NATURAL RESOURCES CANADA - INVENTIVE BY NATURE

NRCan's Final Hearing Presentation: Prairie Creek All-Season Road Project EA1415-01 Canadian Zinc Corporation

Prepared for the Mackenzie Valley Review Board

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Outline

1. NRCan's Mandate and Role
2. NRCan's Technical Review
   - Permafrost and Terrain Conditions
3. Questions

NRCan's Mandate

- Enhance the responsible development, use and competitiveness of Canada's natural resources and products.
- Established leader in science and technology in the fields of earth sciences, energy, forests, and minerals and metals.

NRCan's Role in this Project

- *Explosives Act* and regulations
- Earth Sciences – Permafrost

NRCan's Involvement

- Review of Developer Assessment Report (DAR) and DAR Addendum for permafrost considerations- no Information Requests- 2016

- Participated in Technical Meeting via teleconference- June 13 to June 16, 2016

- Final Written Submission to the MVEIRB- March 10, 2017

Regulatory Review – Explosives Storage

NRCan's review focused on explosives storage as it may be required to provide a licence under the *Explosives Act*. NRCan does not regulate the use of explosives.

The Developer has identified that the project may require a magazine for the storage of explosives and has committed to developing an Explosives Management Plan.

NRCan is satisfied with the explosive storage information provided by the Developer. If an application is submitted for the storage of explosives, NRCan will require more detailed information in the application such as the type of magazine, location of explosive storage and safety and security measures.

Technical Review: Permafrost

Overview

- Permafrost and drainage conditions in the project area
- Permafrost and thaw sensitivity characterization in the project area
- Analysis to determine impacts of the project on permafrost, including effects of climate change

Why is permafrost important

- Permafrost is an important consideration in the design of roads in northern Canada since changes in permafrost conditions can adversely impact infrastructure integrity/performance.
- Climate change can also play an important role due to thawing of permafrost and the associated effects on road integrity.

Permafrost and drainage conditions in the project area

- Understanding permafrost distribution and drainage conditions is important for road operation, and also to minimize impacts on the terrain.
- The Developer identified where permafrost is most likely to occur, which areas were sensitive to thaw, and where seepage and cross drainage exist. Mitigation measures are proposed to limit impacts to permafrost thawing and changes to drainage.
- NRCan's view is that the Developer has reasonably identified areas of permafrost in the project area. However, the distribution of permafrost in areas with significant changes in elevation is complex; colder conditions near the road can lead to freezing of subsurface water moving downslope and result in icings

Permafrost and thaw sensitivity characterization in the Project Area

- Road construction and operation can result in warming and thawing of ice-rich ground and result in ground instability and ponding of water.
- The Developer has characterized permafrost and terrain conditions in the project area using maps, air photos and field investigations.
- NRCan agrees with the characterization for this stage of the design process; the Developer's approach is consistent with other development proposals in NWT, and outlined in guidelines from the Canadian Standards Association and the Transport Association of Canada.

Analysis to determine impacts of the project on permafrost, including effects of climate change

- Understanding the relationship between permafrost and infrastructure interaction is an important consideration for the design of the road.

- The Developer acknowledged that permafrost conditions may change over time due to road construction and climate change and has proposed mitigation techniques to minimize impacts.

- NRCan generally agrees with the Developer's approach. They applied the appropriate screening methods outlined in Canadian Standards Association guidelines. Their qualitative analysis of changing permafrost was conservative, and quantitative analyses are proposed for detailed design.

Summary of NRCan's Recommendations

- NRCan recommends that, to support the detailed design development of mitigation, management and monitoring plans, the Developer:
  - Conduct field investigations that identify additional areas where obstruction of cross flow and icing formation during winter may be an issue.
  - Carry-out additional site investigations (e.g., geophysical surveys, geotechnical boreholes) to confirm permafrost and subsurface conditions including ground ice conditions, particularly in areas of sensitive terrain such as slopes and where major structures are planned.
  - Conduct quantitative analysis in high sensitive areas, potentially including thermal modelling, to better assess how permafrost conditions might change as a result of climate change.

Questions?