Road_August 2015	Parties/Public	20-Aug-15
199	Party IR cover letters_combined	Parties/Public	11-Mar-16
200	Online Review System Comments Table - Round 1 Information Request and Responses	Review Board	17-May-16
201	All-season Road google earth files May 11, 2016 - Liard Crossing file added	Developer	11-May-16
202	email between Review Board and Parks Canada_RE Wolverine airstrip	Parties/Public	16-May-16
203	Letter to parties_tech session preliminary agenda and lines of questioning	Review Board	16-May-16
204	email_Parks Canada to Review Board_RE tech session agenda	Parties/Public	17-May-16
205	Key Lines of Questioning - CPAWS NWT	Parties/Public	18-May-16
206	email between CanZinc and Review Board RE airstrips on IR round 1 response figures_18May2016	Developer	18-May-16
207	TAC 2010 Development and mgmt of transportation infrastructure in permafrost regions	Developer	20-May-16
208	Note to File - Party Status		8-Jan-16
209	key lines of questioning_Oboni Riskope	Parties/Public	24-May-16
210	Summary of outstanding adequacy responses to review for the Technical Session	Review Board	24-May-16
211	GNWT response to key lines of questioning	Parties/Public	25-May-16
212	GoC response to key lines of questioning	Parties/Public	25-May-16
213	Note to File - teleconference_with_CanZinc_26_May_2016	Review Board	26-May-16
214	CanZinc comments on agenda_27May2016	Developer	27-May-16
215	Note to File -third party facilitator	Review Board	27-May-16
216	Online article re All-season road May262016 submitted by Nahanni Butte Dene Band	Parties/Public	27-May-16
217	CV's for CanZinc technical experts	Developer	30-May-16
218	T.Perkins_CV_Knight Piesold	Review Board	30-May-16

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219	Canadian Zinc Prairie Creek Prefeasibility update_March2016	Developer	31-Mar-16
220	CanZinc technical session agenda June 13 to 16, 2016	Review Board	31-May-16
221	Letter from Liidlii Kue First Nation to MVEIRB 1 Jun 2016	Parties/Public	1-Jun-16
222	Preparing for the June 13-16 technical session	Review Board	7-Jun-16
223	Parks_Canada_CVs_for_Technical_Session	Parties/Public	7-Jun-16
224	CanZinc Tech Session intro presentation Jun 2016	Developer	8-Jun-16
225	CV for Dehcho First Nation technical advisor	Parties/Public	10-Jun-16
226	Technical session on cultural impacts from Prairie Creek All Season Road proposed	Review Board	10-Jun-16
227	Meeting_Summary_-_GOC_-_GNWT_-_NBDB_-_IAB_-_CanZinc_-_June-3-16	Parties/Public	3-Jun-16
228	NPMO_-_Response_to_NBDB_-_IAB_Lands_Mtg_-_10-06-16	Federal or responsible minister	10-Jun-16
229	CanZinc Road and IAB Lands Map 09-Jun-20162016	Parties/Public	13-Jun-16
230	Technical session transcripts Monday 13-Jun-2016	Review Board	13-Jun-16
231	EA0809-002_Invasive_and_Rare_Plant_Survey_Report_April_2011	Developer	13-Jun-16
232	Technical session transcripts 14-Jun-2016	Review Board	14-Jun-16
233	Email from NBDB with attached correspondence	Parties/Public	15-Jun-16
234	Email from CanZinc re avalanche assessment	Review Board	16-Jun-16
235	Tuk Inuvik Highway Water Licence	Parties/Public	15-Jun-16
236	PrairieCreekAccessRoad_updated map with IAB lands	Parties/Public	16-Jun-16
237	Technical session transcripts 15-Jun-2016	Review Board	15-Jun-16
238	Sundog_Realign_max_resolution_poster_from_tech_session	Developer	17-Jun-16
239	CanZinc Technical Session Undertakings with cover letter	Review Board	17-Jun-16
240	Technical session transcripts 16-Jun-2016	Review Board	16-Jun-16
241	Note to File - items 26 and 44 from draft undertaking list clarification	Review Board	20-Jun-16
242	GNWT comments on draft undertakings	Parties/Public	20-Jun-16
243	GoC_-_Comments_on_Draft_Undertakings	Parties/Public	20-Jun-16
244	MVEIRB intro presentation for tech session June 13-16	Review Board	17-Jun-16
245	Letter to MVEIRB from CanZinc re Undertakings	Parties/Public	22-Jun-16
246	Note to File - draft commitments from June 2016 technical session	Review Board	23-Jun-16
247	Nahanni Butte technical session on cultural impacts	Review Board	27-Jun-16
248	Fort Simpson technical session on cultural impacts	Review Board	27-Jun-16
249	Notice of Proceedings - technical sessions on cultural impacts	Review Board	27-Jun-16
250	Undertakings from technical session - final	Review Board	28-Jun-16
251	Note to File_Telecon with CanZinc_re_undertakings_23_Jun_2016	Review Board	28-Jun-16
252	Note to File -facilitator for technical session on cultural impacts	Review Board	28-Jun-16
253	GNWT Letter to DFN re participation at cultural impacts technical session	Parties/Public	27-Jun-16

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254	GNWT Letter to ADKFN and FLM re participation at cultural impacts technical session	Parties/Public	27-Jun-16
255	GNWT comments to MVRB on draft commitments table	Review Board	28-Jun-16
256	GoC_-_Comments_on_Draft_Commitment_List	Review Board	28-Jun-16
257	Email from CanZinc re commitment to undertake Archaeological Overview Assessment	Developer	29-Jun-16
258	Simpson_Agenda_Traditional Knowledge Session on the Road Project proposed by CanZinc	Review Board	29-Jun-16
259	Nahanni_Agenda_Traditional Knowledge Session on the Road Project proposed by CanZinc	Review Board	29-Jun-16
260	GoC - Comments on Commitment List - 06-28-16	Parties/Public	28-Jun-16
261	GNWT letter to MVRB_undertaking extension request	Parties/Public	23-Jun-16
262	GoC_Undertakings_Responses_-_tech_session	Parties/Public	30-Jun-16
263	CanZinc letter to MVEIRB re Commitments June 30 2016	Developer	30-Jun-16
264	Letter to MVEIRB re Undertakings July 3 2016	Developer	3-Jul-16
265	Cultural Technical Session - July 4,5 CanZinc presentation	Developer	5-Jul-16
266	MVEIRB intro presentation for community tech sessions_NB	Review Board	4-Jul-16
267	MVEIRB intro presentation for community tech sessions_FS	Review Board	5-Jul-16
268	NBDB - IAB Lands Map with GPS Coordinates	Parties/Public	26-Jun-16
269	NBDB Band Council Resolution on Traditional Land Use Agreement	Parties/Public	5-Jul-16
270	Note to File -Board staff contact for July 8-15 and next steps	Review Board	8-Jul-16
271	NBDB Chief letter to Justin Trudeau 8-Jul-16	Parties/Public	8-Jul-16
272	GNWT response to undertaking #41	Parties/Public	8-Jul-16
273	GoC Responses to Technical Session Undertakings 10 & 15	Parties/Public	14-Jul-16
274	Ecotype Map Report_Nahanni_FINAL	Parties/Public	14-Jul-16
275	Nahanni.Butte_Cultural_session_All Season Road_Report_FINAL	Review Board	26-Jul-16
276	Fort Simpson _Cultural_Session_ All Season Road_Canadian Zinc_FINAL	Review Board	26-Jul-16
277	Note to File -comments requested on Cultural Impacts Technical Session Reports	Review Board	27-Jul-16
278	New lake formed on Canol Trail - News North article	Parties/Public	27-Jul-16
279	Note to File -MVEIRB meeting with DFO_28_Jul_16	Review Board	28-Jul-16
280	Update on timeline for responses to Technical Session undertakings 5_Aug_2016	Review Board	5-Aug-16
281	Email from CanZinc re IAB lands map - Chief and Council approval	Developer	8-Aug-16
282	Letter to MVEIRB re Undertakings from Technical Session Aug 11, 2016	Developer	11-Aug-16
283	Office of the Prime Minister Aug 02 2016 response to NBDB letter of July 8 2016	Parties/Public	2-Aug-16
284	GNWT comments on Facilitator's Reports for Cultural Impacts Technical Sessions	Parties/Public	12-Aug-16
285	CanZinc comments on Cultural Impacts Tech Session Reports Aug 12 2016	Developer	12-Aug-16
286	Email from NBDB Chief and Band Council Resolution	Parties/Public	15-Aug-16

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287	Undertaking response #32 from Technical Sessions	Developer	18-Aug-16
288	Undertaking responses from tech session - (Allnorth 19,23,24)	Developer	18-Aug-16
289	Vegetation and Wildlife Baseline Survey_17_Aug_16		18-Aug-16
290	Note to file - second round information requests	Review Board	19-Aug-16
291	Letter from GoC to MVRB re undertaking #7	Parties/Public	24-Aug-16
292	CanZinc letter to MVEIRB re response to undertaking 7	Developer	18-Aug-16
293	CanZinc response to Undertaking 12 from Technical Sessions	Developer	26-Aug-16
294	Note to File - Undertaking Responses_CanZinc_30_Aug_2016	Review Board	30-Aug-16
295	Note to File_ORs open for IR round 2_30_Aug_16	Review Board	30-Aug-16
296	CanZinc Commitments Table	Review Board	1-Sep-16
297	Wildlife Mitigation and Monitoring Plan Updated_DRAFT_31_Aug_16	Developer	2-Sep-16
298	Follow Up Regarding Reclamation Outcomes_29_Aug_16	Developer	2-Sep-16
299	Supplementary fish habitat report_06_Sep_16 (undertaking #7)	Developer	6-Sep-16
300	Note to File - staff contact Sept 9-28	Review Board	1-Sep-16
301	Note to file - second round information request update	Review Board	12-Sep-16
302	GNWT Letter to MVEIRB and Canadian Zinc regarding Land Tenure Obligations - EA1415-01	Parties/Public	20-Sep-16
303	Note to file - October 7th deadline for IRs relating to undertaking 7 and recent GNWT letter	Review Board	23-Sep-16
304	NBDB Email to MVEIRB 13Sep16	Parties/Public	13-Sep-16
305	Letter CanZinc to NBDB re Sept 13 correspondence	Developer	28-Sep-16
306	Oboni Compiled References	Parties/Public	22-Sep-16
307	NBDB Chief letter to Prime Minister Justin Trudeau, Sep29,2016	Parties/Public	29-Sep-16
308	Letter from Parks Canada to MVRB re baseline information gaps		30-Sep-16
309	Email from Parks Canada to CanZinc re baseline requirements	Parties/Public	30-Sep-16
310	Note to File_teleconference with Parks Canada_04_Oct_2016	Review Board	4-Oct-16
311	Note to file - R2 IRs Extension Reminder	Review Board	6-Oct-16
312	NBDB Band Council Resolution re Traditional Land Use Agreement	Parties/Public	6-Oct-16
313	NBDB Chief letter to MVEIRB - response to Parks Canada 30-Sept-2016 letter	Parties/Public	14-Oct-16
314	MVEIRB note to file - Round 2 IR response deadline	Review Board	19-Oct-16
315	CanZinc letter to MVEIRB re Parks Canada second round information request 9	Developer	19-Oct-16
316	Deh Cho Drum News Article submitted by NBDB - Youth Camp Update	Parties/Public	20-Oct-16
317	CanZinc Letter to MVEIRB re Sep 30 Parks letter re baseline info gaps	Developer	14-Oct-16
318	CanZinc - Tetra Tech memo on stream crossing design water levels Jun 6 2016	Developer	6-Jun-16
319	Updated Work Plan - October 2016	Review Board	27-Oct-16
320	Round 2 information requests - Online Review System Table	Review Board	24-Oct-16
321	MVEIRB letter to Parks Canada - response to Sept 30 letter on baseline info gaps	Review Board	31-Oct-16
322	Office of the Prime Minister email to NBDB	Parties/Public	31-Oct-16



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323	Round 2 information requests - Undertaking #7/GNWT letter - Online Review System Table	Review Board	3-Nov-16
324	Risk Assessment Technical Report submitted by Oboni Riskope	Review Board	18-Nov-16
325	Note to File_telecon between Board staff and Parks Canada_03_Nov_2016	Review Board	3-Nov-16
326	CanZinc - NBDB engagement record Oct 13 2016	Developer	10-Nov-16
327	CanZinc memo to GNWT re Hwy haulage rates for truck	Developer	10-Nov-16
328	GoC Letter to Liidlii Kue and Dehcho First Nations - undertaking #7	Parties/Public	16-Nov-16
329	GNWT-ENR Wildlife Division maps	Parties/Public	23-Sep-16
330	GWNT IR2 cover letter	Parties/Public	23-Sep-16
331	GoC IR2s and cover letter	Parties/Public	7-Oct-16
332	GoC IR2 cover letter	Parties/Public	23-Sep-16
333	Parks Canada example ground water sampling design	Parties/Public	23-Sep-16
334	Oboni Riskope IR2 tables	Parties/Public	23-Sep-16
335	Gregory et al. (1991)	Parties/Public	7-Oct-16
336	Naiman and Decamps (1997)	Parties/Public	7-Oct-16
337	Pusey and Arthington (2003)	Parties/Public	7-Oct-16
338	Parks Canada IR2 response attachment - letters to UNESCO	Parties/Public	24-Oct-16
339	CanZinc IR2 response attachment - EA0809-002 Appendix J	Developer	24-Oct-16
340	Yukon Revegetation Manual	Parties/Public	7-Oct-16
341	CanZinc IR2 response attachment - TetraTech wildlife and vegetation	Developer	19-Oct-16
342	Principles and Guidelines for Ecological Restoration	Parties/Public	7-Oct-16
343	Mackay (1992)	Parties/Public	7-Oct-16
344	CanZinc IR2 response attachment - TetraTech Permafrost summary and mitigation	Developer	24-Oct-16
345	Bornette et al. (1998)	Parties/Public	7-Oct-16
346	CanZinc IR2 response attachment - wolverine airstrip and winter road map	Developer	24-Oct-16
347	Hauer et al. (2016)	Parties/Public	7-Oct-16
348	GoC IR2 response cover letter	Parties/Public	24-Oct-16
349	Parks Canada IR2 reference table	Parties/Public	7-Oct-16
350	CanZinc IR2 response attachment - Allnorth PCA and MVEIRB responses	Developer	21-Oct-16
351	CanZinc IR2 response attachment - TetraTech borrow sources	Developer	24-Oct-16
352	CanZinc IR2 response attachment - letter to MVEIRB	Developer	19-Oct-16
353	CanZinc IR2 response attachment - Hatfield DFN responses	Developer	29-Oct-16
354	CanZinc IR2 response attachment - updated project figures	Review Board	20-Oct-16
355	CanZinc IR2 response attachment - commitments table	Developer	24-Oct-16
356	CanZinc IR2 response attachment - EA0809-002 Commitments	Developer	24-Oct-16
357	CanZinc IR2 response attachment - TetraTech U#7	Developer	25-Oct-16
358	CanZinc IR2 response attachment - TetraTech calibration	Developer	24-Oct-16

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359	CanZinc IR2 response attachment - Hatfield MVEIRB IR response	Developer	19-Oct-16
360	CanZinc IR2 response attachment - TetraTech terrain stability mapping	Developer	17-Oct-16
361	CanZinc IR2 response attachment - TetraTech terrain stability	Developer	24-Oct-16
362	CanZinc IR2 response attachment - Liidlii Kue First Nation engagement record	Developer	24-Oct-16
363	GNWT IR2 cover letter and information request responses	Parties/Public	24-Oct-16
364	CanZinc IR2 response attachment - Allnorth Oboni responses	Developer	7-Oct-16
365	GoC IR2 response attachment	Parties/Public	24-Oct-16
366	CanZinc IR2 response attachment - Hatfield DFO responses	Developer	29-Oct-16
367	CanZinc IR2 response attachment - Updated DFO Table 2.1	Developer	3-Nov-16
368	CanZinc IR2 response attachment - Hatfield PC responses	Developer	3-Nov-16
369	Notice of Proceedings - Instructions on responding to the risk assessment	Review Board	22-Nov-16
370	Compiled Round 2 information requests with responses and attachments	Review Board	22-Nov-16
371	Compiled Round 2 information requests relating to Undertaking #7 and the Sept. 22 GNWT letter, with responses and attachments	Review Board	22-Nov-16
372	Hyperlinks to ORS information request documents on registry	Review Board	22-Nov-16
373	Hyperlinks to ORS Undertaking #7/GNWT letter IR documents on the registry	Review Board	22-Nov-16
374	Letter to INAC from CanZinc re access road land tenure	Parties/Public	29-Nov-16
375	Letter CanZinc to MVEIRB re Liard Transfer Facility	Developer	29-Nov-16
376	Oboni Riskope risk assessment cover letter	Parties/Public	30-Nov-16
377	Parks Canada Letter to MVEIRB - grey and brown water disposal	Parties/Public	1-Dec-16
378	Note to File - Parks Canada request to CanZinc re clarification of water management at camps	Review Board	1-Dec-16
379	Archaeological Overview Assessment Nov 2016	Developer	5-Dec-16
380	Letter CanZinc to MVEIRB re Risk Assessment Dec 5 2016	Developer	5-Dec-16
381	Email from NBDB Chief to MVEIRB and DFN Resolution #2 Dec 2016	Parties/Public	5-Dec-16
382	Notice of proceeding - risk assessment review and response	Review Board	8-Dec-16
383	Letter from PMO to NBDB 17-Nov 2016 in response to NBDB letter 29-Sep-2016	Federal or responsible minister	17-Nov-16
384	Letter CanZinc to MVEIRB re Oboni risk assessment 13-Dec-2016		13-Dec-16
385	CZN-GNWT Socio-Economic Agreement from EA0809-002 for EA1415-01	Review Board	15-Aug-14
386	INAC request for parties status signed form EA1415-01	Federal or responsible minister	13-Dec-16
387	Oboni Riskope response to 08-Dec-2016 Notice of proceeding	Parties/Public	14-Dec-16
388	Letter CanZinc to MVEIRB re NNPR Camps grey and brown water	Developer	14-Dec-16
389	Email from NBDB to MVEIRB re risk assessment	Parties/Public	15-Dec-16
390	GNWT Summary of Meetings with CanZinc - Oct-Nov 2016	Parties/Public	16-Dec-16
391	Letter CZN to MVEIRB re risk assessment Information request Dec 16 2016		16-Dec-16
392	Note to file - Risk Assessment and Technical Report Phase	Review Board	21-Dec-16

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393	Oboni Riskope response to CanZinc informaton requests 28-Dec-2016	Parties/Public	28-Dec-16
394	Note to File - Party Status January 2017	Review Board	6-Jan-17
395	Notice of proceeding - technical report preparation meeting	Review Board	9-Jan-17
396	email from NBDB re CanZinc technical report preparation meeting and video viewing	Parties/Public	10-Jan-17
397	Notice of proceeding - technical report preparation meeting postponed	Review Board	12-Jan-17
398	Letter to Nahanni Butte Dene Band - Risk Assessment Clarification to Chief Marcellais	Review Board	16-Jan-17
399	Email from NBDB to MVRB re timing of technical report preparation meeting	Parties/Public	17-Jan-17
400	Nahanni Butte Dene Band Chief letter to Review Board 20-Jan-2016	Parties/Public	20-Jan-17
401	GNWT letter to Can Zinc - licence of occupation and lease requirements	Parties/Public	10-Jan-17
402	Dehcho Drum article re access road 26-Jan-2017 submitted by NBDB	Parties/Public	26-Jan-17
403	RFP for Risk Assessment technical specialist, Dec 2015	Review Board	18-Dec-15
404	RFP for Engineering technical experts April 2015	Review Board	6-Mar-15
405	CBC North article 30-Jan-2017 re Prairie Creek Access Road	Parties/Public	30-Jan-17
406	NBDB Band Council Resolution	Parties/Public	30-Jan-17
407	Response #2 to risk assessment from CanZinc to MVEIRB 7-Feb- 2017	Developer	7-Feb-17
408	Note to File Board staff meeting in Nahanni Butte_3-Feb-2017	Review Board	7-Feb-17
409	NBDB Chief letter to MVRB 08-Feb-2017	Parties/Public	8-Feb-17
410	Dehcho Drum article re: NNPR Consensus team 9Feb17 submitted by NBDB	Parties/Public	9-Feb-17
411	Notice of proceeding - technical report preparation meeting scheduled	Review Board	10-Feb-17
412	Notice of Proceeding - Technical Reports due March 10, 2017	Review Board	8-Feb-17
413	Meeting agenda and presentation - Preparing a technical report 17-Feb-2017	Review Board	17-Feb-17
414	Technical Report Preparation Meeting Notes	Review Board	17-Feb-17
415	DFN letter to MVEIRB 16Feb17	Parties/Public	16-Feb-17
416	Updated work plan - February 2017	Review Board	20-Feb-17
417	CanZinc MoU with NTPC 14Feb17	Developer	14-Feb-17
418	Note to file - video viewing	Review Board	21-Feb-17
419	INAC letter to NBDB - environmental assessment process	Parties/Public	14-Feb-17
420	INAC letter to NBDB - Nahanni Butte IAB lands	Parties/Public	27-Jan-17
421	EA1415-01 Prairie Creek All Season Road Video meeting notes	Review Board	23-Feb-17
422	NBDB Chief letter to INAC 27-Feb-2017	Parties/Public	27-Feb-17
423	Dehcho Drum Article - 2Mar17 submitted by NBDB	Parties/Public	2-Mar-17
424	Note to File -Prairie Creek All Season Road video online access	Review Board	3-Mar-17
425	Note to File - Technical Report deadline	Review Board	9-Mar-17
426	Prairie Creek habitat offsetting memo submitted by CanZinc	Developer	9-Mar-17
427	Letter from GNWT to NBDB Chief re: land inquiry	Parties/Public	9-Mar-17
428	GNWT note to file and emails with CanZinc re: Liard crossing	Parties/Public	8-Mar-17

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PR#	Document Name	Originator	Date
429	Fortin et al. (2013) submitted by GNWT	Parties/Public	9-Mar-17
430	Cumming and Hyer (1998) submitted by GNWT	Parties/Public	9-Mar-17
431	Larter and Allaire (2016) submitted by GNWT	Parties/Public	9-Mar-17
432	Leblond et al. (2013) submitted by GNWT	Parties/Public	9-Mar-17
433	NWT Boreal Caribou Recovery Strategy 2017 submitted by GNWT	Parties/Public	9-Mar-17
434	Oberg (2001) submitted by GNWT	Parties/Public	9-Mar-17
435	Polfus et al. (2011) submitted by GNWT	Parties/Public	9-Mar-17
436	Schindler et al. (2007) submitted by GNWT	Parties/Public	9-Mar-17
437	Latour et al. (2008) submitted by ECCC	Parties/Public	9-Mar-17
438	NRCAN MEND report (2009) submitted by ECCC	Parties/Public	1-Dec-09
439	FWS trumpeter swan report (2012) submitted by ECCC	Parties/Public	1-Feb-12
440	FWS trumpeter swan report (2014) submitted by ECCC	Parties/Public	6-May-14
441	Benitez-Lopez et al. (2010) submitted by ECCC	Parties/Public	9-Mar-17
442	ANPC guidelines (2012) submitted by Parks	Parties/Public	1-Apr-12
443	Allen (2011) submitted by Parks	Parties/Public	1-Nov-11
444	Mochnacz et al. (2004) submitted by Parks	Parties/Public	10-Mar-17
445	Cameron and Lantz (2017) submitted by Parks	Parties/Public	10-Mar-17
446	Golder/CanZinc 2011 wildlife survey document submitted by GNWT	Parties/Public	11-Mar-11
447	NPMO technical reports cover letter	Parties/Public	10-Mar-17
448	Environment and Climate Change Canada Technical Report	Parties/Public	10-Mar-17
449	Fisheries and Oceans Canada Technical Report	Parties/Public	10-Mar-17
450	Indigenous and Northern Affairs Canada Technical Report	Parties/Public	10-Mar-17
451	Natural Resources Canada Technical Report	Parties/Public	10-Mar-17
452	Parks Canada Technical Report	Parties/Public	10-Mar-17
453	GoC updated department participation and status summary	Parties/Public	10-Mar-17
454	Boreal caribou species status report (2012) submitted by GNWT	Parties/Public	10-Mar-17
455	Government of Northwest Territories Technical Report	Parties/Public	10-Mar-17
456	Email Re: Dehcho First Nations technical report submission	Parties/Public	10-Mar-17
457	CBC article re: First Nations role in parks	Parties/Public	11-Mar-17
458	Notice of Proceeding - March 9 submission re habitat loss and offset	Review Board	14-Mar-17
459	Dehcho First Nations Technical Report	Parties/Public	10-Mar-17
460	Nahanni Butte Dene Band Technical Report	Parties/Public	14-Mar-17
461	CanZinc letter to MVEIRB Re: co-management with NBDB	Developer	14-Mar-17
462	NBDB letter to Minister and Parks Canada	Parties/Public	20-Mar-17
463	Notice of Proceeding - draft final commitments table	Review Board	20-Mar-17
464	EA1415-01 - DFO TR Amendment Request	Parties/Public	20-Mar-17
465	CanZinc letter to Parks - technical report information request	Developer	20-Mar-17

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466	DFO Technical Report Supplement 22-Mar-2017	Parties/Public	22-Mar-17
467	Parties Technical Report ORS Hyperlinked Documents	Review Board	10-Mar-17
468	DehCho Drum, Mar23,2017, Page 4	Parties/Public	23-Mar-17
469	Parks letter to CanZinc - technical report information request	Parties/Public	24-Mar-17
470	Parks responses to CanZinc technical report information requests	Parties/Public	24-Mar-17
471	NNPR caribou collar study maps - kernel density	Parties/Public	24-Mar-17
472	NNPR caribou collar study maps - individual collars	Parties/Public	24-Mar-17
473	Notice of proceeding - Procedures for community and formal (technical) hearings	Review Board	27-Mar-17
474	Bertha Norwegian participation at EA1415-01 hearings	Review Board	29-Mar-17
475	Dehcho Drum article - 30Mar17 submitted by NBDB	Parties/Public	30-Mar-17
476	Pre-hearing conference agenda	Review Board	31-Mar-17
477	DRAFT public hearing agenda	Review Board	31-Mar-17
478	Letter to parties regarding LKFN request for party status (with attachments)	Review Board	4-Apr-17
479	LKFN Request for party status and technical report extension	Parties/Public	3-Apr-17
480	CBC News North article - Apr 05 2017 submitted by NBDB	Parties/Public	5-Apr-17
481	GNWT letter regarding Bertha Norwegian participation - April 5 2017	Parties/Public	5-Apr-17
482	Notice to parties confirming Bertha Norwegian participation at hearings	Review Board	6-Apr-17
483	NBDB letter to MVRB re LKFN's request for party status	Parties/Public	5-Apr-17
484	CZN response to technical reports - Apr 07 2017	Developer	7-Apr-17
485	Draft Final Commitment Table_7_Apr-2017	Developer	7-Apr-17
486	GNWT letter to MVRB re LKFN's request for party status	Parties/Public	7-Apr-17
487	Pre-hearing conference agenda (updated)	Review Board	9-Apr-17
488	CanZinc letter to MVRB re land tenure 6-Apr-2017	Review Board	6-Apr-17
489	CanZinc letter to MVRB re LKFN party status and technical report request	Developer	9-Apr-17
490	Pre-hearing conference presentation v2	Review Board	10-Apr-17
491	NPMO letter to MVRB re LKFN's request for party status	Parties/Public	10-Apr-17
492	Pre-hearing conference meeting notes	Review Board	10-Apr-17
493	DFN letter to MVRB re LKFN party status and technical report request	Parties/Public	10-Apr-17
494	Notice of proceeding Re: expert witnesses	Review Board	13-Apr-17
495	EA1415-01 Public Hearing Agenda-Final	Review Board	13-Apr-17
496	EA1415-01 Letter to NBDB and GNWT re legal proceedings	Review Board	13-Apr-17
497	Reasons for Decision for LKFN party status	Review Board	13-Apr-17
498	DFO Hearing Presentation	Parties/Public	13-Apr-17
499	ECCC Hearing Presentation (Day 2)	Parties/Public	13-Apr-17
500	ECCC Hearing Presentation (Day 3)	Parties/Public	13-Apr-17
501	INAC Hearing Presentation (Day 1)	Parties/Public	13-Apr-17
502	Oboni hearing presentation	Parties/Public	13-Apr-17

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503	INAC Hearing Presentation (Day 3)	Parties/Public	13-Apr-17
504	NRCan Hearing Presentation	Parties/Public	13-Apr-17
505	PCA Hearing Presentation (Day 1)	Parties/Public	13-Apr-17
506	PCA Hearing Presentation (Day 2)	Parties/Public	13-Apr-17
507	PCA Hearing Presentation (Day 3)	Parties/Public	13-Apr-17
508	DFN hearing presentation	Parties/Public	13-Apr-17
509	GNWT Hearing Presentation (Day 1)	Parties/Public	13-Apr-17
510	GNWT Hearing Presentation (Day 2)	Parties/Public	13-Apr-17
511	GNWT Hearing Presentation (Day 3)		13-Apr-17
512	CanZinc Community Hearing Presentations	Developer	21-Apr-17
513	CanZinc Hearing Presentation (Day 1)	Developer	21-Apr-17
514	CanZinc Hearing Presentation (Day 2)	Developer	21-Apr-17
515	CanZinc Hearing Presentation (Day 3)	Developer	21-Apr-17
516	CV's for CanZinc representatives	Developer	22-Apr-17
517	First Nation fights for right to development - True North Photo Journal	Parties/Public	12-Apr-17
518	20170412-EA1415-01-Canadian Zinc-Prairie Creek Mine All-Season Road-Meeting Summary	Parties/Public	12-Apr-17
519	Nahanni Butte Community Hearing Transcript, April 24, 2017	Review Board	24-Apr-17
520	CV for Jamie VanGulk	Review Board	25-Apr-17
521	Fort Simpson Community Hearing Transcript, April 25, 2017	Review Board	25-Apr-17
522	Canzinc hearing presentation info, Dar Addendum risk assessment tables	Parties/Public	26-Apr-17
523	CVs for developer's technical specialists Rozeboom and Watt	Developer	26-Apr-17
524	Fort Simpson Public Hearing Transcript, April 26, 2017	Review Board	26-Apr-17
525	Fort Simpson Public Hearing Transcript, April 27, 2017	Review Board	27-Apr-17
526	letter from Rowes Construction	Parties/Public	28-Apr-17
527	LKFN Hearing Presentation (Day 3)	Parties/Public	28-Apr-17
528	Fort Simpson Public Hearing Transcript, April 28, 2017	Review Board	28-Apr-17
529	EA1415-01 Public Hearing Media Sheet	Review Board	21-Apr-17
530	Wildlife_research_permit_NBDB-1	Review Board	27-Apr-17
531	Update to work plan (May 2017)	Review Board	3-May-17
532	Undertakings and commitments from the Prairie Creek All Season Road EA1415-01 Public Hearing	Review Board	3-May-17
533	CBC News North article - May 3, 2017, submitted by NBDB	Review Board	3-May-17
534	Meeting Record for 7Mar17 meeting between DFO, PCA, and CanZinc	Parties/Public	24-Apr-17
535	CBC News North Article - May 4, 2017, submitted by NBDB	Parties/Public	4-May-17
536	NBDB BCR, DFN, signed, May06, 2017 (1)	Parties/Public	6-May-17
537	News North, May08,2017,page 8	Parties/Public	8-May-17
538	GoC hearing undertaking responses	Parties/Public	10-May-17

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539	CanZinc hearing undertaking responses	Developer	10-May-17
540	GNWT hearing undertaking response	Parties/Public	10-May-17
541	Notice of proceeding Re: instructions on closing arguments	Review Board	15-May-17
542	GNWT letter to CanZinc Re: access control	Parties/Public	25-May-17
543	NPMO closing arguments cover letter	Parties/Public	26-May-17
544	Environment and Climate Change Canada closing arguments	Parties/Public	26-May-17
545	Fisheries and Oceans Canada closing arguments	Parties/Public	26-May-17
546	Parks Canada closing arguments	Parties/Public	26-May-17
547	Natural Resources Canada closing arguments	Parties/Public	26-May-17
548	Nahanni Butte Dene Band closing arguments	Parties/Public	26-May-17
549	Dehcho First Nations closing arguments	Parties/Public	26-May-17
550	Liidlii Kue First Nation closing arguments	Parties/Public	26-May-17
551	Government of Northwest Territories closing arguments	Parties/Public	26-May-17
552	Indigenous & Northern Affairs Canada closing arguments	Parties/Public	26-May-17
553	CanZinc closing arguments	Developer	5-Jun-17
554	Notice of proceeding re: closure of the public record	Review Board	6-Jun-17
555	Online Review System comments table - revised	Review Board	17-May-16