EA0809-002

Summary Report
Prairie Creek Mine – Canadian Zinc Corporation Technical Meeting
Tuesday April 12, 2011
8:50am to 5:00 pm
Tree of Peace – Yellowknife

Participants[1]

Review Board staff: Chuck Hubert (facilitator), Darha Phillpot, Martin Haefele
CZN: Alan Taylor, David Harpley, John Wilcockson (Hatfield), Martin Davies (Hatfield), Byard McLean (SNC Lavallin), Gary Van Der Vinne (Northwest Hydraulic Consultants)
NDDB: Peter Redvers (Cross Current Associates), Caroline LaFontaine (Cross Current Associates)
Parks Canada: Mike Suitor, Jamie VanGluck
GNWT: Jessica Budgell (ITI), Glenn Sorensen (ITI), Nik Larter (ENR), Michael Ball (Finance), Laurie Gravelines (Finance), Gavin More (ENR), Erika Nyyssonen (ENR),
MVLWB: Rebecca Chouinard. Kathleen Graham
WLWB: Kathleen Racher
DFN: Jonas Antoine, Joe Acorn (consultant)
NPMO: Kate Weatherly, Matt Spence,
Environment Canada: Jane Fitzgerald
CPAWS: Kris Brekke
INAC: Nathan Ritchea, Paul Green, Krystal Thompson, Barry Zajdlik (Zajdlik & Associates), John Brodie, David Jessiman, Tracy Covey, Jennifer Potten,
NRCAN: John Clarke (teleconference), Rob Johnstone, Fons Schellekens
DFO: Sarah Olivier, Lorraine Sawdon,
Transport Canada: Chris Aguirre
Department of Justice: Ramona Sladic

Introduction:

- The meeting commenced shortly after 9am. Martin Haefele, manager with MVEIRB, welcomed the group and explained that the purpose of the meeting is 1) for parties to obtain information from CZN that they need to write technical reports and 2) to clarify any discrepancies or perceived discrepancies. Review Board Staff Chuck Hubert facilitated the session and Darha Phillpot was note taker. This report is intended as a summary of key points of discussion, questions and clarifications from parties, and commitments made by the developer. The summary report is organized by subject area, rather than chronologically by discussion. A list of the developers commitments for further information is found at the end of the summary report.

Water Quality

- John Wilcockson, consultant for CZN provided an overview of the toxicity testing program and results, as reported in Toxicity Testing on Synthetic Effluent Samples, Final Toxicity Test Report. Acute toxicity testing for Rainbow Trout and Daphnia Magna and sub-lethal/chronic toxicity testing for C. Daphnia and Duckweed using two mixtures: a 4:1 and 8:1 ratio of treated mine

[1] NB: this may not be a comprehensive list of all participants at the meeting as individuals came and went throughout the day.

water to treated process water. Testing used both PC water and lab water in samples. Testing found:

- Acute toxicity to Daphnia Magna but not Rainbow Trout
- Chronic toxicity to C. Daphnia at 5% concentration
- Unexpected result that reduced concentrations caused increased effects.

Subsequent Toxicity Identification Evaluation (TIE) was done to determine the cause of toxicity, however they were unable to positively determine the cause. It is suspected that it may be a result of lab processes. Metals and organic compounds were ruled out. Sulphate and ion toxicity are identified as potential causes.

- CZN consultants clarified that the water ratios were selected for toxicity testing to simulate expected operational effluent discharge at end of pipe. 4:1 Mine Water (MW): Process Water (PW) was selected as worst case scenario, and 8:1 MW:PW as best estimate ratio, however actual discharge will depend on mine water seepage, which is at this point unknown. The TIE focused on PW as it was found to be contributing to toxicity. Prairie Creek water was used to dilute to simulate downstream conditions.
- CZN consultants clarified why predicted concentrations of analytes of concern (AOCs) increase with Extreme Mine Seepage Scenario (e.g., Appendix D, Table 6) . This is due to the high volume of MW discharged relative to Prairie Creek. Although MW has lower concentrations of AOCs than PW, PW has higher concentrations than Prairie Creek water. Extreme volumes of MW seepage will therefore raise overall concentrations, even though volumes of process water remain constant.
- PC asked if based on the toxicity testing results, CZN thought there was need to re-evaluate the site specific water quality objectives (SSWQOs)? CZN consultants responded no, because metals are not the concern. Although the cause of toxicity has not been identified, they have eliminated the possibility of mercury and toxicity was not observed for fish. Some unexplained toxicity may be ion toxicity as a result of the lab environment or a greater addition of sulphide during testing than would occur during operations. CZN is confident proposed SSWQO are sound and will continue to test during start-up phase of the mine, where tests can be repeated without the lab environment, and with greater aging of water. Limiting factor for doing additional toxicity tests is the time that it takes to obtain a representative sample, and to replicate the on-site water aging process. It was explained that oxidation and precipitation are the primary aging reactions.
- Review Board staff noted that lack of clarity about the cause of the toxicity (i.e., the effluent or something else) may make it difficult for parties to confidently say that the development will not cause significant adverse effects. Without evidence of the cause of toxicity it may be difficult for parties to defend a finding of no significant impacts.
- CZN clarified that the 5% concentration showed no toxicity on C. Daphnia after a month, which indicates that aging mitigates toxicity. The 1 month aged sample is more representative of what will be discharged. The 5% is also a higher percentage than at the boundary of the IDZ. CZN referred parties to table 5 Appendix D which shows predicted concentration of effluent downstream. CZN commented that the TIE points to toxicity in PW, not mine water, therefore low mine-water estimates are where we could expect higher concentrations of PW in stream. March is the only month that approaches 5%, but expected concentrations in the stream would be well below the level where toxicity was found. Higher concentrations would be composed mostly of mine water where AOC concentrations were lower.

- CZN discussed the implications of the age of the water sample i.e., consequences are more significant for biodegradable organic AOCs found in pulp and paper effluent than metals and ions, which are less likely to disappear. There is potentially more precipitation out of the solution. TIE is an iterative process and there are challenges in comparing across tests done at different times. CZN suggests aged samples are more representative of expected effluent. CZN committed to provide written details about time periods between first and second set of TIE tests i.e., dates for each test. No further toxicity testing of effluent is proposed.
- A potential transcription error was identified on Table F5, Appendix F for treated mine water during low flows (8L/s rather than 80L/s). CZN committed to review this including implications to Appendix D, Tables 5 and 8.
- DFO noted that absence of toxicity to fish does not necessarily mean no adverse effect to fish. Acute and chronic toxicity for C. Daphnia and Daphnia Magna has been identified, and therefore concerns about potential impacts to the aquatic ecosystem, to which fish belong, should be further investigated. DFO encourages further testing. Waiting for mine start-up to determine if sulfate is the cause of toxicity is not acceptable given the sensitivity of the area (e.g., species of fish may be at risk, the national park downstream, etc). A precautionary approach is required.
- CZN was asked to further elaborate on corrective actions (contingency plans) that could be taken if upon operation, effluent toxicity is found.CZN responded that they have the ability to manipulate the flow rate of discharge water. The possibility exists to stop process water discharge altogether beyond the current plan not to discharge process water in February and March.
- CZN clarified that 'abnormally low flow' was the lowest monthly flow recorded in 16 years on Praire Creek. CZ committed to provide analysis of the likelihood of the return period for 1 in 16 year low flow.
- CZN clarified that the ditch water run-off was considered in the 8:1 mixture, they noted that there was no expectation that changes in air-quality upon mine start-up will have significant impact on the ditch run-off water quality.
- CZN clarified that they do not expect that there will be any leaching of metals from tailings stored in cell A of WSP.
- CZN was asked what degree of certainty or comfort they could provide to the community of Nahanni Butte re: impacts of effluent discharge into PC. CZN noted that in their extreme case scenario (4:1) there was some uncertainty about toxicity to D Magna but for the expected best case scenario (8:1) they do not expect to see toxicity to any species.
- PC asked if there would be an ecological consequence to exceeding the proposed SSWQO for mercury, zinc and cadmium as predicted for certain months if effluent were discharged with maximum permitted concentrations (Appendix D Table 8). CZN noted the challenge of using one EQC for all seasons. CZN responded that there would be no direct toxicity concerns for mercury, but there may be potential bioaccumulation issues. Mercury and cadmium are below observed effects level for safety as identified in the literature. CZN noted that predictions of the effects of mercury are a challenge due to the detection limits. High calcium (hardness) values in Prairie Creek will minimize ecological effects of zinc. INAC consultant questioned assumptions made in the modeling, stated concern with benchmark data and expressed concern with number of detection limits.
- No additional mine effluent treatment is planned. Contingency plan is to hold PW during low flows. Monitoring will be conducted, and if exceedences are detected effluent will be held and not discharged. CZN agreed to provide additional analysis of the consequences of SSWQO for Cadmium, Zinc, and Mercury.

- Parties discussed specific EQCs that don't meet SSWQOs. Parties were reminded by Land and Water Board staff that the EQCs will be determined during the regulatory phase. The important questions to be addressed during the EA are: are the SSWQO acceptable? What are the mechanisms to achieve them? Can they be met?
- CZN was asked to justify why additional on-site water treatment is not being considered to bring effluent quality closer to background levels, and to explain barriers to upgrading the WTP? CZN noted that the current system is adequate and that mining best management practices are being followed.
- Parties raised concerns about the IDZs potential to impede safe passage of fish and/or interrupt crucial spawning. Specifically:
    - The cross sectional volume of the discharge flow area relative to Prairie Creek is currently not known. CZN agreed to provide this information.
    - Mixing Zone will block passage to funeral creek upstream of the mine where bull trout spawning does occur due to the placement of the exfiltration trench.
- Parties and CZN discussed the sequence of steps to be followed should EQC not be met. CZN noted that the first step is to contact regulators and then the process that unfolds depends on the circumstances. Response would differ depending upon context. Standard approach is 1) Contact, 2) Confirm, 3) Address. Parties were concerned that the first step was not to stop discharge immediately until such time that toxicity testing can confirm, given the sensitivities of the location. They further noted that halting discharge would have a bearing on the storage capacity.
- INAC questioned if high volume of treatment could lead to increased frequency of plant upsets or increased need for maintenance e.g., in June or July where plant is treating 160 L/s in a possible scenario. CZN responded that plant maintenance would not require holding high volumes of water. Agitators can be changed over in 1.5 hours, there are back up pumps, and any WTP maintenance will be done during winter months. Current treatment capacity is 100 L/s and it could easily be expanded to 200 L/s. The sulphide treatment stage in the WTP (treats process water only) has a capacity of 11 or 12 L/s, and could also be expanded by adding another tank. The plant should be functional 98% of the time.
- Parties questioned if deposition of sediment has been considered within and outside of the IDZ. CZN responded that the clarifier will remove most particulates and suspended solids. Treatment of mercury occurs during both WTP process stages during clarification.
- Environment Canada requested information about the expected effluent output from the sewage treatment plant. CZN agreed to provide this.
- Parties and CZN discussed the method to selection of SSWQO (i.e., CCME, water effects ratio, Northern Species Sensitivity Distribution Approach, toxicity testing). Parties raised concern that the approach appears to be that if the CCME benchmark could not be met, that they would look for another benchmark rather than consider a different treatment option, leading to increasingly higher concentrations. CZN disagreed stating that CCME was based on a safety factor.
- Parties requested additional information about CZN prediction of mild nutrient enrichment in downstream environment during operations. CZN agreed to provide.

Exfiltration trench

- CZN noted that the exfiltration trench design significantly changes and improves vertical mixing expectations for dilution (Appendix L Table 3). The design was selected to improve distribution of effluent across the channel. Pipe in the trench will be gravity fed, however pumps will be

used for back up. 2 pipes of different lengths but same diameter will be installed. The second pipe will provide back-up.

- CZN committed to provide additional analysis on the velocity of the effluent discharge for each exfiltration pipe, and the projected velocity increase at the boundary of the IDZ as result of flow and effluent for each of the modeling scenarios.
- CZN confirmed that plume modeling assumed equal flow rate through all slots, because it assumes that pressure will equalize as effluent moves through the sediment.
- Parties pointed to lack of analysis on potential impacts of effluent on fish and fish habitat. The analysis of downstream mixing does not address the impacts to the biota within the IDZ and further downstream. Specific areas of potential concern include: migration of Bull Trout to Funeral creek may be inhibited by exfiltration effluent; whitefish spawning above trench; Prairie Creek as potential overwintering habitat for bull trout; bioaccumulation of mercury within IDZ and further downstream, bioaccumulation of mercury in Grayling at the mouth of Prairie Creek where Nahanni Butte members harvest.
- Parties commented that the model shows that the trench works well for nearfileld mixing but concerns remain about complete mixing (e.g., model shows objectives are not met, at 30m, 100m, or at the Park Boundary). There remain outstanding questions and concerns about how far downstream there will be impacts? How much change is acceptable in the downstream environment (e.g., in a National Park and UNESCO site) is key to setting objectives.
- CZN confirmed a commitment to a second pipe.
- CZN confirmed that construction/installation of the exfiltration pipe would occur during the timing window acceptable to DFO
- CZN noted that the design is such that extreme flood events would not damage the exfiltration pipe.
- CZN stated that the the exfiltration pipe is designed not to fail, therefore excavation for maintenance would not be required. As a contingency, however, if maintenance would be required i.e., a pipe became blocked CZN would 1) use a pump to discharge any sediment from pipe, 2) use air bubbler to clear up substrate and sediment surrounding pipe 3) use the second pipe.

Water management

- CZN explained that the change to water storage pond was made to allow greater flexibility and to maximize recycling of water. Separate cells allow for more control of water blend.
- CZN clarified that the dykes need to be rebuilt and all berms will be leveled to a consistent elevation of 881m including the berm closest to Prairie Creek. Using this elevation the storage volumes in the WSP are as indicated in the submission.
- Parties raised concerns about potential impacts of the work planned to stabilize the WSP (i.e., placement of the fill apron) on water storage volumes. CZN noted that the stability apron (buttress) will have no effect on available water storage volumes as the apron is at least 1 meter below the proposed minimum design pond elevation of 877m.
- Parties questioned if the 10,000m^3 contingency would be sufficient over during the 4-5 month period during winter when water level in the WSP would be increasing.
- CZN clarified that minimum pond elevation of 877 m is the project design with a conservative safety factor for slope stability (DAR Appendix 12) but that the slope would still be stable at 876 m.
- CZN plans to be at the lowest end of storage volumes at the end of summer to allow for maximum storage over the winter.

- CZN noted that conceptually there are three options/factors that would increase the stability of the pond, therefore providing the option to reduce water levels further. These include:
    - If the clay layer is determined to be more stable than curret estimates
    - If the buttress or apron could be made thicker
    - Or if more material could be removed from the back slope than currently proposed i.e., removing the slope to bedrock where it would be more stable.
- CZN was asked if under all circumstances they would have the capacity to store water long enough that SSWQO can be met at the end of the IDZ. CZN noted that they have the capacity to store for 4-5 months. Mine water must be treated and discharged continually because of high volumes, but process water can be stored.
- Contingency plans in the event that SSWQO are not met in IDZ are:
  1) to increase the proportion of mine water fed into the Mill,
  2) process water returned to the pond (i.e. recycle), or
  3) stop the mill and stop creating process water if storage not available in WSP

Tailings Management

- Parties reviewed and discussed CZNs estimations of available void space available for tailings backfill. Parties reviewed differences in calculation of available void space, specifically estimations of the stope void. CZN and INAC determined that differences in calculation were due to INAC assumption that all DMS rock would be stored underground, whereas CZN intends to send 1/3 of total of DMS rock to the waste rock pile on surface. CZN agreed to provide additional information about volume of DMS waste rock diverted to waste rock pile.
- The parties discussed the sequencing backfill operation i.e., initial mining to create space while tailings are stored in the WSP, followed by cemented paste backfill. The lag i.e., amount needed to be stored on surface in the WSP at any given time is 50,000m^3. Once the past plant is running, backfill will be transported underground either by truck and or by pump and pipeline.
- CZN noted that if the paste plant were to cease operations temporarily, there would be temporary storage for tailings next to the mill, and therefore no need to stop operations.

Commitments table

- Parties and CZN discussed the commitments table recently provided by CZN. Parties stated expectation of a more detailed and thorough table of commitments with cross references identifying where a given commitment was made (e.g., DAR, information request responses, technical session transcripts etc.). Parties agreed to provide comments on specific wording of current commitments table by Friday April 15th.

Concluding remarks and next steps

- Some parties noted that that despite discussions that there was still not enough information available to base their conclusions about significance of impacts to receiving environment.
- Review Board facilitator encouraged additional meetings between parties to address outstanding concerns and asked that a summary of outcomes of those meetings be provided for the public registry.

List of commitments

1. Review of error on Table F5, Appendix F for treated mine water during low flows (8L/s rather than 80L/s), including implications to Appendix D, Tables 5 and 8.

2. Analysis of the likelihood of the return period for the documented 1 in 16 year Prairie Creek low flow.
3. Time periods between first and second set of TIE tests i.e., dates for each test.
4. Tailings management: volume of DMS waste rock diverted to waste rock pile.
5. Document that consolidates PC Mine operation contingency plans currently that are dispersed throughout the DAR and IR Responses.
6. A) Velocity of the effluent discharge for each exfiltration pipes. B) For each of the modeling scenarios (max, mean and minimum open water and max, mean, and minimum ice cover), the projected velocity increase at the boundary of the IDZ as result of flow and effluent.
7. Review of transcription error in Appendix L, table 1 (i.e., mean depth and max depth) and any implications this error may have to modeling.
8. Background information about use of the exfiltration discharge design elsewhere
9. Cross sectional value of the discharge flow area relative to Prairie Creek as a whole for each flow scenarios (max, mean and minimum open water and max, mean, and minimum ice cover).
10. Expected effluent output parameters from the sewage treatment plant.
11. Examine Northern Species Sensitivity Distribution Approach to establishing SSWQO for Copper, Cadmium Zinc, Mercury for fish relative to the general guidelines.
12. Predictions of impacts of nutrient enrichment to the receiving environment.
13. Ecological consequences of SSWQO for Cadmium, Zinc, and Mercury.
14. Update March 22nd Commitments Table including a more thorough listing and cross referencing of commitments from source documents.