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**PARKS CANADA AGENCY'S
TECHNICAL REPORT TO THE
MACKENZIE VALLEY ENVIRONMENTAL IMPACT
REVIEW BOARD**

**RESPECTING
THE PRAIRIE CREEK ALL SEASON ROAD
PROPOSED BY THE
CANADIAN ZINC CORPORATION**

MARCH 10, 2017

Canada

Table of Contents

1. NON-TECHNICAL SUMMARY	4
2. INTRODUCTION	5
2.1 Parks Canada's Responsibility	5
2.1.1 World Heritage Status and Canadian Heritage River	5
2.1.3 Park Management and Vision	6
2.1.4 Environmental Assessment in NNPR	7
2.1.5 Project Setting	7
2.2 Parks Canada's Technical Report	8
3. PARKS CANADA'S TECHNICAL REVIEW COMMENTS	10
3.1 ISSUE 1: Potential Arctic Grayling resident population between km 25 and 32 of Sundog Creek	10
3.2 ISSUE 2: Magnitude of impacts to the Northern Mountain Population of Mountain Caribou	11
3.3 ISSUE 3: Baseline requirements, effects assessment and monitoring of potential impacts to Collared Pika	17
3.4 ISSUE 4: Baseline requirements, effects assessment and monitoring of potential impacts to Forest Birds, Waterfowl, Migratory Birds and Avian Species at Risk	20
3.5 ISSUE 5: Baseline requirements and effects assessment of vegetation	24
3.6 ISSUE 6: Baseline requirements for archaeological impact assessment including traditional knowledge	28
3.7 ISSUE 7: Confidence in the hydraulic model of flow in the Sundog Creek realignment	30
3.8 ISSUE 8: Water withdrawal for dust control	32
3.9 ISSUE 9: Water quality monitoring	33
3.10 ISSUE 10: Short term loss of habitat (Macroinvertebrates)	37
3.11 ISSUE 11: Management of grey water and sewage at construction camps	39
3.12 ISSUE 12: Spill contingency and response planning	43
3.13 ISSUE 13: Risk assessment completed to assess consequences of vehicle accidents	45
3.14 ISSUE 14: Permafrost considerations - Borrow Pits	48
3.15 ISSUE 15: Permafrost considerations - All Season Road	51
3.16 ISSUE 16: Restoration of the proposed project	53
4. SUMMARY	58

4.1 Summary of Recommendations 58

1. NON-TECHNICAL SUMMARY

The Prairie Creek All Season Road (the proposed all season road) would be used by Canadian Zinc Corporation to transport ore, materials, equipment, and other mine related items to and from the Prairie Creek Mine on a year-round basis. A portion of the proposed all season road, approximately 84 kilometers, is contained within Nahanni National Park Reserve of Canada (NNPR).

Parks Canada Agency's mandate tasks the Agency with maintaining natural and cultural resources and with providing outstanding visitor experience. The Agency's guiding principles require Parks Canada to be "exemplary" regarding its fulfillment of environmental assessment obligations. Management direction specific to NNPR and developed with input from elders, community leaders, government agencies and other interested groups requires the park to protect a high quality of wilderness, biodiversity, and natural processes, along with respecting the interests of traditional users.

The recommendations presented in this Technical Report for consideration by the Mackenzie Valley Environmental Impact Review Board are designed to address Parks Canada's outstanding concerns with regards to the potential impacts of the proposed project on NNPR. Identified issues include the lack of baseline information related to wildlife and cultural resources, management of water quality and aquatic resources, completeness and integration of risk assessment, and restoration of the proposed project area.

2. INTRODUCTION

2.1 Parks Canada's Responsibility

Under the *Canada National Parks Act (CNPA)*, Parks Canada is responsible on behalf of the people of Canada for the protection and presentation of nationally significant examples of Canada's natural and cultural heritage and to foster public understanding, appreciation and enjoyment in ways that ensure their ecological and commemorative integrity for present and future generations. The CNPA states that "*maintenance or restoration of ecological integrity, through the protection of natural resources and natural processes, shall be the first priority of the Minister when considering all aspects of the management of parks*". According to the CNPA, "ecological integrity" means, with respect to a park, 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. In other words, Parks Canada is tasked with maintaining all of the naturally occurring species and communities, and the processes that sustain them.

2.1.1 World Heritage Status and Canadian Heritage River

Nahanni National Park Reserve of Canada (NNPR) was established in 1976, and at that time consisted of an area of 4,766 square kilometers. In 2009, NNPR was expanded to an area of approximately 30 000 square kilometers, making it the third largest national park in Canada (Figure 1). The expansion occurred to protect a significant portion of the South Nahanni River Watershed, the unique features of the Ram plateau, and the globally unique North Nahanni Karst. NNPR was among the first seven World Heritage Sites in the world, and Canada's first site given World Heritage Site status by the United Nations Education, Science and Cultural Organization's World Heritage Convention. World Heritage Sites are parts of the world's natural and cultural heritage that are so outstanding or scientifically significant that their protection and preservation are considered to be of concern to the world community. This status, conferred in 1978, gives international recognition to the original, pre-expansion, NNPR as a place exhibiting:

- Outstanding examples of major stages in the earth's evolutionary history;
- Significant ongoing geological processes; and
- Superlative natural phenomena, formations and features of exceptional natural beauty.

Parks Canada's mandate and conservation practices reflect the responsibility of this designation in both the protection and presentation of the park. Additionally, in 1987, the portion of the South Nahanni River within NNPR was designated as a Canadian Heritage River. The Canadian Heritage Rivers System was established by federal, provincial and territorial governments to recognize Canada's outstanding rivers and to ensure their long-term protection and continued enjoyment by Canadians. The South Nahanni River is recognized as an exceptional example of several natural history themes and provides outstanding recreational opportunities in a wilderness area of great scenic beauty.

2.1.3 Park Management and Vision

NNPR exists within the Dehcho, a traditional homeland of the Dene for centuries. The tradition of Indigenous use continues to this day in NNPR and is provided for under the CNPA, Section 40. The lands that are now NNPR have benefited from the past, and ongoing, stewardship of the local First Nations. The Dehcho First Nations and the Government of Canada are negotiating self-governance, land use planning and resource management issues through the Dehcho Process. As part of this process, Dehcho First Nations and Parks Canada created the Naha Dehé Consensus Team comprised of representatives from both organizations. This team allows the Dehcho First Nations and Parks Canada to work together cooperatively on park management issues. The following are a few of the objectives identified in the NNPR Naha Dehé Management Plan¹ that are relevant to this EA process:

- The high level of biodiversity in Naha Dehé is retained, including naturally occurring plant and animal species. Unique and sensitive landscape features are protected.
- Natural ecological processes remain the primary forces shaping the ecosystem.
- The cultural heritage and values of Naha Dehé are protected and management respects traditional users and interests.
- The waters of Naha Dehé are high quality and unimpaired by activities inside and outside park boundaries.

Also relevant to this EA process, NNPR's Ecological Integrity Statement incorporates input from elders, community leaders, government agencies and other interested groups. This is a synopsis of the Ecological Vision for Nah?q Dehé, drafted from those inputs:

Nah?q Dehé will protect a wilderness watershed in the Mackenzie Mountains where natural processes remain the dominant forces shaping the park's ecosystem and where native biodiversity will be maintained. Traditional subsistence harvesting will continue to be an integral part of the ecosystem and will occur in accordance with Dene law and principles. Nah?q Dehé will be a model of cooperative management with First Nations of the Deh Cho where ecological and cultural integrity is protected, visitor access & enjoyment is encouraged within the limits of ecological integrity and wilderness experience, and messages of natural and cultural heritage are communicated with excellence. Nah?q Dehé will also promote excellence in the conduct of science and cooperative resource protection.

Wilderness is defined in the Parks Canada *Guiding Principles and Operational Policies* (1994, last updated in 2013) as:

“an enduring natural area of sufficient size to protect pristine ecosystems which may serve physical and spiritual well-being. It is an area where little or no

¹ Parks Canada. 2010. *Nahanni National Park Reserve of Canada Naha Dehé Management Plan*.

persistent evidence of human intrusion is permitted so that ecosystems may continue to evolve”.

Parks Canada has made commitments to respect the rights of existing interests that were in place prior to expansion, including provisions for mining roads. In 2009 the CNPA was amended to expand the boundaries of NNPR; section 41.1 enables Parks Canada to issue permits and licenses for mining roads passing through the expansion area. In light of the regulatory requirements and policy guidance, science based evidence and traditional knowledge are required to ensure a balanced approach to managing the ecological integrity and wilderness character of NNPR as it relates to planning and development of mining roads.

2.1.4 Environmental Assessment in NNPR

Parks Canada is a competent Minister under the *Species at Risk Act (SARA)* and therefore shares the federal responsibility to manage and protect species at risk under this Act. Section 79 (2) of SARA requires the identification of adverse effects of the 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.

Additionally, Parks Canada's *Guiding Principles and Operational Policies* (1994, last updated in 2013) indicates that Parks Canada will be "*exemplary in the implementation of federal legislation pertaining to environmental assessment and review in national parks*". To this end, and to support NNPR's other legislated and mandated commitments regarding park management, Parks Canada requires comprehensive project descriptions, effect assessments, and information about proposed mitigations. This information is used to evaluate project impacts and to support the proponent's development of adaptive management plans. These plans must be developed in a manner that enables the updating of mitigations to reflect current comprehensive baseline and/or ongoing monitoring information.

2.1.5 Project Setting

A portion of the proposed all season road is contained within NNPR, traversing approximately 84 km from the eastern boundary of the park, through the karst, and into the mountain valleys toward the Prairie Creek mine site (Figure 1). In the CNPA (s. 41.1), the government of Canada specifically allowed for a mining access road leading to the Prairie Creek Area. In July 2008, Parks Canada and Canadian Zinc Corporation signed a Memorandum of Understanding (MOU) that acknowledged the interests of both parties with the goal of managing each party's interests (park management, and mine development and access). Parks Canada is committed to working with Canadian Zinc Corporation towards our respective goals as outlined in the MOU.

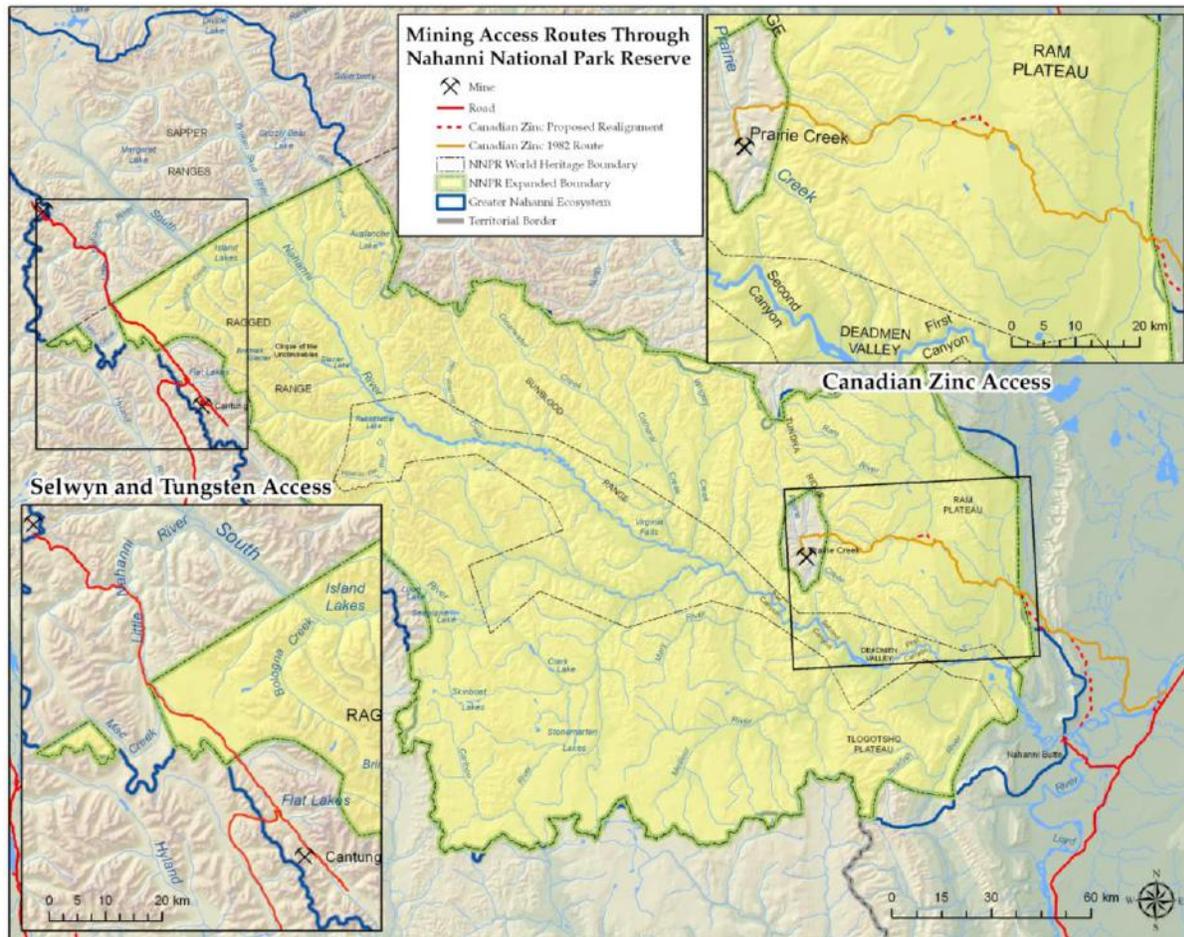


Figure 1. Nahanni National Park Reserve (Note: proposed road in orange though does not depict the most recent proposed all season road alignment)

2.2 Parks Canada's Technical Report

This technical report has been developed after reviewing and assessing the evidence and information provided during the EA against the Review Board's Terms of Reference and Parks Canada's legislative and policy requirements. The technical report summarizes Parks Canada's outstanding concerns related to issues the Agency has identified in the All Season Road DAR and related information requests and makes recommendations for consideration by the MVEIRB. The issues identified include:

- Consideration of potential Arctic Grayling resident population between km 25 and 32 of Sundog Creek;
- Magnitude of impacts to the Northern Mountain Population of Mountain Caribou;
- Baseline requirements, effects assessment and monitoring of potential impacts to Collared Pika;

- Baseline requirements, effects assessment and monitoring of potential impacts to Forest Birds, Waterfowl, Migratory Birds and Avian Species at Risk;
- Baseline requirements and effects assessment of vegetation;
- Baseline requirements for archaeological impact assessment including traditional knowledge.
- Confidence in the hydraulic model of flow in the Sundog Creek realignment;
- Water withdrawal for dust control;
- Water quality monitoring;
- Short term loss of habitat (Macroinvertebrates);
- Management of grey water and sewage at construction camps;
- Spill contingency and response planning;
- Risk assessment completed to assess consequences of vehicle accidents;
- Permafrost considerations - Borrow Pits;
- Permafrost considerations - All Season Road; and
- Restoration of the proposed project.

Parks Canada requests that many of these issues be addressed prior to permitting or during the regulatory phase, should the project proceed to that phase, and that monitoring programs demonstrate how their data will be incorporated into adaptive management. The required baseline information shall be provided to Parks Canada at the time CZN is providing updated project information when entering the regulatory phase and prior to any permits or licences being issued.

Parks Canada serves in this EA as both an expert advisor and a responsible minister (regulator) for the portion of the proposed all season road through the park. The comments included in this technical report are offered in the Agency's capacity as expert advisor on the potential impacts of the project on NNPR.

Parks Canada has worked collaboratively throughout this EA process with other federal government departments. In areas of shared mandate, Parks Canada supports the conclusion and recommendations of these departments.

3. PARKS CANADA'S TECHNICAL REVIEW COMMENTS

3.1 **ISSUE 1: Potential Arctic Grayling resident population between km 25 and 32 of Sundog Creek**

Issue Statement

CZN has not identified mitigation relating to Arctic Grayling between km 25-32 of Sundog Creek. However, Parks Canada believes that there is a high probability that the species resides year-round in this location and that, to minimize adverse effects, mitigations against impacts from construction must be applied at this location.

References

- Public Registry Document # 93: Beak Consultants Ltd. 1981. *Prairie Creek Project Vegetation and Wildlife Studies*.
- Public Registry Document # 94: Beak Consultants Ltd. 1982. *Prairie Creek Project: 1982 Wildlife Studies Addendum*.
- Public Registry Document # 282: *CZN's response to Parks Canada's input into Undertaking #16, outlined in a letter from CZN to the Review Board*. August 11th, 2016.
- Not on Registry: Mochnacz, N. J., J. D. Reist, P. Cott, G. Low, and R. Wastle. 2004. *Biological and habitat data for bull trout (Salvelinus confluentus) and associated species from stream surveys conducted in the southern and central Mackenzie River Valley, Northwest Territories, 2000 to 2001*. Can. Data Rep. Fish. Aquat. Sci. 1131: iv + 38p. Available online at: <http://www.dfo-mpo.gc.ca/Library/279557.pdf>

Proponent's Conclusion

CZN (PRD #282) has indicated that:

- there are pools in the km 25-32 section of Sundog Creek, notably between km 27 and 29, but they are not very deep (1-1.5m at peak flow in mid-summer);
- there is some groundwater flow in the km 23 area in the winter but it is unlikely this flow would sustain water depths in the pools downstream; and
- ice thickness approaches 1m in these alpine areas and it is probable that all the pools freeze to the bottom each winter and, consequently, that any grayling trapped in the pools as the flows recede would not survive the winter. Therefore, it is not likely that a resident population of Arctic Grayling exists between km 27-29 of Sundog Creek.

Parks Canada's Conclusion and Rationale

Parks Canada believes that the area in question has significant groundwater flow which could potentially support grayling throughout the winter. While Parks Canada does not have absolute proof that there is a resident population of Arctic Grayling between km 25-32 of Sundog Creek; however, this species has been observed by Parks Canada staff in the pools along this stretch of the river on many trips to the area, including as late as mid-September, when flows were still substantial. Using the precautionary principle, these fish should be considered a resident population.

There is a case example to apply here: in the Beak studies (1981, 1982) Bull Trout were identified in Funeral Creek, but considered to be unimportant, with only seasonal presence, and not a resident population. Subsequent work by Parks Canada and Fisheries and Oceans Canada has shown conclusively that Funeral Creek provides important spawning habitat, and the creek does support a resident population of Bull Trout (Mochnac, et al. 2004). Flow in the areas of Funeral Creek shown to support this year-round population of Bull Trout is similar to, if not less than, the flow in Sundog Creek in the km 25-32 area. Decisions on the significance of impacts to fish, and other valued components, must be made on evidence, not unsupported opinions, and the precautionary principle should be applied where uncertainty exists.

Parks Canada recognizes that CZN has already rerouted the proposed all season road alignment so there are no stream crossings and in-stream works between km 25-32 therefore greatly reducing the majority of potential impacts to Arctic Grayling at this location. However, impacts may still occur from rock fall and sedimentation/erosion associated with the road.

Parks Canada's Recommendation

Parks Canada recommends that the Review Board apply the following measure to further mitigate potential impacts to Arctic Grayling between km 25-32 of the proposed all season road.

Measure 1

CZN shall include mitigations for impacts to Arctic Grayling during construction of km 25-32 of the proposed all season road.

3.2 ISSUE 2: Magnitude of impacts to the Northern Mountain Population of Mountain Caribou

Issue Statement

There are potential impacts to the Northern Mountain Population of Woodland Caribou (*Rangifer tarandus*), a COSEWIC-listed species of Special Concern, resulting from the proposed

all season road. CZN indicates that the magnitude of these impacts is low. Parks Canada disagrees with this conclusion and believes that there is potential for the magnitude of these impacts to be significant.

References

- Public Registry Document # 102. DAR Addendum, Appendix E. Tetra Tech Vegetation and Wildlife & Wildlife Habitat.
 - Section 4.3.3 - Northern Mountain Caribou, pp 23-25
 - Section 7.3 - Effects on Wildlife Species and Abundance, Northern Mountain Caribou, p 167
 - Section 7.4-Effects on Wildlife Habitat Fragmentation and Barriers to Movement, p 179
- Public Registry Document # 282: *CZN's response to Parks Canada's input into Undertaking #16, outlined in a letter from CZN to the Review Board.* August 11th, 2016.
- Not on Registry:
 - Environment and Natural Resources (ENR). 2014. *Northern Mountain Caribou (Woodland Caribou [Northern Mountain Population])*. Web access: <http://www.nwt-species-at-risk.ca/species/northern-mountain-caribou> [November 2014].
 - Manseau, Micheline. 2017. Landscape Geneticist, Environment and Climate Change Canada. Personal communication with Audrey Steedman (Ecologist Team Leader, Nahanni National Park). March 3, 2017.

Proponent's Conclusion

CZN has indicated that potential disturbance related effects on the Northern Mountain Population of Woodland Caribou are low (PRD #102).

Within the assessment of impact of the project on Northern Mountain Caribou the DAR states that the project area is "outside the defined species range", citing a website map source (ENR 2014). PRD #102 also states that the project area is "well outside known calving and wintering areas" for caribou.

The proponent refers to the publication "Species at Risk in the NWT, 2016" which identifies the road corridor as 'trace occurrence' in terms of Northern Mountain Caribou habitat, with core range to the north (PRD #282).

Parks Canada's Conclusion and Rationale

The Northern Mountain Population of Woodland Caribou is a species listed as Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), with known occurrence in the project area.

Within the assessment of impact of the project on the Northern Mountain Population of Woodland Caribou the DAR repeatedly states that the project area is "outside the defined species range", citing a website map source (ENR, 2014). This is incorrect, outdated information. 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. The DAR also states that the project area is "well outside known calving and wintering areas" for caribou; however, there is reference to multiple observations of caribou calves in the camp logs, including one calf reported as early as 01 June (DAR Addendum, Appendix E).

The conclusion in DAR Addendum, Appendix E, that potential disturbance related effects on the Northern Mountain Population of Woodland Caribou are low is inconsistent with information provided. Section 7.3 cites several references stating that caribou avoid roads, and active roads to a greater extent than inactive ones (up to 35 km avoidance for Dempster Hwy). Caribou are known to be in the project area year-round, so construction and use of an all season road is reasonably expected to have an impact.

To further Parks Canada's understanding of caribou use in the project area, a total of 18 satellite collars were placed on female caribou in the vicinity of the mine site and proposed all season road in February and December 2015. Of these collared females, the majority spend part of the year in the Prairie Creek valley, and migrate northwest in summer. A smaller number of these caribou spent the entire year in close proximity to the project area. Figure 1 provides an example map of the density of locations for all collared caribou, in the calving season; note the mine site and first 20 km of the proposed access road fall within the southeastern area of high density use.

A subset of these caribou were collared east of the mine site, on the other side of Tundra Ridge, in the lower Sundog Creek area. Previous studies and incidental observations have repeatedly shown caribou in this area, and although there were only two caribou fitted with collars, their movement pattern supports the idea that they may comprise a small, sedentary population. Throughout the entire period of data collection (six months for one collar and just under one year for the other), both of these female caribou stayed within a home range of less than 600 km², and both crossed the proposed road alignment (Figure 2). It is unknown at this time how many caribou may be part of this localized group.

Additional information on the sedentary and migratory caribou within the study area is being gathered through genetic analyses. Preliminary analyses have been conducted on DNA from caribou fecal pellets within the study area, including collared animals (samples from 108 individuals). Results to date indicate that caribou within the study area belong to the Redstone herd, and that the sedentary animals may comprise a genetically distinct sub-group (Manseau, 2017). Additional analyses are underway to further elucidate the genetic structure of Mountain caribou populations within the study area and region.

Parks Canada considers the use of the project area by caribou to be important, which is supported by the collar data gathered to date. The satellite collars represent only a small sample of animals, yet, caribou were found north, south, east and west of the mine site and proposed all season road, and, within a few months of collar deployment, at least 3 of 18 caribou (17%) had crossed the proposed road alignment, and several others spent time close to the mine site and proposed all season road. The more sedentary animals described above could be a distinct local population, and the TOR asks for effects on local populations.

Parks Canada considers the potential impact on Northern Mountain Caribou to be significant. Potential impacts include, but are not necessarily limited to, avoidance of the road (resulting in fragmentation / loss of habitat effectiveness), noise disturbance, increase in predation risk, and direct mortality.

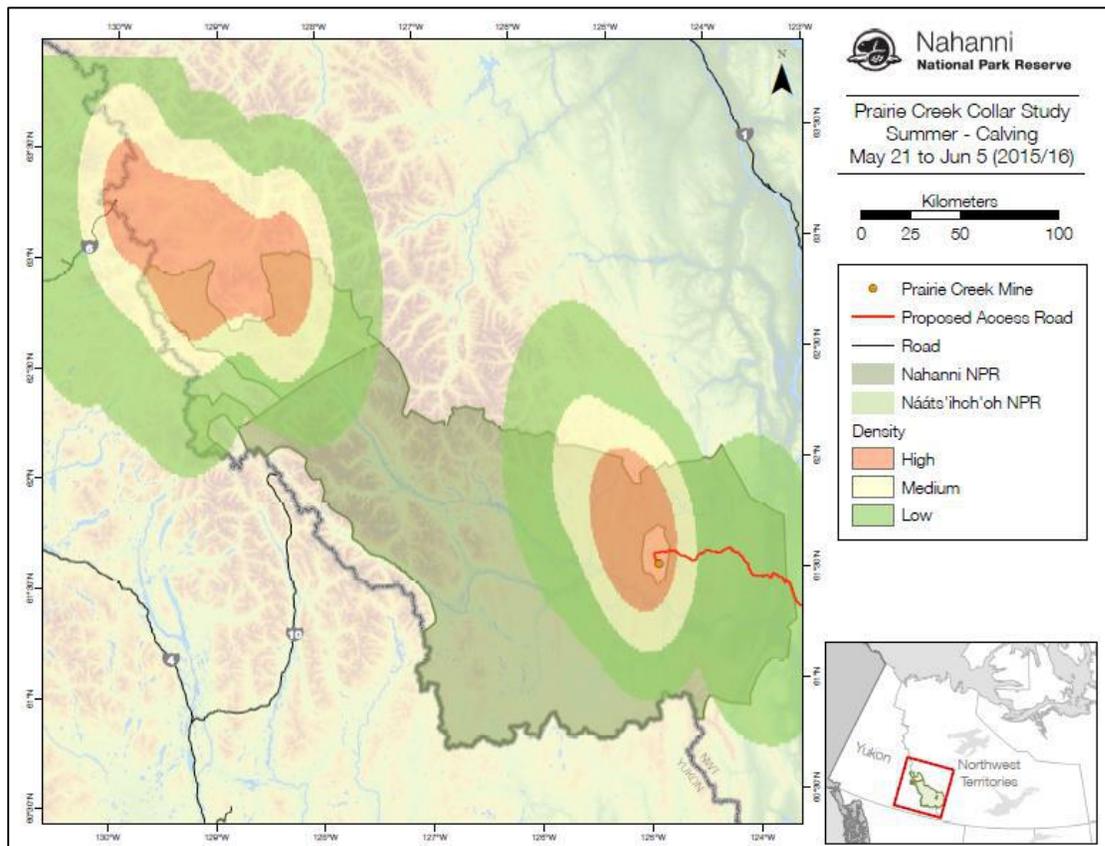


Figure 1. Kernel density map of locations for all collared caribou in calving season.

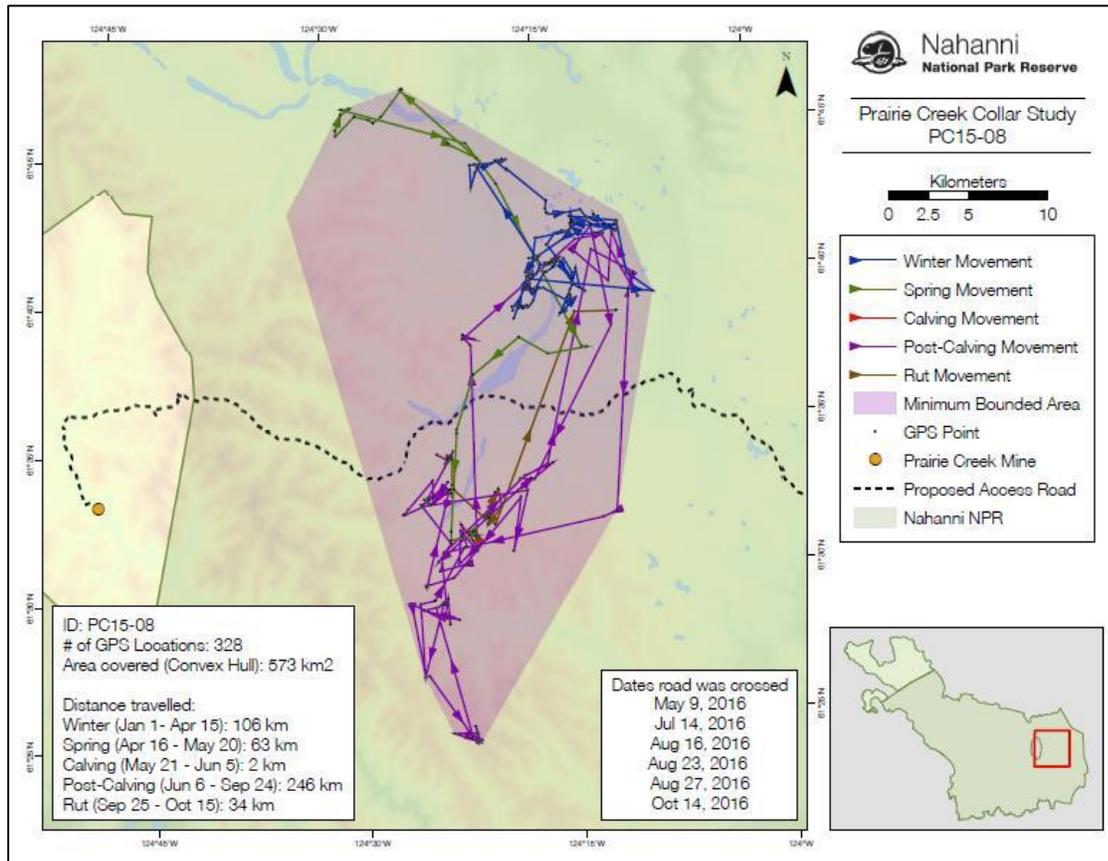


Figure 2. Home range and movements of female caribou PC15-08. Note multiple crossings of the proposed road alignment, in multiple seasons.

Parks Canada's Recommendation

Parks Canada recommends that the Review Board apply the following measures to prevent potentially significant adverse impacts to the Northern Mountain Population of Woodland Caribou from the proposed all season road.

Measure 2

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.

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).

3.3 ISSUE 3: Baseline requirements, effects assessment and monitoring of potential impacts to Collared Pika

Issue Statement

There are potential impacts to Collared Pika (*Ochotona collaris*), a species of Special Concern on Schedule 1 of the *Species at Risk Act* (SARA), resulting from the proposed all season road. While CZN has committed to conducting presence/not detected surveys for pika along km 12-39, Parks Canada believes this type of survey will not provide adequate baseline information to inform the mitigations and monitoring legally required under SARA.

References

- Public Registry Document # 289: *July 2016 Vegetation and Wildlife Baseline Surveys Prairie Creek All Season Road, July 2016*. TetraTech EBA. August 17, 2016.
- Public Registry Document # 308: *PCA Letter to the MVEIRB re: Proposed Prairie Creek all season access road environmental assessment (EA1415-01) Baseline Information Gaps*. September 30, 2016.
- Public Registry Document # 317: *CZN Letter to MVEIRB, October 21st, 2016* (response to Parks Canada's September 30th letter on baseline gaps).

Proponent's Conclusion

Following field studies conducted in July 2016 (PRD #289), which identified pika habitat, CZN has proposed a new road section from KP 24-29. This new section will traverse predominantly shrub and coniferous forest habitats, which typically do not provide pika habitat. CZN has committed to 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; including KP 12-39) prior to disturbance, and adopting mitigation as appropriate under the direction of a wildlife biologist (PRD # 317 - Attachment D). As such, the existing data on Collared Pika occurrence along the proposed road is considered suitable for the effects

assessment and appropriate mitigation has been developed (PRD #317 - Attachment D). Additionally, TetraTech indicates that alternative borrows to sources 33 and 34 should be selected to avoid active Collared Pika sites (PRD #289).

Parks Canada's Conclusion and Rationale

The Collared Pika is listed as a species of Special Concern on Schedule 1 of the *Species at Risk Act* (SARA), with known occurrence in the project area. Section 79 (2) of SARA requires the identification of adverse effects of the project on listed wildlife species (including species of Special Concern) 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. Consequently, Parks Canada has a legislative obligations regarding the protection and management of this species where it occurs in NNPR. The presence/not detected surveys proposed by CZN only allow detection of change in distribution and do not provide adequate information to detect changes in population.

Field work was initiated by the proponent in July 2016 (Tetra Tech EBA, 2016), but was limited to seven borrow sites. Pika were detected at 4 of the 7 sites visited, in suitable talus habitat as far west as km 38. The resulting field report states (p. 15) that "*Suitable talus habitat was not observed near the proposed all-season road and borrows from KP 0 – 16*"; however, there are documented records of pika in this area (approx. km 14 & 15) (Tate, 2017). No survey work was completed on the new proposed re-alignment portion from approximately KP 24 – KP 29, which is steep mountainous terrain, and may contain pika habitat. The proponent has asserted that this section is not pika habitat (TetraTech, 2016), however, the previous example (km 14-15) shows that these blanket assertions are not reliable, and cannot be accepted without evidence. Overall, this information suggests that Collared Pika may have a greater occurrence along the proposed all season road than indicated in the submitted information, and that road construction and operation could therefore have greater impact than predicted.

Without an accurate and thorough description of baseline conditions within the geographic scope of the proposed all-season road as outlined in section 5.1.4 of the TOR, it is impossible to assess potential environmental impacts of the proposed project. Potential significant impacts to Collared Pika could result from both direct and indirect impacts, for example:

- clearing the right of way (esp. KP 24 – 29) and borrow pits 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
- potential for direct mortality
- alteration of habitat increasing edge effects, including predation
- introduction of invasive species to the alpine environment
- dust impacts on pika habitat and food sources

The developer has proposed mitigations to reduce potential impacts to wildlife (PRD #308). Parks Canada supports the implementation of these mitigation measures, as they may help to reduce impacts to Collared Pika, however, additional specific mitigations to reduce the significance of impacts may be required depending on the lifecycle and distribution of the species.

Parks Canada's Recommendations

It is Parks Canada opinion that we currently do not have enough information to determine the significance of impacts related to this issue. We therefore recommend that the Review Board apply the following measures.

Measure 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.

Measure 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.

Measure 5

CZN shall develop a systematic monitoring program to address potential impacts to 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. These responses/mitigation adjustments must be approved by Parks Canada.

3.4 ISSUE 4: Baseline requirements, effects assessment and monitoring of potential impacts to Forest Birds, Waterfowl, Migratory Birds and Avian Species at Risk

Issue Statement

There are potential impacts to birds (including waterfowl), including several SARA-listed species, resulting from the proposed all season road. CZN indicates that additional baseline data are not needed at this time as they are unlikely to alter the predicted low magnitude of project effect. Parks Canada disagrees with this conclusion and notes that the baseline data provided does not meet the requirements of the TOR for the current proposed all season road EA.

References

- Public Registry Document # 42: *Terms of Reference for EA 1415-01*. Section 3.2.3 point 3, Section 5.1.4, Section 5.1.6.
- Public Registry Document # 102. *DAR Addendum, Appendix E. Tetra Tech Vegetation and Wildlife & Wildlife Habitat*.
- Public Registry Document #282: *Tetra Tech response to Undertaking #14*. July 6, 2016
- Public Registry Document # 308: *PCA Letter to the MVEIRB re: Proposed Prairie Creek all season access road environmental assessment (EA1415-01) Baseline Information Gaps*. September 30, 2016.
- Public Registry Document # 317: *CZN Letter to MVEIRB, October 21st, 2016* (response to Parks Canada's September 30th letter on baseline gaps).
- Public Registry Document # 341: *CZN Response to ECCC IR#2, Round 2, Migratory Birds*. October 24, 2016.

Proponent's Conclusion

In their September 2015 effects assessment (PRD #102), Tetra Tech predicted that the magnitude of project effects to birds (including waterfowl) among other wildlife species is negligible to low, and that the overall significance of effects is low, because the direct habitat loss associated with the additional footprint of the proposed all season road beyond the approved winter road alignment (EA0809-002) is only approximately 45 ha (PRD #102 - page 163). Consequently, CZN indicated that they do not believe additional baseline data are needed at this time, and that the additional data are unlikely to alter the predicted low significance of effects (PRD #317). CZN indicated (PRD #317):

“there are some baseline information gaps that should be addressed prior to all season road construction (so that we can determine if any effects actually occur during the project and respond to them adaptively if they do), however, we believe that the very substantial baseline information that has been generated and is currently available is more than sufficient for a proper and thorough assessment of the potential for project adverse effects. CZN submits that we have completed such an assessment.”

Parks Canada’s Conclusion and Rationale

It is Parks Canada’s opinion that significant gaps remain in the current baseline for birds and that without an accurate and thorough description of baseline conditions within the geographic scope of the proposed all season road as outlined in the TOR, it is impossible to assess potential impacts to birds (including waterfowl) (PRD #308). The DAR, DAR Addendum, and response to Information Requests have not included baseline information to confirm which bird species are present, estimated population size or the use of habitats within the project area.

CZN has confirmed that the winter road EA did not include information on migratory birds (PRD #282). The construction and use of an all season road is a significantly different project than a winter road, regardless of whether it uses the same alignment or not; this is supported by PRD #341, *“The permanent loss of habitat and the indirect effects on migratory bird habitat from an all-season road are not comparable to those of a winter road.”* Therefore, the baseline work must cover the entire proposed all season road alignment (not just the realignments that go beyond the approved winter road alignment) and include the required seasonal surveys for forest birds, waterfowl, and migratory birds, including avian Species at Risk.

CZN repeatedly references studies on traffic volumes of existing roads, but not impacts of construction of an essentially new road (PRD #317 - Attachment D). The one NWT study cited looked at one bird species in tundra habitat; the proposed road into Prairie Creek is in tundra habitat for less than 15% of its length. The response provided no additional information on what species will be affected, number of territories lost, etc. It may be true that *“not all bird species densities respond negatively to traffic”*, but there is currently no information provided on what species and densities are present in the project area, let alone which of those may respond negatively, and how much impact this will have on the local population. Simply stating that one has *“assumed the presence of the noted bird species for the purpose of mitigation”* is not a proper effects assessment.

Some additional information on habitat loss was provided in PRD #341. Calculations of direct and indirect habitat loss are increased, using standard species-specific project setback recommendations, which greatly improves the available information. However, even with habitat loss estimates of 5,890 ha and 8,502 ha for Common Nighthawk and Olive-sided Flycatcher respectively, two SARA-listed Threatened species, as well as showing far more

assessments of moderate level than low, the assessment in Table 3 still somehow suggests an overall low significance. Another avian species at risk, Canada Warbler, a SARA-listed Threatened species, which has been recorded near the project area, is not even considered. Unlike for mortality from collisions or effects of dust, there are no simple mitigations for habitat loss. Section 79 (2) of SARA requires the identification of adverse effects of the project on listed wildlife species (including species of Special Concern) 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. Consequently, Parks Canada has a legislative obligations regarding the protection and management of SARA-listed birds where they occur in NNPR.

It is a concern that direct habitat loss, or loss of habitat effectiveness, could have a significant impact on local populations of native species, or composition of biological communities, in the project area. PCA has outlined a number of potential significant impacts to wildlife (including birds/waterfowl) that could result from both direct and indirect impacts (PRD #308). CZN has proposed a number of mitigations to reduce potential impacts to birds (PRD #308) and Parks Canada supports the implementation of these mitigation measures. However, additional specific mitigations to reduce the significance of impacts on individual species may be required depending on the lifecycle and sensitivity of species. For example, the time to fledging may vary between species which would alter timing windows for specific sections of the road depending on where particular species are present.

There remains some confusion as to what the intentions of the proponent are with regards to collecting baseline data on migratory birds. In PRD #317 (Attachment C) CZN states: *"Yes, bird surveys to collect the listed parameters will be completed next year during the appropriate timing windows."* However, it is later stated that: *"The [bird] surveys are proposed to be completed after a winter road has been cleared to facilitate access"* (PRD # 317 - Attachment D). These statements are contradictory.

Parks Canada's Recommendations

It is Parks Canada opinion that we currently do not have enough information to determine the significance of impacts related to this issue. We therefore recommend that the Review Board apply the following measures.

Measure 6

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).

- PCA defines population characteristics as including species presence, distribution and relative abundance
- PCA defines habitat use as including use of habitats for foraging, reproduction and rearing of offspring and that includes seasonality in their use.
- 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.
- Survey methodology shall include the appropriate spatial distribution and seasonal timing for adequate representation of species along the entire proposed all season road alignment (not just the realignments that go beyond the approved winter road alignment).
- Survey methods and overall sampling design shall be developed in collaboration with, and approved by, both Parks Canada and Environment and Climate Change 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.

Measure 7

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.

CZN shall provide the updated effects assessment prior to permits or licences being issued, should the project proceed to the regulatory phase.

Measure 8

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 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. 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 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.

3.5 **ISSUE 5: Baseline requirements and effects assessment of vegetation**

Issue Statement

There are potential impacts to vegetation resulting from the proposed all season road. CZN indicates that some baseline gaps should be addressed prior to all season road construction. Parks Canada believes that these gaps should be addressed through rigorous survey work and that an updated effects assessment should be conducted prior to permits or licences being issued, should the project proceed to the regulatory phase, to ensure that impacts to vegetation are not significant.

References

- Public Registry Document #186: Tetra Tech EBA. *Response to Parks Canada IR 45*. April 28th, 2016.
- Public Registry Document # 308: *PCA Letter to the MVEIRB re: Proposed Prairie Creek all season access road environmental assessment (EA1415-01) Baseline Information Gaps*. September 30, 2016.
- Public Registry Document # 317: *CZN Letter to MVEIRB, October 21st, 2016* (response to Parks Canada's September 30th letter on baseline gaps).
- Not on Registry:
 - Alberta Native Plant Council. 2012. *Guidelines for Rare Vascular Plant Surveys in Alberta*. Available online: <https://anpc.ab.ca/wp-content/uploads/2015/01/Guidelines-For-Rare-Plant-Surveys-in-AB-2012-Update.pdf>
 - Allen, L. 2011. *Alberta Conservation Information Center - ecological community sampling guidelines*. Available online: <http://open.alberta.ca/publications/alberta-conservation-information-center-ecological-community-sampling-guidelines>
 - Cameron, E. and Lantz, T. (2017). *Persistent changes to ecosystems following winter road construction and abandonment in an area of discontinuous permafrost, Nahanni National Park Reserve, Northwest Territories, Canada*. Arctic, Antarctic and Alpine Research. DOI: 10.1657/AAAR0016-012. <http://dx.doi.org/10.1657/AAAR0016-012>.

Proponent's Conclusion

CZN (PRD #317) indicated that "Canadian Zinc Corporation (CZN) agrees that, based on the results of our studies and assessments, there are some baseline information gaps that should be addressed prior to all season road construction (so that we can determine if any effects actually occur during the project and respond to them adaptively if they do), however, we

believe that the very substantial baseline information that has been generated and is currently available is more than sufficient for a proper and thorough assessment of the potential for project adverse effects.” Tetra Tech concluded that sufficient baseline data are currently available for the purposes of effects assessment, and development of appropriate mitigation (PRD #317 - Attachment D).

Tetra Tech “recommended conducting further rare plant surveys in mid-June as part of the pre-construction phase of the all season road...” (PRD #317 - Attachment D). They also indicated that “CZN has committed to do this” but that “the additional surveys are proposed after the winter road corridor has been cleared, which will facilitate access for further rare plant survey coverage.”

Parks Canada’s Conclusion and Rationale

Parks Canada appreciates that CZN has recognized that there are baseline gaps and that there is a need for further baseline studies, and has committed to performing those studies.

However, there is confusion over when these studies will take place and what they will include. Baseline data is used to inform the assessment of impacts as well as the development of mitigation measures. As a result, it is Park’s Canada’s expectation that all baseline work be completed prior to permitting the construction of the all-season road, which includes the winter road along the all-season road corridor.

It is Parks Canada’s opinion (PRD #308), that significant gaps remain in the current baseline for vegetation. Without an accurate and thorough description of baseline conditions within the geographic scope of the proposed all season road, it is difficult to assess potential environmental impacts of the proposed project.

The lack of an overarching methodology for describing current baseline conditions makes it difficult to gauge the quality of the existing data. Further, the individual study methods described to date do not indicate that surveys have been structured to achieve appropriate spatial coverage and representative sampling of the study area, including appropriate coverage of rare and sensitive areas. There is the need to conduct fine-scale field assessments in representative habitats and high priority areas for rare, valued and protected plants and assemblages. High priority areas include those deemed to be highly sensitive to disturbance, those that support uncommon plant communities or habitats, and small-scale features and microhabitats (Alberta Native Plant Council, 2012).

Rare and valued assemblages include locally significant ecological communities. Locally significant ecological communities are, for example, communities at the edge of their known distribution, an extension of the known range of a specific community, mature or old growth forests or communities that are rare or uncommon in the local context (Allen, 2011). Locally significant ecological communities contribute to local biodiversity even though they may not be

ranked or designated as rare in the Northwest Territories. Locally significant ecological communities may be in the form of small-patch communities (Allen, 2011). Small patch communities are usually associated with specific, specialized habitats within small, discrete areas, and may add significantly to the biodiversity of a site (Allen, 2011).

Potential significant impacts to plant communities could result from direct impacts (e.g., clearing of vegetation for the project footprint of road, borrows, camps) and indirect impacts (e.g., changes to drainage patterns [surface and groundwater], permafrost degradation, erosion, introduction and establishment of invasive species in disturbed areas, and dust deposition). Net impacts to vegetation could result in potential significant impacts on wildlife through changes to the quality of their habitat.

Project components causing impacts to vegetation include clearing of the project footprint, construction of roadbed and associated infrastructure, road traffic and accidental spills, and reclamation activities. These project components span the construction, operations, closure and post-closure phases of the project.

Interaction of project components directly with vegetation, as well as other biotic and abiotic components of the ecosystem can initiate ecological feedbacks that further impact vegetation, e.g., ecosystem impacts associated with permafrost thaw (Cameron and Lantz, 2017).

With regards to mitigation of impacts to vegetation, CZN has indicated that the proposed all-season road alignment “is designed to avoid sensitive habitat features such as wetlands and karst formations where rare plants have a higher potential for occurrence” (PRD #186). However, 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. If potential significant impacts to vegetation were identified after review of complete baseline data, potential mitigations that may be proposed could include re-routing to accommodate setbacks from rare, valued or sensitive species or communities.

Parks Canada’s Recommendation

It is Parks Canada opinion that we currently do not have enough information to determine the significance of impacts related to this issue. We therefore recommend that the Review Board apply the following measures.

Measure 9

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 prior to permits or licences being issued, should the project proceed to the regulatory phase.

The baseline data on vegetation shall include:

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.).

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.

2. Survey data to describe areas of high rare plant potential and high rare vegetation assemblage potential.

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.

Measure 10

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.

CZN shall provide the updated effects assessment prior to permits or licences being issued, should the project proceed to the regulatory phase.

3.6 ISSUE 6: Baseline requirements for archaeological impact assessment including traditional knowledge

Issue Statement

There is potential to impact cultural resources from the proposed all season road. CZN has conducted an archaeological overview assessment (AOA) that recommends an archaeological impact assessment (AIA). Parks Canada agrees with CZN that an AIA is required prior to construction but believes that additional traditional knowledge (gathered through community consultations) and archaeological surveys must be conducted, and their results used to inform the AIA, to ensure that impacts to heritage resources are not significant.

References

- Public Registry Document # 42: *Terms of Reference for EA 1415-01*. Section 7.3.10.
- Public Registry Document # 55: DAR Sections 5.3-Cultural and Heritage Resources, p 126-128, Section 11.9-Cultural and Heritage Resources, p 268-269. April 2015.
- Public Registry Document # 196: Prager, Gabriella. 2009. *Prairie Creek Mine Access Road Archaeological Investigations, 2009*. NWT Permit 2009-023, Parks Canada Permit NAH-2009-3917). Prepared for Canadian Zinc Corporation by Points West Heritage Consulting Ltd. Langley, BC
- Public Registry Document # 379: Lifeways of Canada Ltd. 2016. *Archaeological Overview Assessment of the Proposed Prairie Creek Mine All Season Access Road*. November 29, 2016.

Proponent's Conclusion

CZN indicated in the TOR (PRD #42) and the DAR (PRD #55) that they have conducted adequate traditional knowledge interviews and that a previous AIA completed for the winter road (EA0809-002) is sufficient for assessing potential impacts to heritage resources from the proposed all season road. Since that time, CZN has conducted an AOA for the proposed all season road; this assessment recommends that a new AIA be conducted to cover the extent of the proposed project area (PRD #379). Additionally, CZN indicated in the DAR (PRD #55 - 11.9.3, p 269) that they can use a Cultural Heritage Protection Plan and heritage resource booklet in place of a preconstruction AIA by a qualified archaeologist

Parks Canada's Conclusion and Rationale

Parks Canada believes that additional collection of traditional knowledge and archaeological investigation is required for an AIA to identify and protect heritage resources within the all season road project area. Testing for buried archaeological resources will identify older land use by groups no longer reflected in the traditional knowledge from living communities or communities that are currently connected to the project area.

Incorporating traditional knowledge from all Indigenous groups that may have knowledge of the project area is a critical component of an AIA prior to commencing field work. Undertaking community meetings where community members and elders have an opportunity to share place name information, and traditional land use and harvesting from a year round perspective, not just winter use, are an important component of the AIA. This ensures that archaeological activities related to specific land forms and locations identified through place names are incorporated into the field reconnaissance of the AIA. The traditional knowledge used for the winter road was from only one community and the knowledgeable elder was not available for the archaeologist to consult with prior to the existing AIA for the winter road (PRD # 196).

In the AOA for the proposed all season road, GIS modelling to predict high potential areas for cultural resources was based on previously recorded sites. However, there has been limited archaeological investigations conducted in NNPR and most of the work was conducted along waterways at low elevations. Traditional knowledge work and limited survey at high elevations indicate precontact sites are likely to occur in higher elevations. Parks Canada is concerned that there was insufficient base-line data to indicate areas of elevated archaeological potential based solely on the AOA predictive modeling.

The previous AIA conducted for the winter road identified three areas of potential, only two of which were tested. The third area was reviewed only by a fly over (PRD # 196). This approach does not address buried archaeological resources and is insufficient for determining the presence or absence of cultural resources.

Parks Canada's Recommendation

Parks Canada recommends that the Review Board apply the following measures to prevent potentially significant adverse impacts to heritage resources from the proposed all season road.

Measure 11

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.

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.

CZN shall conduct the AIA prior to permits or licences being issued, should the project proceed to the regulatory phase.

Measure 12

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 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.

3.7 ISSUE 7: Confidence in the hydraulic model of flow in the Sundog Creek realignment

Issue Statement

CZN has produced one hydraulic model for Sundog Creek and indicates that alternative modelling methods to support or refute the results from this original model are not possible given the available information. Parks Canada believes that at least one alternate hydrotechnical calculation is possible using the available information and that this calculation is required to support or correct the hydraulic model utilised and to determine if the potential exists for significant impacts to the aquatic ecosystem and road infrastructure from the proposed realignment.

References

- Public Registry Document # 178: Tetra Tech. *Sundog Creek Realignment Reach, KP 35-38, Hydrotechnical Assessment Proposed Prairie Creek All Season Access Road*. March 17, 2016.
- Public Registry Document # 282: *Tetra Tech Response to Undertaking 26 - Sundog Creek Realignment Reach, KP 35-38, Supplemental Assessment Proposed Prairie Creek All Season Road, NT*. July 5, 2016.
- Public Registry Document # 357: *Round 2 Parks Canada Aquatic IR#11 and Canadian Zinc response*.

Proponent's Conclusion

CZN has stated that the south channel of Sundog Creek at the proposed realignment area is capable of withstanding 100 year floods within the main channel without overtopping the existing channel (PRD #282). The design was prepared based on basin extrapolation of regional peak flows data (PRD # 178).

In response to Parks Canada's request to provide an additional hydraulic model for Sundog Creek through alternate modelling methods to increase confidence in the hydraulic modelling for Sundog Creek (PRD #357), CZN indicated that:

“Alternative hydrologic modelling methods would typically involve developing a basin model with representative soil storage and runoff characteristics, and then impose meteorological inputs including precipitation, temperature, snow pack, solar radiation, etc., depending on the model. For the present study, necessary climate data are not available to represent the mountain headwater areas of Sundog Creek. The adopted regional analysis approach, which incorporates a peak flow frequency analysis for Prairie Creek at the project mine site, in close proximity to Sundog Creek, is the most reliable method, especially considering the physical similarities of the Prairie Creek and Sundog Creek basins, and we consider this to be an appropriate and suitable approach.”

Parks Canada's Conclusion and Rationale

It is Parks Canada's opinion that using one hydraulic model based on a single set of calculations increases the risk that the realigned channel may not be capable of withstanding 100 year floods within the main channel, resulting in a potential significant impact to the aquatic ecosystem and road infrastructure. In other jurisdictions it is standard practice to provide multiple hydrotechnical calculations. For example, both Alberta Transportation and BC Ministry of Transportation recommend more than one design flow calculation for bridge crossings. As these desktop calculations are not onerous, such a check is seen simply as design due diligence.

Parks Canada requested that at least one more hydraulic model be provided for Sundog Creek through alternate modelling methods to increase confidence in the hydraulic modelling for Sundog Creek. As outlined above, the proponent indicated in their response that they were not able to provide an alternate model (PRD #357).

Parks Canada's Recommendation

It is Parks Canada opinion that we currently do not have enough information to determine the significance of impacts related to this issue. We therefore recommend that the Review Board apply the following measures.

Measure 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.

3.8 ISSUE 8: Water withdrawal for dust control

Issue Statement

CZN indicates that proposed water extraction monitoring either by using an in-line flow meter, or by recording the number of fills of tanks of known capacity will provide sufficient data for permit compliance methods. Parks Canada agrees with the proponent that proposed annual extraction volumes are unlikely to have a significant impact, however, the installation of water gauges is required to ensure there are no significant cumulative impacts over a number of years of annual withdraws.

References

- Public Registry Document # 282: *CZN letter to MVEIRB, p 28-29*. August 11, 2016
- Public Registry Document # 323: *Aquatic Round 2 Information Requests - CZN response to Parks Canada's IR#5*. Available on the public registry.

Proponent's Conclusion

In response to Parks Canada's Aquatic Round 2 IR#5, CZN indicated the following:

"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. We have proposed monitoring of water extraction volumes to ensure our commitments are maintained, and also in the knowledge that this data will be needed for permit compliance purposes. We believe that is satisfactory, and the installation of gauges to be unnecessary."

Parks Canada's Conclusion and Rationale

The proposed all season road will require dust control measures involving the withdrawal of water from local water bodies. Water withdrawal has the potential to impact water levels which could result in significant effect to the aquatic ecosystem, the riparian zone, and species that depend on it.

CZN made statements regarding the recharge rates of several of the water bodies to be used for withdrawals for summer dust control (PRD #282); however, these statements lacked

empirical data to substantiate them. Assessing the environmental effects of water withdrawals requires knowledge of the volume of the water source, its recharge rate (e.g., the flow rate of flowing water bodies and recharge of standing water bodies) and the timing and volume of water that will be removed. While CZN indicates that 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” (PRD #282), given the paucity of data on recharge rates, PCA does not believe that these methods will provide the required information to adequately monitor lake levels and effectively quantify recharge.

While Parks Canada agrees with the proponent that proposed annual extraction volumes are unlikely to have a significant impact on lake volumes and, in particular, the littoral zone fish habitat, this is dependent on the assumption that lakes will recharge to a suitable level annually to ensure there are no significant cumulative impacts over a number of years of annual withdraws. Water gauges would allow the proponent to establish lake level thresholds, based on the proposed withdraw quantities, which if exceeded, would trigger adaptive management and contingency plans.

Parks Canada's Recommendations

Parks Canada recommends that the Review Board apply the following measure to prevent potentially significant adverse cumulative impacts to lake volumes and, in particular, the littoral zone fish habitat from water withdrawal for the proposed all season road.

Measure 14

CZN shall install water gauge stations at the lakes from which water will be withdrawn for dust control within NNPR.

Measure 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.

3.9 ISSUE 9: Water quality monitoring

Issue Statement

CZN has committed to revising the Sediment and Erosion Control Plan (SECP) to incorporate a suitable water quality monitoring program. To ensure that any reductions in water quality are identified and mitigated, Parks Canada recommends specific key details to be included in the revised SECP.

References

- Public Registry Document # 101: *Allnorth. DAR Addendum, Section 2.2, Table 2.* September 8, 2015.
- Public Registry Document # 315: *CZN Letter to MVEIRB.* October 19, 2016.

Proponent's Conclusion

CZN committed to revising the Sediment and Erosion Control Plan (SECP) to incorporate a suitable water quality monitoring program (PRD #315). They have indicated that they will draw on the advice from Parks Canada and Environment and Climate Change Canada (ECCC) to implement monitoring that will be efficient and suitably protective. They have indicated that the details of the monitoring plan can be further considered during SECP review prior to construction, at which time Parks Canada will be a regulator.

Additionally, Allnorth stated that standard construction practices, for example, utilizing silt fences, settling ponds and water diversion will be applied and that CZN will apply standard approaches and mitigation measures during construction (PRD #101).

Parks Canada's Conclusion and Rationale

We agree with the application of standard construction practices but suggest that applying these practices will only minimize, not eliminate, reductions in water quality at crossing installation sites. CZN does not present a detailed description of how potential changes in water quality will be monitored during installation and operation of culverts and bridges, and more broadly in water bodies located adjacent to road construction and operation.

The number and location of sites to be monitored upstream, downstream and adjacent to the proposed all season road are not identified. Identification of these sites is important to detect the magnitude, duration and spatial extent of potential reductions in water quality and their potential effects on fish and other stream biota. Moreover, the frequency that sites will be monitored during construction and then across longer time frames post construction, is also not explicitly identified. Last, while the DAR identifies monitoring of turbidity and total suspended sediments during construction, it does not include the monitoring of other important variables such as water pH, dissolved oxygen and conductivity.

Parks Canada's Recommendation

Parks Canada recommends that the Review Board apply the following measures ensure that any reductions in water quality are identified and mitigated.

Measure 16

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.

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.

Measure 17

CZN shall develop a detailed program to monitor the short-term effects of construction on surface water quality. This program shall include:

- At all waterbody crossings:
 - At least two sampling sites located upstream beyond the potential influence of the construction to define the unimpacted, reference condition.
 - At least three sampling sites located downstream of the construction representing: “near-field”, “intermediate-field”, and “far field”.
- At the Sundog Creek realignment:
 - 3 sites located upstream beyond the potential influence of the realignment to define the unimpacted, reference condition.
 - 3 sites, located downstream of where the realign channel reconnects with the existing channel.
 - At least 2 sites, located within the lower half of the new channel.
 - Reference sites may also be required upstream in the tributary that enters Sundog Creek from the north shortly after the realigned channel if suitable downstream sites are not available prior to its influence
- 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.
- Sampling frequency and intensity during and following construction, and when monitoring would commence

- 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.
- 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.
- 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.

The duration of this short-term 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.

Measure 18

CZN shall 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, 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:

- 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.
- Measurements of TSS, turbidity, dissolved oxygen, conductivity and water pH.
- 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.
- This monitoring program needs to demonstrate how the resulting monitoring data will be incorporated into adaptive management. The program is subject to review and approval by Parks Canada during the regulatory phase, should the project proceed to that phase.

3.10 ISSUE 10: Short term loss of habitat (Macroinvertebrates)

Issue Statement

CZN's proposed realignment of a section of Sundog Creek will result in temporary impacts to the benthic community that various taxa, including fish, forage on. CZN indicates that the magnitude of these impacts is low. Parks Canada disagrees with this conclusion and believes there is uncertainty regarding the magnitude and significance of these impacts over the short term.

References

- Public Registry Document # 185: Hatfield Consultants. *Memo responding to various IR's including Parks Canada's IR#25 – point #2 – Colonization of new channel*. April 22, 2016.
- Public Registry Document # 200: PCA. 2016. *IR#25 - Round 1*.
- Public Registry Document # 368: Hatfield Consultants. *Memo responding to PCA IR#2, 3, 8 and 10 from the proposed all season road undertaking 7 information requests*. November 3, 2016.
- Not on Registry: Mackay, R.J. 1992. *Colonization of lotic macroinvertebrates: a review of processes and patterns*. Canadian Journal of Fisheries and Aquatic Sciences, 49 (3): 617-628. Available online at: http://www.nrcresearchpress.com/doi/abs/10.1139/f92-071#.WLnFum_yuUk

Proponent's Conclusion

A portion of Sundog Creek will be realigned to facilitate construction of the proposed all season road. Hatfield (PRD #368) maintains the belief that the benthic invertebrate assemblages in this new section of the creek should return to similar to pre-diversion species diversity and densities within a short timeframe post-diversion. Additionally, they indicate that "Given that this stretch was (and continues to be) naturally depopulated from periods of bedload movement and periods where the channel is completely dry, it is expected to provide poor benthic invertebrate habitat relative to areas of Sundog Creek upstream of the stretch under consideration. Therefore, the relative impact on the creek from diverting the creek in this stretch compared to other stretches will be smaller" (PRD #185). Hatfield (PRD #368) concludes that a poor macroinvertebrate community similar to that described for the existing alignment would be established within one season.

Parks Canada's Conclusion and Rationale

Parks Canada continues to hold the opinion that the realignment of a section of Sundog Creek to a new area in the floodplain that was recently dry will adversely affect benthic macroinvertebrates (PCA, 2016). Benthic macroinvertebrates, such as insects, worms and crustaceans, which live on the bottom of streams and rivers, are a food source for many species

and are, with certainty, an important food source in the Sundog Creek drainage. Rerouting and training of the stream channel in Sundog Creek will impact the short-term composition and abundance of the benthic macroinvertebrates community. Until the stream channel is able to fully colonize, the quality of habitat for fish and other taxa in this area that forage on these organisms will be reduced.

Colonization of benthic macroinvertebrates in new reaches of streams is highly variable and can take from months to years (Mackay, 1988). Hatfield's assertion that recolonization will match the current state of the existing channel within one season (PRD #368) is unsubstantiated as there has been no data collected to describe the structure and abundance of the existing macroinvertebrate community and there are several factors that will influence its establishment. First, areas of the floodplain that receive new flow will be more physically unstable, compared to the current channel, and delay the community's establishment for a period of time until the stream channel stabilizes. Second, the new channel will lack the periphyton and diatom structure (e.g.: the food source for benthic macroinvertebrates) of the current channel. This will take some time to develop, meaning that the new channel would initially support a less diverse and abundant benthic macroinvertebrate community. Last, in new channels the ability for species to colonize via methods other than drift is initially limited. Taken together, these factors imply that recovery of the benthic macroinvertebrate community composition in the realigned section of Sundog Creek to a condition reflecting the upstream non-disturbed area may take multiple years.

Parks Canada's Recommendations

Parks Canada recommends that the Review Board apply the following measures to prevent potentially significant temporary adverse impacts in the rerouted section of Sundog Creek to the benthic community upon which other taxa, including fishes, rely.

**Note:* Parks Canada supports DFO's technical analysis and recommendations as they relate to fish and fish habitat.

Measure 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.

Measure 20

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.

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.

Measure 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.

3.11 ISSUE 11: Management of grey water and sewage at construction camps

Issue Statement

CZN indicates that the current plans for the management of grey water and brown water (sewage) provide effective mechanisms for preventing adverse effects from their disposal. Parks Canada believes that alternative mechanisms (e.g. respectively, a properly designed septic system/disposal field and, preferably, removal of sewage from the park) are required to effectively manage the disposal of these wastes.

References

- Public Registry Document # 320: CZN. 2016a. *PCA IR#8, second round and CZN response*. October 24, 2016.
- Public Registry Document # 388: *CZN Letter to MVEIRB, December 14th, 2016, in response to PCA Dec 1st, 2016 letter*.
- Not on Registry:
 - Health Canada. 2010. *Canadian Guidelines for Domestic Reclaimed Water for Use in Toilet and Urinal Flushing*. Prepared by the Working Group on Domestic Reclaimed Water of the Federal-Provincial-Territorial Committee on Health and the Environment. Ottawa, Ontario. January, 2010. Available online at: <https://www.canada.ca/en/health-canada/services/publications/healthy-living/canadian-guidelines-domestic-reclaimed-water-use-toilet-urinal-flushing.html>

- Yukon Territorial Government (YTG). 2012. *Environmental Health Services Guidelines for Grey Water Disposal at Remote Camps*. Yukon Health and Social Services. Updated June 2016. Available online at: <http://www.hss.gov.yk.ca/pdf/greywaterguidelines.pdf>
- Yukon Territorial Government (YTG). 2016. *Design Specifications for Sewage Disposal Systems*. Yukon Health and Social Services. March 2012. Available online at: http://www.hss.gov.yk.ca/pdf/septic_guide.pdf

Proponent's Conclusion

Management of Grey Water

CZN has indicated that sumps will effectively degrade organic components of grey water sufficiently to avoid environmental impacts when sited according to guidelines (PRD #320). There should be no environmental impacts from sump water if siting and construction guidelines are followed; deleterious organic compounds in the water should degrade long before reaching surface water and sumps will be sited as distant from surface water as possible (PRD #320). CZN also stated that sump design and maintenance will follow established guidelines, such as the Yukon Government's *Design Specifications for Sewage Disposal Systems, A Guide to their Design*, with consideration of the type of water being disposed of (i.e. no disposal of sewage) (PRD #320).

Management of Sewage (Brown Water)

CZN (PRD #388) has indicated that for camps at km 65 and 87, sewage water will either be treated on site (by standard biological digestion and solids filtration) and discharged into the grey water sumps OR taken to the mine site for treatment and disposal. Since no untreated sewage will be disposed of on site, there is no need to monitor water quality from the discharge of the sumps (PRD #320 and #388). At km 23 and km 40 camps, sewage will be collected for later transfer to the mine site for treatment and disposal (PRD #388).

Parks Canada's Conclusion and Rationale

The management of grey water and sewage associated with construction camps has the potential to affect local surface water and shallow ground water through the release of nutrients, pathogens, heavy metals and pharmaceutical compounds (Health Canada, 2010). These compounds have the potential to migrate into surface water bodies such as lakes, rivers, and streams and can negatively affect aquatic life. Further, odours that attract wildlife may be produced, potentially resulting in human wildlife conflict incidents.

Management of Grey Water

Parks Canada believes that a properly designed septic system and disposal field is required to provide an effective mechanism for managing grey water disposal. The system must be operated and maintained to provide optimum conditions for the breakdown of grease, fats, harmful bacteria and detergents (soaps) that may enter the system; incomplete degradation of

components of grey water could contaminate local surface and ground water. The design and location of the septic field needs to be carefully evaluated so that it does not contribute deleterious substances to either surface waters or shallow ground waters.

The *Environmental Health Services Guidelines for Grey Water Disposal at Remote Camps* (YTG, 2012) and the *Design Specifications for Sewage Disposal Systems* (YTG, 2016) provide clear and relevant specifications for the development of these types of septic systems. In lieu of equivalent Standards or Guidelines produced by the Government of Northwest Territories, the Yukon standards should apply.

Management of Sewage (Brown Water)

CZN has not provide the specifics for the physical design of sewage treatment facilities at camps km 65 and 87, beyond noting that they will consist of standard biological digestion and solids filtration. This lack of information limits Parks Canada's ability to assess the potential effects of the facilities. Given the camp sizes and variable flows (the system would have to meet 50 person volumes for a short period and then 12 person flows), it would be difficult to rely on consistent biological treatment of the sewage. The variable volume of flow as well as the cold climate could impact the function of biological activity in the system. Without strict monitoring of the treatment facilities, there is also a risk of malfunctions.

It is Parks Canada's opinion that sewage should be removed from the park because a properly designed sewage treatment system is required to provide an effective mechanism for managing sewage disposal. The current proposal for onsite treatment of sewage and disposal in a sump at Camp 65km and Camp 87km is not acceptable to Parks Canada.

Parks Canada's Recommendations

Parks Canada recommends that the Review Board apply the following measures to prevent potentially significant adverse effects to the environment from improperly treated grey water and sewage from camps associated with the construction phase of the proposed all season road.

Measure 22 (Management of Grey Water)

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 included the treatment of grey water to remove waste materials prior to disposal into the environment.

Measure 23 (Management of Grey Water)

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:

- a. a design of the grey water septic system being proposed,
- b. the soil stratification for all proposed locations,
- c. the depth of the water table,
- d. the distance to nearest water course/ water body and potable water source.

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.

Measure 24 (Management of Sewage (Brown Water))

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.

Measure 25 (Management of Sewage (Brown Water))

If CZN chooses to manage sewage for camps at km 65 and 87 within NNPR rather than at 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:

- a. a design of the sewage treatment system being proposed in accordance with accepted standards and guidelines,
- b. in the case of a septic system, a soil stratification for all proposed locations,
- c. the depth of the water table,
- d. the distance to nearest water course/ water body and potable water source,
- 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

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.

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.

3.12 ISSUE 12: Spill contingency and response planning

Issue Statement

Spill contingency and response planning are critical components to mitigate against the potential impacts to the environment resulting from a spill. CZN's spill contingency and response planning has focused on the operations phase of the project, with lesser details associated with the construction and closure phases of the project.

As per Terms of Reference 7.2.2 the evaluation of potential spills was to be informed by the risk assessment of accidents and malfunctions. Oboni's risk assessment on accidents and consequences has not been utilized to update CZN's evaluation of high risk zones for spills. This is likely a result of the sequence of completing the risk assessment after the Technical Sessions in the EA process. Further, Oboni's risk assessment is focused on the operations phase of the project and does not address the construction and closure phases.

References

- Public Registry Document # 42: *Terms of Reference Prairie Creek All Season Road and Airstrip EA1415-01*. September 12, 2014.
- Public Registry Document # 55: *DAR, Section 9 – Effects Assessment – Accidents and Malfunctions*. April 2015.
- Public Registry Document # 100: *DAR Addendum, Section 7 – Effects of Potential Accidents and Malfunctions*. September 2015.
- Public Registry Document # 282: *Undertaking #46*
- Public Registry Document # 324: *Oboni – Risk Assessment Technical Report*. November 18, 2016.

Proponent's Conclusion

CZN's evaluation of spill contingency and response has focused on the operations phase of the project and to a lesser extent on the construction and closure phases. CZN provided additional details regarding spill response and management as part of Undertaking #46. As with the DAR (Section 9) and DAR Addendum (Section 7), Undertaking #46 was focused on the operations phase of the project and based on the risk locations identified by CZN in the DAR and DAR addendum.

Parks Canada's Conclusion and Rationale

Parks Canada concludes that spill contingency and response planning has unique characteristics that can differ between the construction, operations and closure phases of the project. For

example, and without limitation, during construction, response time to respond to a spill will be different than during operations, due in part from:

- Additional resources (e.g., equipment and personnel) likely on the road to react to a spill;
- Travel times to a spill location from a control point or equipment station will be influenced by stage of road completion; and,
- Control points and equipment stations may not be static during construction and closure, versus the locations proposed during operations.

As such, Spill Contingency and Response Plans are needed for each phase of the project (construction, operations and closure).

Parks Canada concludes that high risk locations evaluated in CZN's Undertaking #46 may not reflect the high risk locations as identified in the Oboni risk assessment for accidents and malfunctions. This is a result of the risk assessment being completed after Undertaking #46. Further, there is disagreement between CZN and Oboni on the interpretation of the risk assessment and that risk assessment requires further interpretation to readily identify the locations of higher risk. The Oboni risk assessment did not include a map of high risk zone or kilometer marker reference point to each high risk location. It is noted that Terms of Reference 7.2.2 Effects of Potential Accidents and Malfunctions required a map of high risk zones. PCA concludes that an updated Spill Contingency and Response Plan should be informed by an updated risk assessment to further mitigate against potential environmental impacts.

Upon review of Undertaking #46, PCA concludes the following:

With regards to volume of spills for the reasonable and worst-case scenario, PCA considers CZN volumes to be underestimated. Despite the underestimation, PCA considers that CZN initial response actions may reasonably accommodate a larger volume of spill than PCA considers likely.

- With regards to spill response deployment and equipment, CZN is planning to utilize resources at the mine, along the road and at the barge/transfer facilities. PCA is unsure if these resources will be CZN staff or contractors. This level of detail is likely not known at this stage of the project. PCA concludes that all resources (e.g., personnel and equipment, contractor, subcontractor, and staff) relied upon for spill response and deployment be required to follow the CZN developed Spill Contingency and Response Plan.
- Of the locations assessed in Undertaking #46, additional mitigations (e.g., slower road speed, gauge rails, etc.) may be warranted to reduce the occurrence of a spill as a result of challenges with deployment of response equipment and/or challenging environmental conditions. These locations and challenges are noted as follows:
 - KM 7.4 to 12 – Fish spawning area in watercourse near road. Fuel spill in winter if it breaks through ice will be challenging to recover and respond to.

- KM 12 to 17.2 – Steep grade between road and stream, therefore access to spill location is challenging.
- KM 23.5 to 28.1 – Steep slope to watercourse from road therefore challenging deployment of clean up equipment.
- KM 53.3 to 59.9 – Fish present in watercourse in summer.
- KM 95.8 to 102 – Deployment of spill response equipment along the steep slope will be slow and challenging.

Further, Parks Canada concludes that the locations for high risks for spills should be updated based on an updated risk assessment, as well as, updated road design and operation plans during the regulatory phase and prior to construction.

Parks Canada's Recommendations

Parks Canada recommends that the Review Board apply the following measures to prevent potentially significant adverse effects to the environment from spills associated with the proposed all season road.

Measure 26

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.

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.

3.13 ISSUE 13: Risk assessment completed to assess consequences of vehicle accidents

Issue Statement

The Review Board's adequacy assessment of the DAR concluded that CZN did not meet the requirements of the Terms of Reference for completion of a risk assessment for accidents and malfunctions. The MVEIRB commissioned Oboni to complete a risk assessment for accidents and malfunctions along the all season road. The method of analysis and findings from the Oboni risk assessment has been subject to several communications between CZN and Oboni since its issuance in November 2016. A main purpose of the communications is to understand

the assessment that was completed, provide additional information to improve/refine the assessment, and provide conclusions regarding the assessment findings. There are numerous issues raised by the parties that are not addressed further here; thus, the conclusions summarized below are not all encompassing and are limited in scope. The focus of the discussion herein pertains to the implementation of the assessment findings to inform spill response, road design and road operation.

References

- Public Registry Document # 42: *Terms of Reference Prairie Creek All Season Road and Airstrip EA1415-01*. September 12, 2014.
- Public Registry Document # 55: *CZN – DAR, Section 9 – Effects Assessment – Accidents and Malfunctions*. April 2015.
- Public Registry Document # 77: *Adequacy Review Prairie Creek All Season Road Canadian Zinc Corporation – Section 7: Effects of Potential Accidents and Malfunctions*.
- Public Registry Document # 262: *Undertaking #18*
- Public Registry Document # 324: *Oboni – Risk Assessment Technical Report*. November 18, 2016.
- Public Registry Document # 387: *Oboni – Replies to EA1415-01 Notice of proceeding- risk assessment review and response*. December 14, 2016.
- Public Registry Document # 380: *CZN letter re: Environmental Assessment EA1415-001, Prairie Creek All Season Road Oboni Risk Assessment*. December 5, 2016.
- Public Registry Document # 703: *Review Board EA1314-01 Report of Environmental Assessment and Reasons for Decision Dominion Diamond Ekati Corp*. February 1, 2016.

Proponent's Conclusion

The discussion in this sub-section includes the CZN and Oboni conclusion.

CZN does not agree with the entire findings of the Oboni risk assessment regarding the number of accidents and associated consequences. Select key arguments are related to the assumptions in the road design (e.g., stratifications) and operations assumed by Oboni. CZN has provided further detail regarding their position on this subject and Oboni has responded; however, Oboni's response has not resulted in an updated risk assessment with the additional information provided by CZN. Rather, Oboni concludes (page 5 of 41 Oboni Dec 14, 2016) that changes will occur during design of the road and therefore they "selected an objective scale of consequences that would accommodate them [road design changes] without requiring excessive updates of the risk assessment". In general, Oboni noted that information was sought from CZN and the risk assessment was based on that information. CZN position (page 1 of 25 CZN Dec 5, 2016) is that the information used was limited and better data is available and has

been provided to “allow further consideration of location-specific concerns and adaptive mitigation requirements, as necessary”.

Oboni’s risk assessment was focused on the operations phase of the Project and does not address the construction or closure phases of the project.

With respect to consequences of an accident, Oboni utilized information provided by PCA (Undertaking #16) in the assessment of consequences for select areas along the road. CZN does not consider PCA’s position “to be an accurate reflection of regional environmental sensitivities, or a suitable basis for consequence assessment” (page 2 of 25 CZN Dec 5, 2016).

Parks Canada's Conclusion and Rationale

Parks Canada interprets that CZN is of the opinion that the accidents and consequences are overestimated in the Oboni risk assessment.

Parks Canada interprets Oboni’s risk assessment to be focused on the operations phase of the Project and does not address the construction or closure phases of the project. The accidents and consequences during operations are likely greater than during construction or closure; however, the assessment does not address this consideration. Thus, the risk assessment may not be applicable to mitigate against accidents and associated consequences that are unique to the construction or closure phases of the Project. PCA interprets the Terms of Reference 7.2.2 Effects of Potential Accidents and Malfunctions is to address each phase of the project. There is an apparent gap in the Oboni risk assessment in this regard.

Parks Canada agrees with CZN that the utility of the risk assessment can be improved by further identifying location-specific concerns and adaptive management. Based on the results presented by Oboni, further interpretation is required to identify the road stratification type along the road, and therefore the associated consequence of an accident at a specific road location. The risk assessment completed by Oboni would have benefited from the road stratifications being interpreted for each road kilometer section by Oboni and not left to the reader to interpret. This would ensure that the assumptions and bounds of the risk assessment were correctly considered. Said information should be used to inform where improvements to the current road design (e.g., stratification) and/or road operation (e.g., vehicle speed) could occur to further mitigate the occurrence of an accident.

Parks Canada agrees that a risk assessment for accidents and malfunctions should adopt the best available information. The timing for information availability may have contributed to challenges now faced by stakeholders on interpreting the results of the risk assessment. From review of the correspondences between CZN and Oboni, Parks Canada concludes that there is updated information on road stratifications that is available compared to that utilized by Oboni.

Parks Canada also concludes that further refinement to the road design (and therefore stratifications) will likely occur during the detailed design stage.

With respect to consequences of an accident, Parks Canada maintains their opinion, as detailed in Undertaking #16, regarding the environmental sensitivities noted along the road and conclude they are appropriate to consider in the risk assessment.

Overall, Parks Canada concludes that an update to the risk assessment is warranted and should be used to inform the detailed design and operations of the road to mitigate accident occurrence and associated consequences. Specifically, the introduction of narrower road segments (4m top vs. 5m) into the design is not recommended by Parks Canada. With regard to the one lane road generally, the roadway sightlines and the positioning of pullouts and sightlines from those pullouts will require thorough review at the design stage as they are critical elements in risk reduction and the safe operation of the haul road.

Parks Canada's Recommendations

Parks Canada recommends that the Review Board apply the following measures to inform spill response, road design and road operation.

Measure 27

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).

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.

3.14 ISSUE 14: Permafrost considerations - Borrow Pits

Issue Statement

CZN has proposed to develop numerous borrows along the road alignment to facilitate construction and operation of the road. There is potential for permafrost to be encountered within the borrow vicinity (overburden, borrow material, under burden), and in these instances use of the borrow source will result in disturbance/change to the permafrost, which if not mitigated could result in the potential for environmental impacts. The extent of permafrost (if any) within the proposed borrow sources are not known at this time, thus, site specific

mitigation and monitoring for each borrow source has not been defined and considered in the reclamation of the borrow area.

References

- Public Registry Document # 351: *Tetra Tech – GoC – Round 2 PCA IR #5 – Borrow Sources -Development and Management*. Oct 24, 2016.

Proponent's Conclusion

CZN has not provided a complete draft permafrost mitigation and monitoring plan for borrow pits but has provided proposed mitigations and monitoring that can be considered for all borrow sources (PRD # 351). CZN acknowledges that individual borrow source development and management plans are to be prepared for each borrow source that will incorporate site-specific recommendations relating to permafrost at each borrow source (PRD # 352 - page 1 of 10).

Parks Canada's Conclusion and Rationale

A detailed geotechnical and permafrost intrusive investigation for each borrow source vicinity has not been completed to understand the extent of permafrost (if any) and sub-surface soil/rock characteristics (e.g., geotechnical parameters, stratigraphy, permafrost, ice/water contents, etc.) in the project area.

Parks Canada agrees with CZN that each borrow source will require a borrow source development and management plan and that within this plan the mitigations and monitoring for permafrost management and protection would be defined. PCA concludes that a complete characterization of the sub-surface, involving intrusive geotechnical and permafrost investigations, is required in advance of borrow source development so as to ensure proper mitigations and managements to limit the potential effects of permafrost degradation and environmental impacts.

In addition to the mitigations and monitoring outlined in Tetra Tech (PRD #351), Parks Canada concludes additional mitigation measures are necessary to protect against permafrost degradation and/or thaw settlement of the soils located below the material extraction zone within a borrow. For example, if borrow material is removed to an extent where the ground thermal regime results in thawing of ice rich soils below the extraction extents, it may result in unwanted thaw settlements. These settlements may result in potential for environmental degradation of the area and therefore impacts. To mitigate against this occurrence, the following are necessary:

- Geotechnical and permafrost characterization completed beyond the extents of the extraction zone within each borrow.

- Maintaining proper thermal insulating layer between the base/extents of the extraction zone and the soils requiring protection against thaw settlements.

Parks Canada's Recommendations

Parks Canada recommends that the Review Board apply the following measures to prevent potentially significant adverse effects to permafrost at borrows associated with the proposed all season road.

Measure 28

Complete geotechnical and permafrost intrusive investigation is required prior to completion of each borrow source management plan and prior to any development of the borrow source.

Measure 29

The Borrow Source Management Plans for each borrow source would include/consider the following, without limitation:

- Frequency and location of monitoring and the parameters to monitor.
- All mitigation and monitoring plans, including permafrost protection/management.
- Informed by industry best practices, including, Indian and Northern Affairs Canada (2009) Northern Land Use Guidelines: Pits and Quarries.
- Factual reports that documents the site specific geotechnical and permafrost investigations and results

Each Borrow Source Management Plan is subject to review and approval by Parks Canada during the regulatory phase and prior to construction.

Measure 30

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:

- Geotechnical and permafrost characterization completed beyond the extents of the extraction zone within each borrow.
- Maintaining proper thermal insulating layer between the base/extents of the extraction zone and the soils requiring protection against thaw settlements.

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).

3.15 ISSUE 15: Permafrost considerations - All Season Road

Issue Statement

Select locations of the all-weather road will be subject to a potential disturbance/change to local permafrost conditions within the vicinity of the road alignment. The disturbance/change to permafrost will be a result of road construction and operations and potentially could also occur during the closure phase of the project. Avoidance of all disturbance/change to permafrost may not be practical and therefore effective mitigation is necessary to limit the potential impacts to the changes in ground temperatures and associated environmental damage.

References

- Public Registry Document # 372: *Tetra Tech – GNWT IR #8 Round 2 – Permafrost Summary Table with Proposed Mitigations*. Oct 24, 2016.

Proponent's Conclusion

CZN has provided a summary of all potential permafrost areas and proposed permafrost mitigation measures for the all-season road (PRD #372). The summary is based on the current level of information and as additional information is obtained, the permafrost areas and associated mitigation will be further defined. The additional information will be obtained from site-specific investigations completed during the detailed design stage of the road which will occur after the permitting stage.

Parks Canada's Conclusion and Rationale

The summary presented by Tetra Tech is based on the current level of information and as additional information is obtained, the permafrost areas and associated mitigation will be further defined. PCA agrees that as more information becomes available, the permafrost areas and mitigations should be further defined to account for the updated information and site-specific conditions.

Parks Canada notes that detailed geotechnical and permafrost intrusive investigations to support road design has largely not been completed. To date and in general, permafrost locations have been inferred from ground reconnaissance and terrain analysis. While such an approach is typical for a preliminary study for road alignment, Parks Canada agrees with CZN that additional site-specific information is required for detailed road design.

Parks Canada would prefer that disturbance to permafrost be avoided where practically attainable; however, Parks Canada acknowledges that site specific factors may limit the extent at which this can be implemented. Avoidance 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. Many of these concepts are included in CZN preliminary road design; however, the detailed road design is not yet completed to assess if all permissible methods of permafrost protection have been considered.

In locations where permafrost disturbance/change may occur, appropriate mitigations should be factored into the road design to limit the potential for adverse effects during construction, operation and closure phases of the road. Thus, the concept of designing for closure and achieving a site condition that does not require long term management (e.g., walk away solution) may be a critical factor to consider in the road design. Considerations for changes in climatic conditions in the future should be factored into the road design and closure conditions. Further, to mitigate against the potential for permafrost degradation, appropriate monitoring and response action planning is required. Parks Canada concludes that monitoring of permafrost and signs of permafrost degradation be a component of the construction, operations and closure phases of the project. Further, a response action plan should also be developed that utilizes the monitoring data to determine when corrective action is required to address potential for permafrost degradation prior to impact occurrence, as well as, corrective action where permafrost degradation has occurred.

Parks Canada's Recommendations

Parks Canada recommends that the Review Board apply the following measures to prevent potentially significant adverse effects to local permafrost conditions within the vicinity of the proposed all season road alignment.

Measure 31

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:

- Design report, drawings and construction specifications that are signed and stamped by a NAPEG engineer.
- 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.
- The road design considers the construction, operations and closure phases of the project.
- Factual reports that document the site specific geotechnical and permafrost investigations and results that is utilized in the production of the road detailed design.

Measure 32

A Permafrost Monitoring and Response Action Plan for the road shall be developed that includes at a minimum the following:

- Frequency and location of monitoring and the parameters to monitor.
- 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.
- Triggers and response actions to mitigate against signs of potential permafrost degradation.
- Response actions to correct the occurrence of permafrost degradation.
- Site specific factors.

The Permafrost Monitoring and Response Action Plan is subject to review and approval by Parks Canada during the regulatory phase and prior to construction.

3.16 ISSUE 16: Restoration of the proposed project

Issue Statement

Upon project completion, deactivation and reclamation of the proposed project is required. While CZN has provided reclamation plans, Parks Canada believes these require additional information to address the objectives of ecological restoration, set measurable targets and timelines to achieve reclamation objectives, and predict realistic long-term outcomes.

References

- Public Registry Document # 55: Developer's Assessment Report, Section 16.0
- Public Registry Document # 101:
 - Appendix C to Appendix A to the DAR Addendum
 - Borrow Pit Management and Reclamation Plan
 - Road Closure and Reclamation Plan
 - Erosion and Sediment Control Plan
- Public Registry Document # 340: Matheus P. and Omtzigt T. (2011). Yukon Revegetation Manual: Practical Approaches and Methods. Mining and Petroleum Environmental Research Group, Government of Yukon and Yukon College, Whitehorse, Yukon. Accessed online: <http://www.yukoncollege.yk.ca/downloads/Yukon%20-Revegetation-Manual.pdf> (2017).
- Public Registry Document # 342: Parks Canada. 2008. Principles and Guidelines for Ecological Restoration in Canada's Natural Protected Areas. National Parks Directorate, Parks Canada Agency, Gatineau, Quebec.

- Public Registry Document # 368: Hatfield Consultants. *Prairie Creek Mine, all season road undertaking 7 IR replies – PCA IRs*. November 3, 2016.
- Not on Registry:
 - Densmore R. et al. 2000. Native Plant Revegetation Manual for Denali National Park. U.S. Department and the Interior, U.S. Geological Survey, Anchorage, Alaska. Accessed online: <https://pubs.er.usgs.gov/publication/itr000006> (2017).
 - Hatfield Memo. September 6, 2016. “Prairie Creek Mine, All Season Road habitat loss and offset – DRAFT” (posted to Registry on March 9 2017 but no PR yet)
 - Polster D. 2016. Natural Processes: Restoration of Drastically Disturbed Sites. Polster Environmental Services Ltd., Duncan BC. Available online at: <http://www.asmr.us/Portals/0/Documents/Journal/Volume-5-Issue-2/Polster-BC.pdf>

Proponent's Conclusion

Road deactivation and reclamation concepts are discussed in several documents and plans, with the objective of sediment and erosion control (PRD #55, 101, 340, and 342). Additional objectives are identified for the reclamation of borrow and waste areas, including to “enhance the natural re-vegetative process and help establish a stable ecosystem” and “enable the disturbed area to return to productive use in the context of the surrounding area” (PRD# 101, Borrow Pit Management and Reclamation Plan).

In general along the roadbed, the subgrade and gravel will not be removed. However, reclamation may include the removal of “overland” construction sections which cross larger wetland complexes (PRD #101, Borrow Pit Management and Reclamation Plan). The roadbed will be graded and scarified to promote natural plant invasion. For all project components, natural regeneration of vegetation will be relied on; a seed mix will not be used because of the danger of introducing an exotic species. Topsoil will be salvaged and stored where possible and warranted for later use in reclamation, as will large woody debris, snags, and other organic material. Overburden and stripped material will be placed where deemed to be beneficial to re-vegetation. Areas close to water courses will be temporarily or permanently stabilized depending on whether vegetation invades. Slopes may be stabilized by the placement of coarse woody debris, boulders, or mulch. Silt fence will be installed as a sedimentation control measure.

CZN contends that the present condition of 1981 Prairie Creek winter road demonstrates that the all season road alignment and associated components will readily revegetate (PRD #55).

CZN has committed to conduct inspections and monitoring until 1) re-vegetation is occurring, consistent with the local area, 2) surface water is being contained and managed with no

significant erosion or sedimentation, and 3) no slope or soil stability issues exist (PRD #101, Borrow Pit Management and Reclamation Plan, Road Closure and Reclamation Plan).

Parks Canada's Conclusion and Rationale

The proponent has not provided adequate information within their reclamation plans to address the objectives of ecological restoration. The reclamation plans do not set measurable targets and timelines to achieve reclamation objectives, or predict realistic long-term outcomes.

Parks Canada defines ecological restoration as “the process of assisting the recovery of an ecosystem that has been degraded or damaged” with the objective of restoring ecological integrity (PRD #342). Within Parks Canada’s protected areas, ecological integrity is defined as “a condition that is determined to be characteristic of its natural region and is likely to persist, including abiotic components and the composition and abundance of native species and biological communities, rates of change and supporting processes” (*Canada National Parks Act*, 2000). Achieving reclamation objectives requires measurable targets and timelines, and an adaptive management approach as part of monitoring.

The revegetation of the 1981 Prairie Creek winter road 35 years after abandonment is not an appropriate analogue for natural regeneration of the proposed all-season road. No gravel fill was placed and compacted on the 1981 winter road; this substrate will not support regrowth of the pre-disturbance vegetation community.

Sites with gravel fill, or little to no organic content in the soil have low revegetation potential; vegetation that establishes on gravel fill is usually more similar to vegetation on gravel river bars or stony, steep slopes than to surrounding undisturbed vegetation (Densmore et al, 2000). The proponent states that stockpiled topsoil will be applied as available, but there is no indication that an adequate amount will be available for the reclamation of the road and all associated features. Furthermore, without additional site-specific measures to improve soil structure and nutrients (ex. surface preparation, adding organics, soil amendments) plant growing conditions may be limited. As such, residual impacts to vegetation communities are predicted, resulting in a decrease in ecological integrity.

The revegetation target outlined by the proponent (revegetation is occurring, consistent with the local area) is not measurable and is not consistent with restoring ecological integrity. Ecological integrity requires that ecosystem components be intact including species composition and abundance, abiotic parameters, and ecological processes (*Canada National Parks Act*, 2000).

Several reclamation techniques using locally sourced plant materials are appropriate for restoring native vegetation communities, and do not risk the introduction of non-native or

invasive species into a national park. These include plant salvage and transplant, and collecting and sowing seeds of local plants (PRD #340; Densmore et al, 2000).

Parks Canada's Recommendations

Parks Canada recommends that the Review Board apply the following measures to ensure complete restoration of the proposed project.

Measure 33

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).

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.

Each reclamation plan shall include:

- 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.
- 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.
- Methods and materials that are consistent with ecological restoration objectives
- 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.
- 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.

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.

4. SUMMARY

Parks Canada's analysis of the DAR for the proposed all season road focused on the potential impacts of all phases (construction, operation and decommissioning) of the proposed project on NNPR. To date, the project and baseline information used by the proponent to determine magnitude of effects and resulting mitigation is not at the standard expected in a national park. Consequently, and as described in this technical report, where information was missing, a reasonable worst case environmental impact was predicted. On that basis we have made recommendations for additional baseline information, mitigations, monitoring, and adaptive management. We recommend that the Board consider these measures when making its determination under Section 128 (1) of the MVRMA.

Parks Canada has indicated throughout this document that individual components of the proposed project have the potential to cause significant impacts. However, due to the level of project and baseline information provided, Parks Canada is not able to provide the Board with a definitive recommendation regarding the overall significance of project impacts.

4.1 Summary of Recommendations

Measure 1

CZN shall include mitigations for impacts to Arctic Grayling during construction of km 25-32 of the proposed all season road.

Measure 2

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.

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).

Measure 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.

Measure 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.

Measure 5

CZN shall develop a systematic monitoring program to address potential impacts to 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. These responses/mitigation adjustments must be approved by Parks Canada.

Measure 6

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).

- PCA defines population characteristics as including species presence, distribution and relative abundance
- PCA defines habitat use as including use of habitats for foraging, reproduction and rearing of offspring and that includes seasonality in their use.
- 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.
- Survey methodology shall include the appropriate spatial distribution and seasonal timing for adequate representation of species along the entire proposed all season road alignment (not just the realignments that go beyond the approved winter road alignment).
- Survey methods and overall sampling design shall be developed in collaboration with, and approved by, both Parks Canada and Environment and Climate Change 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.

Measure 7

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.

CZN shall provide the updated effects assessment prior to permits or licences being issued, should the project proceed to the regulatory phase.

Measure 8

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 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. 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 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.

Measure 9

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 prior to permits or licences being issued, should the project proceed to the regulatory phase.

The baseline data on vegetation shall include:

3. 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.).

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.

4. Survey data to describe areas of high rare plant potential and high rare vegetation assemblage potential.

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.

Measure 10

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.

CZN shall provide the updated effects assessment prior to permits or licences being issued, should the project proceed to the regulatory phase.

Measure 11

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.

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.

CZN shall conduct the AIA prior to permits or licences being issued, should the project proceed to the regulatory phase.

Measure 12

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 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.

Measure 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.

Measure 14

CZN shall install water gauge stations at the lakes from which water will be withdrawn for dust control within NNPR.

Measure 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.

Measure 16

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.

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.

Measure 17

CZN shall develop a detailed program to monitor the short-term effects of construction on surface water quality. This program shall include:

- At all waterbody crossings:
 - At least two sampling sites located upstream beyond the potential influence of the construction to define the unimpacted, reference condition.
 - At least three sampling sites located downstream of the construction representing: “near-field”, “intermediate-field”, and “far field”.
- At the Sundog Creek realignment:
 - 3 sites located upstream beyond the potential influence of the realignment to define the unimpacted, reference condition.
 - 3 sites, located downstream of where the realign channel reconnects with the existing channel.
 - At least 2 sites, located within the lower half of the new channel.

- Reference sites may also be required upstream in the tributary that enters Sundog Creek from the north shortly after the realigned channel if suitable downstream sites are not available prior to its influence
- 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.
- Sampling frequency and intensity during and following construction, and when monitoring would commence
- 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.
- 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.
- 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.

The duration of this short-term 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.

Measure 18

CZN shall 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, 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:

- 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.
- Measurements of TSS, turbidity, dissolved oxygen, conductivity and water pH.
- 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.

- This monitoring program needs to demonstrate how the resulting monitoring data will be incorporated into adaptive management. The program is subject to review and approval by Parks Canada during the regulatory phase, should the project proceed to that phase.

NOTE:

Parks Canada supports DFO's technical analysis and recommendations as they relate to fish and fish habitat.

Measure 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.

Measure 20

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.

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.

Measure 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.

Measure 22 (Management of Grey Water)

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.

Measure 23 (Management of Grey Water)

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:

- e. a design of the grey water septic system being proposed,
- f. the soil stratification for all proposed locations,
- g. the depth of the water table,
- h. the distance to nearest water course/ water body and potable water source.

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.

Measure 24 (Management of Sewage (Brown Water))

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.

Measure 25 (Management of Sewage (Brown Water))

If CZN chooses to manage sewage for camps at km 65 and 87 within NNPR rather than at 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:

- f. a design of the sewage treatment system being proposed in accordance with accepted standards and guidelines,
- g. in the case of a septic system, a soil stratification for all proposed locations,
- h. the depth of the water table,
- i. the distance to nearest water course/ water body and potable water source,
- j. 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

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.

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.

Measure 26

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.

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.

Measure 27

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).

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.

Measure 28

Complete geotechnical and permafrost intrusive investigation is required prior to completion of each borrow source management plan and prior to any development of the borrow source.

Measure 29

The Borrow Source Management Plans for each borrow source would include/consider the following, without limitation:

- Frequency and location of monitoring and the parameters to monitor.
- All mitigation and monitoring plans, including permafrost protection/management.
- Informed by industry best practices, including, Indian and Northern Affairs Canada (2009) Northern Land Use Guidelines: Pits and Quarries.
- Factual reports that documents the site specific geotechnical and permafrost investigations and results

Each Borrow Source Management Plan is subject to review and approval by Parks Canada during the regulatory phase and prior to construction.

Measure 30

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:

- Geotechnical and permafrost characterization completed beyond the extents of the extraction zone within each borrow.
- Maintaining proper thermal insulating layer between the base/extents of the extraction zone and the soils requiring protection against thaw settlements.

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).

Measure 31

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:

- Design report, drawings and construction specifications that are signed and stamped by a NAPEG engineer.
- 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.
- The road design considers the construction, operations and closure phases of the project.

- Factual reports that document the site specific geotechnical and permafrost investigations and results that is utilized in the production of the road detailed design.

Measure 32

A Permafrost Monitoring and Response Action Plan for the road shall be developed that includes at a minimum the following:

- Frequency and location of monitoring and the parameters to monitor.
- 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.
- Triggers and response actions to mitigate against signs of potential permafrost degradation.
- Response actions to correct the occurrence of permafrost degradation.
- Site specific factors.

The Permafrost Monitoring and Response Action Plan is subject to review and approval by Parks Canada during the regulatory phase and prior to construction.

Measure 33

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).

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.

Each reclamation plan shall include:

- 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.
- 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.
- Methods and materials that are consistent with ecological restoration objectives

- 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.
- 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.

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.