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October 29, 2010

Chuck Hubert
Environmental Assessment Officers
Mackenzie Valley Environmental Impact Review Board
Box 938 #200 Scotia Centre 5102-50th Avenue
Yellowknife, NT X1A 2N7

File#: NWT-142
File#: EA0809-002

Sent via e-mail: chubert@reviewboard.ca

Subject: Natural Resources Canada's (NRCan) Information Request Regarding the Environmental Assessment of the Prairie Creek Mine EA0809-002

Further to the Review Board's letter of October 20, 2010 with instructions for a second round of information requests (IRs), Natural Resources Canada (NRCan) is providing the attached additional requests to the Mackenzie Valley Environmental Impact Review Board regarding the Prairie Creek Mine Environmental Assessment.

NRCan is using this second round of IRs to ensure that additional information is obtained in order to complete a technical review in cooperation with other regulatory authorities, and to address questions requiring detailed and technical responses prior to hearings.

We also note that, in order to accommodate our experts' schedule and availability, the proponent provided additional information to NRCan in advance of the MVEIRB's technical workshop in Dettah in September. We are suggesting that this second round of IRs can allow the proponent to put the responses to our questions, reiterated in the attached on paste backfill strength, waste rock management and effluent treatment / post closure water quality on the Public Registry. Similarly, this second round of IRs can allow the proponent an opportunity to ensure that data provided to NRCan following the technical workshop (i.e., Northwest Hydraulic Consultants provided a time series analysis of peak and annual runoff in the Prairie Creek region) is also on the Public Registry.

Where possible, we have indicated where Information Requests from other federal departments reference similar issues as NRCan. As with our previous submission, our view is that these other Information Requests are related to NRCan's, but do not wholly duplicate or conflict with NRCan's.

Should you have any questions regarding NRCan's information requests, please do not hesitate to contact the undersigned.

Sincerely,

Original signed by

John Clarke
Natural Resources Canada
A/Director, Environmental Assessment Coordination
John.Clarke@nrcan.gc.ca

IR Number: NRCan 2-1

Source: Natural Resources Canada – Earth Science Sector

To: Canadian Zinc Corporation (CZN)

Subject: Terrain Conditions along the Access Road

References:
TOR: 3.2.4, 3.3.1, 3.3.7, 3.3.3
Project Description Report Appendix B
DAR: Main Report section 4.12.3, 4.12.4, 9.2, 9.4.2, 10.4.2, Appendix 16, DAR Addendum sections 5.4, 6, and 7.4
Response to NRCan IR 1-11, Parks Canada IR 1-8,1-10, and 1-12, Transport Canada IR 1-3 and 1-5, Proponent's Response Appendix D
Transcripts Technical Meeting Oct. 7 2010 pg 140-221

Preamble:
In response to NRCan IR 1-11 (and IRs from other parties), the Proponent provided additional information regarding the terrain conditions along the access road, including the results of investigations carried out in August 2010. The additional maps and information provided have been helpful in providing a better understanding of the terrain stability along the road corridor. Investigations conducted to date have largely consisted of desk top studies and field and air reconnaissance and no field investigations have been conducted to determine the geotechnical properties of subsurface materials. The report provided by Golder (App. D) indicates that further investigations are proposed for final design after receipt of regulatory approval. The proposed investigations may include ground surveying and possibly drilling to confirm ground conditions. Instrumentation to measure ground temperatures may also be installed at selected locations. NRCan is supportive of the proposed investigations but it was unclear from the written material whether the Proponent is committed to conducting these more detailed investigations. During the technical session NRCan requested further details regarding plans for future geotechnical investigations. The Proponent indicated that further investigations would be done that would include borehole drilling and temperature cable installation where permafrost could affect for example design and construction of permanent bridge abutments.

The Proponent has provided additional information regarding the techniques that will be utilized to mitigate potential road construction and operation impacts such as ground instability and erosion. The Proponent has identified sections of the road that are most vulnerable and described design features to limit impacts. NRCan suggests that the results of the future proposed geotechnical investigations may result in revisions to proposed alignment routing, mitigation plans or identify other sections of the road that may also be vulnerable to erosion etc. According to the updated maps provided (App. D fig.11-4), portions of the proposed re-routing east of Silent Hills will cross terrain that may be ice-rich. Vegetation clearance may result in changes to the ground thermal regime due for example, to loss of shade resulting in increased summer heating of the ground. Loss of surface protection and increased thaw penetration could result in ground instabilities, alterations in drainage and increased erosion. Disturbance to the organic layer would exacerbate these effects. There are also a number of water crossings in this section of the road and these potential instabilities may have implications for water crossing design and mitigation of environmental effects. Clarification is required regarding whether the Proponent will conduct further geotechnical investigations including borehole drilling and temperature cable installation to better characterize the sensitivity of the terrain in this section of the proposed route to determine the final alignment and also to develop mitigation and environmental management plans.

NRCan also requested a description of monitoring plans to determine if ground conditions are adequate for activities associated with the road to occur. Parks Canada (IR 1-12) also requested information on the criteria to determine opening and closing of the road. The Proponent has

indicated that the road will be advanced east of km38 when the ground is sufficiently frozen to support the machinery without rutting and remain open until the ground is not sufficiently frozen. The Proponent indicated during the Technical Sessions and in their responses to IR requests (e.g. Transport Canada IR 1-3) that activities for the winter road would start in November working from the mine to the intermediate transfer facility with hauling from the mine to the Liard crossing to start Dec. 1 and continue to March 31 with potential shoulder periods depending on prevailing conditions. There was some discussion during the technical session regarding realistic operating periods for the winter road opening and closing. The Proponent indicated that based on the temperature profiles they have examined (pg 149, Oct. 7 transcript) the winter road will operate until April 15. Some clarification however is required on the analysis done by the proponent to determine the most likely operating period of the road as this may change from year to year due to climate variability and perhaps progressively decrease if climate warms over the project life (as acknowledged by the Proponent in response to Parks Canada IR 1-10, App. D). This variability including extreme warm years can lead to later freeze-up and earlier onset of thaw and result in a shorter operating season.

Temperature conditions will be a factor determining when suitable conditions exist for winter road operation as this will determine when active layer freeze-back is complete in permafrost terrain or where seasonal frost has penetrated sufficiently in other areas. Snow cover will provide protection for the ground and this could also be a limiting factor for road construction and operation. With thin snow cover conditions, it may be difficult to provide a level surface and protect the organic layer from damage (which as mentioned above could lead to alterations in the ground thermal regime). It is not clear from the IR responses and the discussions at the technical sessions how the Proponent will ensure that damage to the ground surface will be minimized under thin snow cover conditions which could periodically occur.

Request:

(i) Please confirm if detailed geotechnical investigations (borehole drilling, installation of temperature cables) will be conducted as recommended by Golder in App. D for the proposed re-routed sections of the access road such as that to the east of Silent Hills to better characterize subsurface conditions including ground ice conditions where there is a potential for ice-rich soils. Please also describe how the results of these investigations will be utilized in route selection and associated mitigation and environmental management plans.

(ii) Please provide any further information on any analysis conducted to determine the most probable period for construction and operation of the access road.

(iii) Please describe any plans to ensure that impacts to the ground surface (including damage to the organic layer) are minimized during periods of thin snow cover conditions.

See also DFO IR 2-5 and Parks Canada 2-1

IR Number: NRCan 2-2

Source: Natural Resources Canada – Earth Science Sector

To: Canadian Zinc Corporation (CZN)

Subject: Stability of the Water Storage Pond (WSP)

References:
TOR: 3.2.4, 3.2.5, 3.3.1, 3.3.2, 3.3.7

DAR: Main Report section 4.12.3, 4.12.4, 6.3.7, 6.16, 6.17, 8.7, 8.8.1, 8.8.3, 9.2, Appendices 12 and 16, DAR Addendum sections 3 and 7.3, Addendum Appendix B
Response to NRCan IR 1-12, INAC IR 1-2, Environment Canada IR 1-13, Parks Canada IR 1-41, Proponent's Response Appendix D, Transcripts Technical Meeting Oct 8 pg 21-29

Preamble:
The Proponent has provided (App. D) a report by BGC (1995) which includes additional information on subsurface conditions in the vicinity of the WSP including the north slope and an assessment of slope stability conditions. This report has addressed NRCan's request for further information and has been useful in providing a better understanding of the terrain stability conditions at the project site. This report indicates that the slopes have performed poorly in the past and instability in the back slope resulted in distortion and tearing of the synthetic liner. Heavy precipitation and melting of a deeper than average snow pack led to continuous shallow failures upstream of the perimeter dyke in 1982. Data collected for a short period following inclinometer casing installation in 1994 indicates movement of several millimetres per year with significant deformation of the casings occurring following those measurements making it impossible for the probe to penetrate the entire length. Limited measurements from new inclinometer casings installed recently also appear to indicate similar movements. The information provided would seem to indicate that significant deformation of the north slope is possible and that further monitoring would be recommended. During the technical meeting the Proponent indicated that further investigations (including borehole drilling) of the north slope would be done prior to final design to better determine the extent of the clay layer. NRCan suggests that these investigations will also allow the Proponent to determine whether permafrost still exists at the site and whether degrading permafrost may still be a factor at some locations as it has been in the past resulting in failures observed in the backslope (BGC 1995). The Proponent has also indicated that additional piezometers and slope inclinometers will be installed prior to final design. The information acquired through ongoing monitoring of this instrumentation will be useful in determining whether slope movements are increasing and for planning mitigation. It would be useful if the Proponent could indicate how this information will be utilized to determine when mitigation will be required including the criteria for intervention.

NRCan also requested information regarding how extreme events such as high rainfall or excessive snow melt have been incorporated in the stability analysis and design of the WSP (including stability of north slope). From the information in the BGC (1995) report it appears that high rainfall and excessive snow melt in the past have been a factor in the poor performance of the slopes. The proponent has indicated that extreme events have been incorporated into the stability analysis. They have provided some information on design features and also on a monitoring plan. The proposed design appears to be reasonable, however it is not clear how design values with respect to extreme events have been determined.

Request:

(i) Please indicate how information acquired from ongoing monitoring of piezometers and slope inclinometers will be utilized to determine when mitigation will be required to deal with potential instabilities of the north slope, including definition of criteria for intervention and for selection of mitigation options.

(ii) Please provide any further information on the design values with respect to extreme events (rainfall, snow melt) utilized for stability analysis and design of diversion structures.

IR Number: NRCan 2-3

Source: Natural Resources Canada – Earth Science Sector

To: Canadian Zinc Corporation (CZN)

Subject: Design values (flood data, climate data) for mine components

References:
TOR: 3.2.4, 3.3.2, 3.3.7
Project Description Report: Sections 3.1 and 4.8.3 and Appendix B
DAR: Main Report section 4.3, 4.4, 8.7 and 8.8; DAR Appendices 9, 11,12, 16 18, 20, 22
DAR Addendum: Sections 2 and 3
Response to NRCan IR 1-10, INAC IR 1-2, Parks IR 1-40, 1-42, Environment Canada IR 1-13, MVRB IR 1-3, 1-4, Proponent's Response Appendices D and Q
Transcripts Technical Meeting Oct. 8 pg 18-79

Preamble:
NRCan requested (NRCan IR 1-10) further information regarding the climate data utilized for design of project components such as the water storage pond, water diversion and retention structures. NRCan also requested information regarding how climate variability and extreme events were included in the design of project components. The Proponent provided additional information in its response to NRCan IR 1-10, as well as responses to IRs from other parties, and there was further discussion of these issues during the technical session on Oct 8.

NRCan agrees with the Proponent that records for project site climate data are generally short for most resource development projects which is the reason that the site climatology must be developed from records from regional stations. In its request NRCan was seeking a better understanding of the data sources utilized and the analysis performed to develop the site climatology that the Proponent utilized in the impact assessment and design of project components. The Proponent has indicated that a detailed analysis of site climatology was not required as design of diversion structures for the Waste Rock Pile (WRP) and the Water Supply Pond (WSP) and the water balance for the WSP are relatively insensitive to climate. The Proponent acknowledges that it has made assumptions regarding climatic variables and that these have been conservative. The 16 year record of monthly flows recorded for Prairie Creek has been used in the impact assessment of proposed discharges, and in the design of water management plans. The Proponent has indicated that no significant issues have been noted in 20 years of performance observations of structures.

NRCan is in some agreement with the Proponent that some components may be less sensitive to climate and that utilization of conservative assumptions can ensure that structures are designed to maintain their integrity and minimize impacts. There have however been some reports of the impact of extreme events on project components. In their report (provided in App. D) on Tailings Pond Design, Bruce Geotechnical Consultants (1996) commented that continuous shallow failures upstream of the perimeter dyke in 1982 were likely due to heavy rain and melting of thicker than average snow pack. In response for MVRB IR 4 on the subject of the flood protection dyke, NHC (App. Q) indicates that a flood in July 2006 was responsible for rip rap displacement along the berm. This event followed a heavy 24 hour rainfall and the flood was the largest flow in 30 years (since 1978) and was likely comparable to the peak flow recorded in 1977. Both examples show the importance of having adequate knowledge of climate variability and for accounting for uncertainties especially where only short records exist which may not adequately capture the range in conditions that may occur. Difficulties also arise in the determination of design floods including Probable Maximum Flood because the calculation of flows of a return period of 100 years or longer requires extrapolation of a much shorter data record. The July 2006 event for example, was not included in the analysis conducted to determine whether the height of the flood protection dyke is adequate. It would be useful to incorporate more recent data into the analysis to determine whether there would be any significant change in the magnitude of the design flood for the flood protection dyke.

The Proponent provided to NRCan (Oct. 19) further information on data records utilized in analysis which included two graphs showing normalized maximum daily discharge and annual

runoff for 4 locations. It is not clear whether there is any significant trend in the daily maximum discharge record that could be related to for example, increases in the magnitude of extreme rainfall events. Continuation of an upward trend may mean that higher flows occur more frequently over time which could have implications for performance of mine components, such as the flood protection dyke, over the intended project life.

Request:

(i) Please provide any additional information regarding how incorporation of more recent data including the 2006 event may affect the design values for project components (e.g. design flood for flood protection dyke) and how this information may be incorporated into final design of project components.

(ii) Please clarify if any analysis has been conducted to determine whether there is a significant trend in daily maximum discharge, magnitude of extreme rainfall events and if there are significant trends, comment on the implications of increasing values over the project life for project design and operation.

IR Number: NRCan 2-4

Source: Natural Resources Canada – Minerals and Metals Sector

To: Canadian Zinc Corporation (CZN)

Subject: Waste Rock Management

References: DAR Appendices 22 and 27, Response to Parks Canada IR 1-42

Preamble:
The waste rock would be deposited in a designed waste rock pile (WRP) on the north slope of the Harrison Creek valley, approximately 400 m north of the 930 portal. The organic soil cover and overburden from the designated WRP area would be stripped to bedrock. Part of the overburden material would be used for construction of a lined seepage collection pond and berms for collecting drainages from the waste rock pile. At closure, the pile would be covered with a suitable cover material to minimize precipitation infiltration and, hence, drainage from the site. Response from the proponent is sought on the following items

Request:

(i) Prior to placement of the waste rock and other solid wastes in WRP, would the exposed WRP bedrock pad be cleaned and any major cracks sealed to minimize seepage loss to the Harrison Creek Alluvial Aquifer (HCAA) below?

(ii) In the WRP cover model simulations for closeout (DAR Appendix #22), two cover systems consisting of a 2 m granular till and a combination of 0.5 m compacted clayey till and 1.5 m granular till were evaluated. The cover systems reduced the annual net percolation through the pile by approximately 34% – 40% and by 42 - 50%, respectively, with both ponding of water on the cover layer and without in comparison to the bare waste rock as cover. In the conceptual closeout scenario (DAR Appendix #27) placing of only a 20 cm soil amendment layer as a suitable growth media is considered.This discrepancy needs to be resolved in terms of cover selection criteria and the anticipated benefits in terms of overall improvement in the drainage water quality from WRP upon closure.

(iii) Consideration should also be given to the predictive modelling of post closure drainage water quality from WRP in terms of both short term (5-10 y) and long term (10 y +) time frame and the need for collection and treatment of the WRP drainage, if any.

IR Number: NRCan 2-5

Source: Natural Resources Canada – Minerals and Metals Sector

To: Canadian Zinc Corporation (CZN)

Subject: Paste Backfill

References: Response to Parks Canada IR 1-19, 1-21, 1-28, 1-35 and NRCan IR 1-2(8); Appendix I to the CZN IR Response; Technical Meeting Day 3 Transcript, pp. 48-61

Preamble:

The mill tailings, as produced, together with approximately 75% of the DMS float rock, as aggregates, and mixed with 1-3% cement would be placed back underground as paste backfill in mined out stopes. The paste backfill placement would use a combination of haul trucks and pumping methods to fill the available void space with appropriate bulkheads for retention of the fill.

Request:

(i) Certain operational information was explained during the technical sessions in discussions between consultants to the proponent and consultants to the parties. Among the points of interest to NRCan, we are interested in the following areas: whether the proposed paste backfill cement content provides the required trafficability / load bearing strength for equipment mobility within a reasonable time; if the solid content would permit pumping of the paste to the desired locations; and, whether booster pumps, back-up units or lowering of the solids content would be needed to meet pumping requirements.

(ii) “Appendix 1” to Appendix I was not included in the CZN IR responses.

IR Number: NRCan 2-6

Source: Natural Resources Canada – Minerals and Metals Sector

To: Canadian Zinc Corporation (CZN)

Subject: Effluent Treatment and Post Closure Water Quality

References: Responses to Parks Canada IR 1-21, 1-22, 1-23, 1-25, 1-26, 1-45 , 1-46, and 1-47 and INAC IR 1-07, 1-08, and 1-09

Preamble:
The expected Se concentration in the treated process water is reported to be high at approximately 0.039 mg/L in comparison to both CCME and site specific SRC water quality objectives.

Request:
Are these concentrations expected to remain elevated through both operational and closure periods or better treatment technologies, if any, would be implemented to lower them to meet the stated water quality objectives?

Preamble:
Post closure drainages from WRP, vein fault zones and backfilled mine are expected to have elevated Zn concentrations of ~ 30,000 µg/L, 1,185 µg/L and 1,300 µg/L, respectively, with estimated average discharge flow rates of ~ 0.14 L/s, 2.9 L/s and 2.1 L/s.

Requests:

(i) What is the expected time frame for these elevated Zn levels to continue and the anticipated treatment requirements, if any?

(ii) What are the management and disposal plans for the effluent treatment sludge generated during both operational and post closure phases?

(iii) CZN is proposing a different regulatory approach for the water license to include the expected water quality exceedences during both operational and post closure phases? What is the expected timeframe for post closure collection and treatment of effluents from all sources, and the cut-off water quality requirements for no further treatment?

(iv) Zn and Cd levels in the Prairie Creek are reported to be further reduced by the natural attenuation processes in the creek. Have these natural attenuation processes/compartments been identified and what are the expected overall and seasonal removal efficiencies? Any supporting documents or test results to these effects should be provided.