



To:	David Harpley, VP Environment and Permitting Affairs, Canadian Zinc Corp.	Date:	August 29, 2016
c:		Memo No.:	001
From:	Amy McLenaghan	File:	Y14103320-01.008
Subject:	Prairie Creek Mine Proposed All-Season Road, Environmental Assessment Follow Up Regarding Reclamation Outcomes Indicated by the Original Winter Road		

1.0 INTRODUCTION

The technical session for the Prairie Creek Mine's proposed all-season access road was held June 13 to 16, 2016. Undertakings were identified from the technical session that required additional information and explanation by Canadian Zinc Corporation (CZN) and others. A response to Undertaking #2 was provided on August 2, 2016. This memo provides further detail based on recent field studies.

2.0 RESPONSE TO UNDERTAKING #2

Undertaking #2: Parks and CanZinc will discuss need for additional assessment of ecosystems that will be disturbed so as to tailor reclamation approaches (and potentially further examination of potentially permanent impacts, e.g., those associated with permafrost degradation) and report to the Board.

CZN provided the following response to Undertaking #2 on July 28, 2016 (in italics):

Response: CZN, Tetra Tech EBA, and Parks Canada discussed Undertaking #2 during a conference call on June 28, 2016. Since this discussion, Tetra Tech EBA conducted field studies along the proposed all-season access road that included an area along the old winter road (KP 95) that exhibited signs of potentially permanent changes due to permafrost degradation, as discussed in the Cameron report (2015). Results from the field studies will be available in a forthcoming, separate report. Conclusions from the field studies will also be integrated into the reclamation plan. Potentially longer term impacts, particularly those associated with permafrost degradation, may have resulted from the construction and operation of the winter road, however, the engineering practices implemented historically versus the practices employed currently have changed substantially, particularly with respect to construction in permafrost areas. Current construction techniques in permafrost are directed towards protection of the ground thermal regime so that thaw is reduced or avoided, where possible. The documents listed below identify mitigation measures that will be implemented to avoid permafrost degradation:

- *Addendum and Progress Report to Address Adequacy Review of Developer's Assessment Report for Environmental Assessment, EA1415-01 – Proposed All-Season Road Access to Prairie Creek Mine, NT (2015);*
- *Permafrost-Karst Characterization – Developer's Assessment Report for Environmental Assessment, EA1415-01 - Proposed All-Season Road Access to Prairie Creek Mine, NT (2016);*
- *Memo #2 – IR 13: Responses to Information Requests from Mackenzie Valley Review Board and Oboni Riskope Associates Inc. – Prairie Creek Mine Site Proposed All-Season Access Road, EA1415-01 Technical Review (2016); and*

- *Memo #4 – IR 27: Responses to Information Requests from the Government of the Northwest Territories - Prairie Creek Mine Site Proposed All-Season Access Road, EA1415-01 Technical Review (2016).*

3.0 FIELD STUDY RESULTS

Tetra Tech EBA has compiled and reviewed the data collected from the field studies conducted in July 2016. Cameron (2015; “the Cameron report”) described an area along the old winter road (approximately KP 93 to 97) as being potentially permanently changed due to permafrost degradation. Along this same section of the old winter road, Tetra Tech EBA made the following field observations:

- The footprint of the winter road is evident.
- The winter road and surrounding area is within an extensive wetland complex composed of a complex of fens as described by the Canadian Wetland Classification System (National Wetlands Working Group 1997), and poor fens, called spruce muskeg by Cameron (2015). Surface water is a dominant feature throughout the complex (Photo 1).
- Fen Communities:
 - Fen vegetation adjacent to the winter road consisted of a mixture of tamarack (*Larix laricina*), willows (*Salix* spp.), dwarf birch (*Betula glandulosa*) and sedges, with water sedge (*Carex aquatilis*) being dominant. Water levels were at the surface.
 - The winter road through fen was dominated mainly by water sedge and lacked shrub cover; however, the same sedge species found adjacent to the road were still persistent on the road. The road footprint seemed wetter than adjacent areas (Photo 2).
- Poor Fen/Spruce Muskeg Communities:
 - Vegetation adjacent to the winter road had a pronounced tree layer consisting of a mixture of tamarack and black spruce (*Picea mariana*). Shrubs consisted of willow and ericaceous shrubs. *Sphagnum* and feather mosses were the dominant ground cover. Surface water was not present.
 - The winter road through poor fen lacked tree cover but is regenerating with shrubs (predominantly willows; Photo 3).
- Evidence of a past fire (>15 years) not mentioned in the Cameron report was observed in the area, with charred standing dead trees throughout both wetland types, as described above (Photo 4).

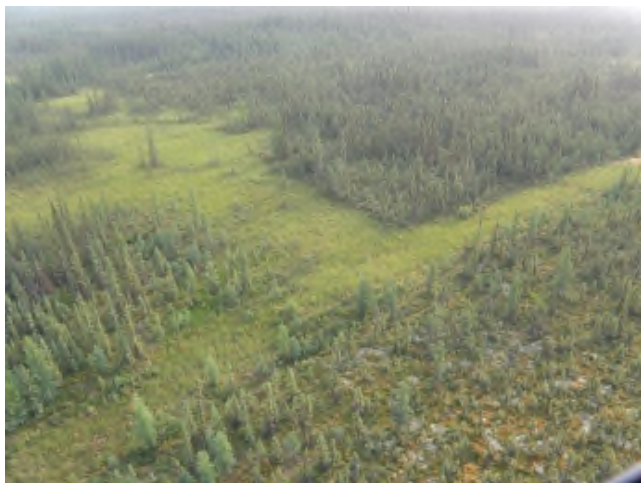


Photo 1. Aerial view of fen complex.



Photo 2. Sedge community on winter road.



Photo 3. Shrub regeneration on winter road.



Photo 4. Evidence of fire.

4.0 DISCUSSION

It is clear that the footprint of past construction and limited operation of the historic winter road is still evident today. It is not considered to be within the scope of the assessment and review process for CZN to prove or disprove whether or not vegetation changes associated with the historic winter road are the result of permafrost degradation, and whether permanent changes to vegetation communities along the existing road corridor are occurring. It is, however, CZN's responsibility as a potential developer in the area to take the necessary precautions to avoid potential adverse effects during the design, construction, operation, closure, and reclamation of the proposed all-season road.

The remnants of the historic winter road have been incorporated into the Developers Assessment Report (DAR) prepared for the Project (CZN 2015). Additionally, several commitments regarding the construction and operation of the proposed all-season road have been made, both within the DAR and throughout the environmental assessment review process, in order to avoid adverse effects.

CZN understands that particular care needs to be taken in the design and construction of an all-season road in the zone of warm, discontinuous permafrost. CZN acknowledges that any permafrost degradation from their activities has the potential to alter surrounding communities, if not closely managed and monitored from construction through to the reclamation phase. As a result, CZN has retained the help of engineering professionals who specialize in developing infrastructure in permafrost conditions to develop the road design and construction techniques.

As stated in the DAR, the primary mitigation strategy is to avoid thaw-sensitive terrain. Where this is not possible, road design and construction techniques specific to warm, discontinuous permafrost will be implemented. During operations, management and maintenance strategies specific to maintaining the ground thermal regime will also be in place, and routine monitoring of the road will identify any areas that may be displaying evidence of permafrost thaw. These areas will be remedied immediately as it is critical to Mine operations, from both a safety and economic perspective that the road be in optimal working condition. Consideration and management of the ground thermal regime will continue into the reclamation design and implementation phases.

5.0 LIMITATIONS OF REPORT

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6.0 CLOSURE

We trust this technical memo meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech EBA Inc.



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Attachments: Tetra Tech EBA's General Conditions

GENERAL CONDITIONS

NATURAL SCIENCES

This report incorporates and is subject to these "General Conditions".

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This report pertains to a specific site, a specific development or activity, and/or a specific scope of work. The report may include plans, drawings, profiles and other supporting documents that collectively constitute the report (the "Report").

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Both electronic file and hard copy versions of Tetra Tech EBA's Instruments of Professional Service shall not, under any circumstances, be altered by any party except Tetra Tech EBA. Tetra Tech EBA's Instruments of Professional Service will be used only and exactly as submitted by Tetra Tech EBA.

Electronic files submitted by Tetra Tech EBA have been prepared and submitted using specific software and hardware systems.

Tetra Tech EBA makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

3.0 STANDARD OF CARE

Services performed by Tetra Tech EBA for the Report have been conducted in accordance with the Services Agreement, in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Professional judgment has been applied in developing the conclusions and/or recommendations provided in this Report. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of the Report.

Tetra Tech EBA professionals are bound by their ethical commitments to act within the bounds of all pertinent regulations. In certain instances, observations by Tetra Tech EBA of regulatory contravention may require that regulatory agencies and other persons be informed. The client agrees that notification to such bodies or persons as required may be done by Tetra Tech EBA in its reasonably exercised discretion.

If any error or omission is detected by the Client or an Authorized Party, the error or omission must be immediately brought to the attention of Tetra Tech EBA.

4.0 ENVIRONMENTAL ISSUES

The ability to rely upon and generalize from environmental baseline data are dependent on data collection activities occurring within biologically relevant survey windows.

5.0 DISCLOSURE OF INFORMATION BY CLIENT

The Client acknowledges that it has fully cooperated with Tetra Tech EBA with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The Client further acknowledges that in order for Tetra Tech EBA to properly provide the services contracted for in the Services Agreement, Tetra Tech EBA has relied upon the Client with respect to both the full disclosure and accuracy of any such information.

6.0 INFORMATION PROVIDED TO TETRA TECH EBA BY OTHERS

During the performance of the work and the preparation of this Report, Tetra Tech EBA may have relied on information provided by persons other than the Client.

While Tetra Tech EBA endeavours to verify the accuracy of such information, Tetra Tech EBA accepts no responsibility for the accuracy or the reliability of such information even where inaccurate or unreliable information impacts any recommendations, design or other deliverables and causes the Client or an Authorized Party loss or damage.

7.0 GENERAL LIMITATIONS OF REPORT

This Report is based solely on the conditions present and the data available to Tetra Tech EBA at the time the data were collected in the field or gathered from publically available databases.

The Client, and any Authorized Party, acknowledges that the Report is based on limited data and that the conclusions, opinions, and recommendations contained in the Report are the result of the application of professional judgment to such limited data.

The Report is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present at or the development proposed as of the date of the Report requires a supplementary investigation and assessment.

It is incumbent upon the Client and any Authorized Party, to be knowledgeable of the level of risk that has been incorporated into the project design or scope, in consideration of the level of the environmental baseline information that was reasonably acquired to facilitate completion of the scope.

The Client acknowledges that Tetra Tech EBA is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of property, the decisions on which are the sole responsibility of the Client.

8.0 JOB SITE SAFETY

Tetra Tech EBA is only responsible for the activities of its employees on the job site and was not and will not be responsible for the supervision of any other persons whatsoever. The presence of Tetra Tech EBA personnel on site shall not be construed in any way to relieve the Client or any other persons on site from their responsibility for job site safety.