

Review Comment Table

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| Board: | MVLWB |
| Review Item: | Prairie Creek Mine - Mineral Exploration - Type B Licence Amendment Request (MV2019L2-0006) |
| File(s): | MV2019L2-0006 |
| Proponent: | CanZinc Corporation |
| Document(s): | Application for Licence Amendment and SNP Change (3.79 MB) Effluent Treatment Plan Version 3.1 (2.42 MB) Minewater Treatment Contingency Plan Version 3.1 (235.87) |
| Item For Review Distributed On: | Jan 18 at 16:44 Distribution List |
| Reviewer Comments Due By: | Feb 9, 2021 |
| Proponent Responses Due By: | Feb 17, 2021 |
| Item Description: | <p>February 16, 2021- Canadian Zinc Corporation requested and was granted a one-day extension to the Proponent Responses End Date. The responses are now due on February 17, 2021.</p> <hr/> <p>Canadian Zinc Corporation (the Applicant) submitted a complete application to amend Water Licence (Licence) MV2019L2-0006. The Applicant is requesting to amend the effluent quality criteria (EQC) in the Licence (Part E, Condition 16). Specifically, the Applicant has requested that: the EQC for total zinc be changed to dissolved zinc; the EQC for total petroleum hydrocarbons (TPH) be changed to extractable petroleum hydrocarbons (EPH); and the EQC for ammonia and TPH only apply when underground activities are occurring. The Applicant is also requesting Surveillance Network Program (SNP) changes to the Licence. Specifically, the Applicant has requested that: hardness, dissolved organic carbon (DOC), and dissolved zinc be added to the sampling parameters for a new Prairie Creek downstream SNP station; that SNP station 3-11 be closed (downstream from the confluence of Prairie Creek and Harrison Creek); and that the requirement to measure Benzene, Toluene, Ethyl benzene, and Xylene (BTEX) be deleted for SNP station 3-12 (Tank Farm dewatering Discharge).</p> <p>The Applicant has requested an exemption from preliminary screening because the Applicant believes that the development, or a part thereof, has not been modified since it was previously licenced.</p> <p>Using the Online Review System (ORS), reviewers are invited to submit comments and recommendations on the documents linked below by the review comment deadline specified. Reviewers may also wish to consider providing an overarching recommendation regarding whether the Board should approve the</p> |

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| submission, to provide context for the comments and recommendations and assist the Board with its decision. Notices of intent to file a claim for water compensation must also be submitted by the review comment deadline. If reviewers seek clarification on the submission, they are encouraged to correspond directly with the Applicant prior to submitting comments and recommendations. | <p>Board staff agree the amendment Application may be exempt from preliminary screening in accordance with the Exemption List Regulations. If you believe that a preliminary screening is required, please describe your rationale and provide comments and recommendations (e.g., on impacts and mitigation measures) to assist with the Board’s preliminary screening determination.</p> <p>Please be advised that comments made by reviewers regarding impacts of this proposed amendment to wildlife and wildlife habitat in this preliminary screening will inform the GNWT Minister of Environment and Natural Resources’ determination regarding whether a Wildlife Management and Monitoring Plan will be required for this project as per section 95 of the Wildlife Act.</p> <p>All documents that have been uploaded to this review are also available on our public Registry. If you have any questions or comments about the ORS or this review, please contact Board staff identified below.</p> |
| Contact Information: | <p>Andy Wheeler 867.766.7467 Jacqueline Ho 867-766-7455 Jen Potten 867-766-7468 Kim Murray (867) 766-7458</p> |

Comment Summary

| CanZinc Corporation (Proponent) | | | |
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| ID | Topic | Reviewer Comment/Recommendation | Proponent Response |
| 1 | General File | Comment (doc) Letter Recommendation | |
| Acho Dene Koe First Nation: Scott Mackay | | | |
| ID | Topic | Reviewer Comment/Recommendation | Proponent Response |
| 1 | License Amendment and SNP Change Table 1: Prairie Creek Dissolved Zinc Actual and Calculated Guideline Concentrations | Comment As noted in ADKFN’s preliminary concern #1 in the letter to CZN on dated December 18, 2020, ADKFN is concerned with the solubility of solid phase zinc discharged from the mine site, and the potential implications for fish downstream of the project, especially on bull trout and other sensitive fish species important to ADKFN members. The Proponent | Feb 17: We believe that the proposed amendment will continue to protect aquatic life in the downstream environment. It is important to keep in mind that granting our request to change the EQC from Total Zinc to Dissolved Zinc will not change anything on site. For example, this change will not change the quality of the mine water coming |

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| | | <p>has stated that they have addressed ADKFN's concern of zinc solubility without providing any analytical results to support their claim. ADKFN would consider this concern addressed when analytical results and modelling demonstrate CZN's claims regrading solid phase solubility in the downstream environment.</p> <p>Recommendation The Proponent should provide the total zinc values in addition to dissolved zinc values at station 3-11 and continue to report both total and dissolved zinc from all SNP stations at all sampling events. To confirm that the solid phase zinc will not be readily soluble upon discharge in Prairie Creek, recommend the Proponent commit to studying the predominant solid phase(s) in which zinc occurs in the effluent as part of their mining and milling operations. The results of this study could better inform risks relative to their zinc effluent criteria.</p> | <p>out of the underground, it will not change our commitment to treating that mine water, it will not change our commitment to optimize the water treatment we already have in place, and it will not change conditions in the receiving environment. The amendment will only change how we are judged to be in compliance with the licence, and we argue that it's a change for the better because now we will be judging things based on using and measuring and monitoring and keeping track of the form of the most toxic form of Zinc. With respect to the concern about the dissolution of Total Zinc downstream of Prairie Creek: as noted above, there is no reason to think conditions in Prairie Creek will change as a result of this amendment. Although we have limited data on Dissolved Zinc concentrations at SNP 3-11, we have provided, in Attachment 1, a graph of nearly two decades of data from an Environment and Climate Change Canada monitoring station about 1.6 km downstream of the Mine. The graph shows that Dissolved Zinc levels have continued to remain below the CCME Guideline at all times. This demonstrates that whatever dissolution processes are taking place in Prairie Creek, there is no evidence that there are adverse impacts to water quality in the creek. These results are not expected to change due to this amendment. We agree that it is reasonable and necessary for us to monitor for both Dissolved and Total Zinc at the downstream station in Prairie Creek. With SNP 3-4 data, we can see how well treatment is working for both forms of Zinc and to track trends in the receiving environment. Lastly,</p> |
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| | | | ADKFN has requested that studies be performed to understand the solubility of Zinc as part of our mining and milling operations. We note we will have more opportunity to discuss these concerns as part of the upcoming process for the mining water licence amendment to accommodate an expansion, but it is worthy of note that the current total zinc issues are related to sulphide treatment, which may not be the case during operations. |
| 2 | License Amendment and SNP Change Table 1: Prairie Creek Dissolved Zinc Actual and Calculated Guideline Concentrations | <p>Comment As noted in ADKFN's preliminary concern #2 in the letter to CZN on dated December 18, 2020, ADKFN is concerned by the fact that the ambient pH in Prairie Creek and the induced hardness in the polishing pond discharge exceed the range at which the formula to determine the zinc water quality guideline applies. ADKFN are concerned with potential effects on fish that our members consume given the limitations of the most up to date scientific literature on zinc toxicity. Considering the potential long term effects to our members, we consider the most conservative approach to be the most appropriate to be protective of the fish and wildlife that our members consume, and consequently the health of our members.</p> <p>Recommendation The Proponent should use the most conservative value for zinc criteria in circumstances where constituent parameters for the zinc water quality guideline are outside the range at which the formula applies.</p> | <p>Feb 17: The CCME equation for the Dissolved Zinc water quality guideline was derived using data in the pH range of 6.5 to 8.13. If we use pH values that are outside the pH range of the underlying data, then we are making an assumption without supporting evidence. We believe that using a pH of 8.13 is more correct. That said, a graph is provided in Attachment 1 of the uploaded letter of Dissolved Zinc versus the CCME guideline calculated both ways - that is, calculated using ambient pH and calculated using a maximum pH of 8.13. As shown in the graph, historic Dissolved Zinc levels have remained below the guideline value no matter which pH value is used. As noted in our response to ADKFN-1, there is no reason to assume conditions in Prairie Creek will change as a result of this amendment.</p> |
| 3 | License Amendment and SNP Change - Setting EQC For Exploration Licenses | <p>Comment The Proponent has requested the change in Effluent Quality Criteria from total to dissolved zinc for the exploration license but has not indicated whether they will request a similar change for the operational phase of the Project.</p> | <p>Feb 17: While it is unrelated to this review, it is our intension to propose dissolved zinc as a criterion for operations effluent discharge. This would be similarly consistent with current science. We note that operations effluent discharge would</p> |

| | | ADKFN is concerned with the implication this request has for the operations phase of the project, as this changes has potentially greater implications during the operations phase of the project when discharge volumes will be substantially greater and thus the risk to fish that ADKFN members consume on their Traditional Territory is increased. Recommendation The Proponent should confirm whether their intention is to carry forward dissolved zinc as the effluent criterion for the mining and milling water license | still need to meet the criterion, no matter the volume. |
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| 4 | License Amendment and SNP Change - Effects on Harrison Creek | Comment ADKFN is encouraged by the positive results from the 96-hour rainbow trout lethality test using polishing pond discharge water with the highest concentrations of zinc. ADKFN notes that this is an individual sample, and only reflects acute toxicity to fish, not the potential risk for ADKFN members who consume fish that may have higher body burdens of zinc as a consequence of acute exposure to high concentrations of zinc. Recommendation ADKFN request that the updated Aquatic Effects Monitoring Plan for the Project include regular lethality tests that consider both total and dissolved zinc to develop a rigorous database demonstrating effects on salmonids outside of the range at which the zinc water quality formula applies. Future testing should study the increase in body burden of zinc in fish as a consequence of acute exposure to high concentrations of dissolved zinc. | Feb 17: There is no AEMP associated with the exploration Water Licence. Re the operations AEMP design, there will be opportunities to review and discuss this. However, receiving water quality data indicate that there have been no 'high' concentrations of dissolved zinc in Prairie Creek. |
| Environment and Climate Change Canada: Anna Graham | | | |
| ID | Topic | Reviewer Comment/Recommendation | Proponent Response |
| 1 | CZN Licence Amendment and SNP Change Jan 12, 2021 | Comment The colorimetric method of doing zinc field measurements, discussed in the Future On-Site Effluent Monitoring section, does not | Feb 17: We are not aware of a better field measurement method. However, a review of the colourimetric test method (Appendix |

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| | <p>Page 8 SNP Report Dec. 2020 Table 1</p> | <p>consistently measure total metals. Based on the 2020 data reported in the Dec. 2020 SNP Report, which provides concentrations for Total, Dissolved, and Colorimetric zinc, the relationship between total, dissolved and colorimetric data is not consistent. In some cases, the colorimetric data is above both total and dissolved zinc levels, and in one case it is substantially below both. It is possible that the colorimetric meter is not being calibrated and working as designed. ECCC requests a review of field measurement options and issues to identify whether real-time data used for treatment dosing can be improved. Recommendation ECCC recommends review of the options for improving field measurements of zinc concentrations.</p> | <p>F, ETP) indicates that interference is possible on highly buffered water. Compensation can be made by acidifying the sample to pH 4-5. While we believe colourimetry will generally be more accurate on filtered amples, we will evaluate the possible benefit of testing acidified samples also.</p> |
| <p>2</p> | <p>SNP Report Dec. 2020 Table 1</p> | <p>Comment ECCC notes that the dissolved zinc concentrations exceeded the EQC of 0.8 mg/L on four occasions in 2020, and that improved treatment is still required. Given the variable relationship between TSS and zinc (both Total and Dissolved) is it not clear that settling is the only factor affecting treatment . Specifically, elevated dissolved zinc was also measured when TSS was below detection limits, which has not been explained. Based on the 2020 data, there appears to be a very low correlation between TSS and zinc (both Total and Dissolved) concentrations at SNP 3-4. This is consistent with the trial results for the sand filter, which did not consistently reduce zinc levels. Recommendation ECCC recommends that treatment improvements be actively sought and implemented, and that additional treatment not rely solely on settling/removal of particulate matter.</p> | <p>Feb 17: The improvements with respect to dissolved zinc were made last year, and will be made before and after 2021 start-up. See our response to MVLWB 7. Re the comments, dissolved zinc would not be correlated with TSS. Suspended matter is only created in response to treatment. Also, we have not yet trialled a sand filter.</p> |

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| 3 | CZN Licence Amendment and SNP Change Jan 12, 2021 Page 8 Proposed SNP Changes | <p>Comment CZN has proposed replacing the Total Zinc Effluent Quality Criterion (EQC) with Dissolved Zinc. Measurement of total zinc at SNP 3-4 should continue, as well as adding the requirement to measure dissolved zinc at SNP 3-4 and downstream SNP stations to provide information on the fate and behaviour of zinc loadings in the receiving environment. CZN proposes the addition of hardness and Dissolved Organic Carbon to the new downstream station. Currently the licence SNP requirements do not specify these parameters for any of the stations, and it would be useful to have data on these toxicity modifying factors at all stations to allow comparisons to guidelines. ECCC does not disagree with the change in hydrocarbon monitoring requirements for samples originating underground, i.e. monitoring extractible petroleum hydrocarbons (EPH) rather than Total Petroleum Hydrocarbons (TPH). However, at such time as substantial quantities of gasoline are again stored and used on site, TPH should be added back to the SNP to be monitored.</p> <p>Recommendation ECCC recommends the addition of Dissolved Organic Carbon and Hardness as monitored parameters to SNP stations 3-4, 3-5, 3-6, 3-10, and the new downstream SNP Station, and including both dissolved and total zinc at these stations.</p> | <p>Feb 17: We are concerned with the escalation in testing costs. Only those tests that are useful should be included. Re 3-4, 3-5 and the IDZ location, we agree total and dissolved metals are appropriate. Re 3-6, 3-10 and 3-11, these can be dissolved metals only, since total results aren't informative. All samples will include hardness. DOC is only needed on 3-4, 3-5, the IDZ and 3-11. Re hydrocarbons, refer to our responses to ENR 6 and Parks 2.</p> |
| 4 | Replacement of Total Zinc with Dissolved Zinc EQC | <p>Comment ECCC would like to remind CZN that at such time as the project is subject to the Metal and Diamond Mining Effluent Regulations, the standard for zinc in effluent will be for the Total Zinc form.</p> <p>Recommendation Comment, no recommendation</p> | <p>Feb 17: We understand.</p> |
| 5 | Minewater Treatment Contingency Plan V. | <p>Comment The original section 3.1 in V. 3.0 of the MRCP discussed exceedances of the EQC, and noted</p> | <p>Feb 17: Refer to our response to ADKFN 3 in the comments on the ETP/MTCP v3 re system capacity. Re</p> |

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| <p>3.1 Section 3.1 Mitigation of Excess Water</p> | <p>that: "System capacity was increased twice over the period, and we have added additional redundancy since that time to avoid a recurrence." It appears from Section 3.1 in V. 3.1 that the capacity increases were associated with the culvert and reaction tank overflow, but the extent of additional redundancy hasn't been identified, and there is not certainty that further increases will not be necessary. The statement is made that the size of the Polishing Pond remains sufficient to provide settling time within prescribed levels, but ECCC notes that this will have an upper limit. The occurrence of further exceptional precipitation events in conjunction with dewatering of the second decline should be evaluated in respect of the ability to effectively maintain treatment and retention.</p> <p>Recommendation ECCC recommends that treatment capacity limitations be reviewed in advance of the second decline dewatering in the contingency of repeated high rainfall events.</p> | <p>the potential for 'overlap' between 2nd decline dewatering and infiltration from high rainfall events, it is important to recognize that the water source underground is the vein, which is one system. We recognize that decline dewatering will need to be controlled in order not to inundate our management capacity, particularly if it is occurring during high rainfall events.</p> |
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| <p>6 Effluent Treatment Plan V. 3.0 and Minewater Treatment Contingency Plan V. 3.0 - Comments submitted by ECCC http://lwbors.yk.com/LWB_IMS/ReviewComment.aspx?appid=13150</p> | <p>Comment ECCC notes that the comments provided on the previous version of the plans apply to Versions 3.1.</p> <p>Recommendation Comment, no recommendation</p> | |
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GNWT - ENR - EAM (Environmental Assessment and Monitoring): Central Email GNWT

| ID | Topic | Reviewer Comment/Recommendation | Proponent Response |
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| 9 | General File | <p>Comment (doc) ENR Letter with Comments and Recommendations</p> <p>Recommendation</p> | |
| 1 | Topic: Pre-Engagement | <p>Comment ENR was provided a draft application for preliminary review in December 2020 and, in conjunction</p> | <p>Feb 17: We appreciate ENR's review and comments on the draft application.</p> |

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| | | <p>with our consultant, Hutchinson Environmental Services Ltd. (HESL), provided some initial comments and recommendations at that time. As well, ENR and HESL met with CZN on February 8, 2021 during which time CZN provided additional information. ENR appreciates the opportunity to provide comments prior to the formal submission to the Board and some of the references below make reference to these early discussions.</p> <p>Recommendation N/A</p> | |
| 2 | Topic: Acute Lethality | <p>Comment In general, ENR is supportive of the move from total to dissolved zinc as the proposed approach is consistent with that currently taken by CCME. However, it is noted that both the proposed average and maximum dissolved zinc EQCs are above the generic CCME hardness and dissolved organic carbon dependent acute water quality objective for dissolved zinc of 0.037 mg/L. The application provides evidence that the discharges are unlikely to be acutely lethal to rainbow trout. However, it is unclear whether dissolved zinc concentrations up to 0.8 mg/L will be acutely lethal to <i>Daphnia magna</i>. ENR is particularly concerned with <i>Daphnia magna</i> as they are the more sensitive of the two test standard test species to zinc exposures. The CCME zinc water quality objective derivation dataset includes a LC50 of 0.0227 mg/L dissolved zinc for <i>Daphnia magna</i>, and a LC50 of 0.0849 mg/L dissolved zinc for rainbow trout, approximately 4x higher. While it is understood that there will be mixing within the receiving environment related to meeting water quality objectives in Prairie Creek, ENR would like to specify that the requirement that effluent must not be lethal to aquatic life still remains. CZN should provide additional evidence to</p> | <p>Feb 17: Following the amendment, we propose to collect a treated water sample with a dissolved zinc concentration near 0.8 mg/L for toxicity testing. We prefer this approach to a literature review because the latter may not account for synergistic effects or the specific chemistry of Prairie Creek mine water. This approach should also properly reflect how the high water hardness limits toxicity.</p> <p>Feb 17: Thank you for the support.</p> |

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| | | <p>demonstrate that the maximum grab value requested (0.8 mg/L dissolved zinc) will not be acutely lethal to aquatic life.</p> <p>Recommendation 1) While ENR is supportive of the amendment process proceeding, ENR recommends that CZN provide additional evidence following the amendment approval, providing assurances that the maximum grab value requested (0.8 mg/L dissolved zinc) will not be acutely lethal to aquatic life. This evidence may be provided through acute toxicity testing on Daphnia magna and Rainbow Trout using site water near the proposed maximum grab sample EQC, or by citing relevant acute toxicity testing data from the literature that includes reported dissolved organic carbon and hardness representative of site conditions. These data should be provided in addition to the ongoing toxicity testing requirements under the existing Type B Water Licence.</p> | |
| 3 | Topic: Downstream Monitoring | <p>Comment CZN has proposed closing Station 3-11 within Prairie Creek and establishing a new location approximately 100 m downstream from the confluence of Prairie and Harrison creeks to evaluate the influence of project activities on the receiving environment; Harrison Creek conveys effluent from the site to Prairie Creek. This new newly proposed station follows directly from HESL's December 2020 recommendation that CZN "establish a new station 100 m downstream of the confluence between Harrison Creek and Prairie Creek. to evaluate water quality at the edge of the mixing zone." CZN's indicates the proposed new monitoring station will be located on the "eastern side of [Prairie] creek, the same side that Harrison Creek enters from, and so sampling should be representative</p> | |

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| | | <p>of maximum concentrations at that location". ENR confirms the proposed new monitoring location is satisfactory and will achieve the objective of evaluating water quality at the edge of the mixing zone.</p> <p>Recommendation N/A</p> | |
| 4 | <p>Topic: Predicted Dissolved Zinc Concentrations in Prairie Creek Downstream</p> | <p>Comment CZN has updated their approach to predicting water quality in Prairie Creek directly following from recommendations following the December 2020 discussions. Specifically, modeled water quality in Prairie Creek is now provided for a point 100 m downstream of the confluence of Prairie Creek and Harrison Creek, and relies on mixing with only 25% of the available flow in Prairie Creek as a conservative prediction of dilution. This follows the MVLWB/GNWT Guidelines for Effluent Mixing Zones (2017) which recommends that the width of a mixing zone should not exceed the lesser of 100 m and 25% of the width of the stream. These updated predictions are provided in Table 4: Predicted Downstream Concentrations, 3-4 Average Flows (mg/L) and Table 5: Predicted Downstream Concentrations, 90th Percentile 3-4 Flows (mg/L) in the application. ENR is now satisfied with CZN's approach to predicting water quality resulting from discharges to Prairie Creek under the Type B Water Licence. The updated model indicates that predicted downstream dissolved zinc concentrations will remain less than the calculated CCME chronic water quality objective when mixing with only 25% of the available flow in Prairie Creek is assumed, except for November under low flow conditions in Prairie Creek. It is noted that November has the lowest flow in the discharge window covered by the Type B Water Licence. CZN notes that there</p> | <p>Feb 17: The current monitoring frequency is monthly. We propose to increase this to twice per month starting in mid-October. We discussed tracer studies with ENR, and are amenable to a study. A review of conductivities indicates that site discharge (SNP3-5) and Harrison at Prairie (SNP3-6) have conductivities in the range of ~1,000 uS/cm, while Prairie above Harrison is ~500 uS/cm. Therefore, a conductivity survey may be suitable. We will evaluate this on-site prior to the late season period, and if we're not confident it will work, make plans to use dye instead.</p> |

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| | | <p>is "compelling evidence" that greater than 25% of the available flow should be assumed to be available to mixing with the effluent in November, even under low flow conditions. CZN argues that mixing with 50% of the available flow in Prairie Creek at 100 m downstream is more realistic. While CZN has not provided evidence that this will be the case within the application, they have previously stated there are numerous rapids in the watercourse that are likely to induce further mixing. While more thorough mixing within the mixing zone may occur, additional monitoring and adaptive management may be necessary to a) demonstrate the available mixing under different flow regimes and b) ensure compliance with the CCME dissolved zinc water quality objective at the edge of the mixing zone.</p> <p>Recommendation 1) ENR recommends that CZN implement an increased monitoring frequency at the edge of the mixing zone in later October through November to confirm ongoing compliance with the CCME dissolved zinc water quality objective during lower flow periods, and tracer studies (e.g. conductivity or rhodamine dye) to demonstrate that the available mixing exceeds 25% at the 100m AEMP site under low November flow conditions.</p> | |
| 5 | Topic: Future Monitoring | <p>Comment CZN notes their preference to begin evaluating filtered treated water samples using a colourimetric meter rather than the existing approach whereby unfiltered treated water samples are assessed. CZN suggests that this "will render a more reliable indication of water treatment performance than at present". While a shift to colourimetric evaluation of dissolved zinc is supported, it is suggested that CZN: . Reference a valid</p> | <p>Feb 17: We agree to do this using on site colourimetric results and those from the weekly SNP 3-4 samples.</p> |

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| | | <p>methodology for the analysis of dissolved zinc using the existing colourimetric meter; and . Develop a correlation between lab and colourimetric measurements of dissolved zinc to demonstrate the accuracy of the proposed update to the monitoring approach under site specific conditions.</p> <p>Recommendation 1) Regarding the shift to colourimetric evaluation of dissolved zinc, ENR recommends that CZN develop a correlation between lab and colourimetric measurements of dissolved zinc to demonstrate the accuracy of the proposed update to the monitoring approach under site specific conditions.</p> | |
| 6 | Topic: SNP Changes | <p>Comment ENR supports CZN's request to delete the requirement to assess BTEX from Station 3-12, the tank farm, given gasoline is no longer stored at that location. We also support CZN's request to replace the Total Petroleum Hydrocarbons (TPH) EQC with Extractable Petroleum Hydrocarbon (EPH) at Station 3-4 as it is a more appropriate analysis for diesel and oil compounds which may be present on site. However, it is recommended that EPH analysis be refined to include both light and heavy EPH to improve analytical resolution of diesel fuel and heavy oil residuals within Harrison Creek.</p> <p>Recommendation 1) ENR recommends that TPH at Station 3-4 can be replaced by EPH and that EPH analysis be refined to include both light (LEPH) and heavy (HEPH) EPH analysis.</p> | Feb 17: Agreed. |
| 7 | Topic: SNP Changes | <p>Comment CZN has requested that the MVLWB "consider a way to not require [assessment of TPH/EPH and ammonia EQCs] in the absence of underground activities." While we agree that an ammonia EQC may not be necessary in the absence of underground activities,</p> | Feb 17: We agree to accept the <50% of EQC requirement, however the 6 month period is excessive and unnecessary. As explained in our response to MVLWB 17, once the decline is flooded, any blasting residue concentrations will only |

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| | | <p>particularly those associated with blasting, the ongoing use of diesel-powered vehicles and generators necessitates ongoing inclusion of an TPH/EPH EQC. ENR agrees with CZN that, in the absence of a source of ammonia on-site, the MVLWB could consider temporary suspension of the ammonia EQC and associated analytical requirements. It is proposed that the ammonia EQC at Station 3-4 only be required when a nitrogenous blasting agent (e.g. ANFO) is being stored on-site and/or blasting is planned using a nitrogenous blasting agent (e.g. ANFO). The monitoring requirement should persist until sampling over a six-month period indicates total ammonia is consistently equal to or less than 50% of the EQC. This requirement is intended to account for blasting residuals that have yet to be flushed by variable precipitation and flow conditions on-site.</p> <p>Recommendation 1) ENR recommends that the ammonia EQC at Station 3-4 only be required when a nitrogenous blasting agent (e.g. ANFO) is being stored on-site and/or blasting is planned using a nitrogenous blasting agent (e.g. ANFO). The monitoring requirement should persist until sampling over a six-month period indicates total ammonia is consistently equal to or less than 50% of the EQC. This requirement is intended to account for blasting residuals that have yet to be flushed by variable precipitation and flow conditions on-site.</p> | <p>decrease thereafter, therefore testing need not continue once concentrations are <50% of EQC.</p> |
| 8 | None | <p>Comment None</p> <p>Recommendation 2) ENR also recommends the EQC associated with petroleum hydrocarbons be suspended within CZN's Type B Water Licence for Prairie Creek until such time as</p> | <p>Feb 17: Agreed.</p> |

| | | underground or other activities that may contribute hydrocarbons to Station 3-4 resume. | |
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| MVLWB: Kim Murray | | | |
| ID | Topic | Reviewer Comment/Recommendation | Proponent Response |
| 1 | Amendment Application - Technical Workshop | <p>Comment Due to uncertainty about the proposed dissolved zinc EQC values presented by CZN (see comments and recommendations below), Board staff believe that a technical workshop may be helpful for reviewers. This would allow CZN an opportunity to present on additional information submitted in response to reviewer comments, and allow further opportunity for reviewers to ask CZN questions about the Amendment Application. Board staff will evaluate the need for a technical workshop following CZN's responses to reviewer comments.</p> <p>Recommendation For information.</p> | <p>Feb 17: We realize that Board staff made these comments before having the benefit of knowing the comments and positions of other reviewers. We believe we have suitably addressed the uncertainties noted in our responses. We do not think a technical session is necessary for this amendment. Firstly, in their comments, parties have all expressed their general support for the change to a dissolved EQC to be more appropriately consistent with the latest scientific knowledge about Zinc toxicity. Secondly, we engaged extensively on this application, discussing a 1st draft with ENR, ECCC, Racher and ADK, and a 2nd draft with ENR. Thirdly, granting our request to change the EQC from Total Zinc to Dissolved Zinc will not change the efforts we are currently undertaking on site. As discussed in further detail in response to ADKFN 1, there is no evidence that granting this amendment request will change water quality conditions in the receiving environment negatively. We are only asking to change how we are judged to be in compliance with the licence. Lastly, we have agreed to enhanced SNP monitoring which will ensure data is available for any changes that will be needed to the Effluent Treatment Plan or the Mine water Treatment Contingency Plan. Those changes can and should be made during the term of an amended licence. With this in mind, we do not believe a technical session is necessary. We would ask the Board to make a timely decision to</p> |

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| | | | adopt dissolved zinc EQC based on the scientific evidence provided which indicates that the downstream environment will be suitably protected. |
| 2 | Definition of Waste, Waters Act | <p>Comment As per the Waters Act: "waste" means (a) a substance that, if added to water, would degrade or alter or form part of a process of degradation or alteration of the quality of the water to an extent that is detrimental to its use by people or by an animal, fish or plant, or (b) water that contains a substance in such a quantity or concentration, or that has been so treated, processed or changed, by heat or other means, that it would, if added to other water, degrade or alter or form part of a process of degradation or alteration of the quality of that water to the extent described in paragraph (a), and includes (c) a substance or water that, for the purposes of the Canada Water Act, is deemed to be waste, (d) a substance or class of substances prescribed by regulations made under subparagraph 63(1)(b)(i), (e) water that contains a substance or class of substances in a quantity or concentration that is equal to or greater than a quantity or concentration prescribed in respect of that substance or class of substances by regulations made under subparagraph 63(1)(b)(ii), and (f) water that has been subjected to a treatment, process or change prescribed by regulations made under subparagraph 63(1)(b)(iii);</p> <p>Recommendation For information.</p> | |
| 3 | The Boards' Water Effluent and Management Policy | <p>Comment The Board regulates the deposit of waste through Licence requirements such that two objectives are met: (1) Water quality in the receiving environment is maintained at a level that allows for current and</p> | <p>Feb 17: With reference to the comment, to ensure Objective 1 is met, we understand that the Board sets conditions, including EQC, to make sure water quality objectives are met in the receiving</p> |

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| | | <p>future water use; and (b) The amount of waste deposited to the receiving environment is minimized. The Policy describes the Boards' approach to managing the deposit of waste to the receiving environment through enforceable terms and conditions set in water licences. Such terms and conditions include, but are not limited to, effluent quality criteria (EQC), activities related to waste management, monitoring programs, adaptive management planning, and/or other management plans.</p> <p>Recommendation For information.</p> | <p>environment. We agree with this and have proposed: . An SSWQO for Dissolved Zinc that is based on a CCME guideline value. As described in our reply to MVLWB 4, we do not believe there is a credible basis for adopting an SSWQO for Total Zinc. . A Dissolved Zinc EQC that will ensure that the Dissolved Zinc SSWQO (i.e., the CCME Guideline) will be met in Prairie Creek. . Additional monitoring to make sure that Dissolved Zinc levels in the discharge and Prairie Creek remain at appropriate levels. Note that, if the amendment is granted, the Effluent Treatment Plan/Mine water Treatment Contingency Plan can be updated to describe what actions will be taken if Dissolved Zinc levels exceed levels measured in previous years or in our predictions. With respect to meeting Objective 2, we submit that we are minimizing the amount of waste deposited to the receiving environment through our current mine water treatment process. If granted the amendment request, we will not reduce this treatment. As pointed out by Board staff, CZN does not plan on employing sand filtration if the amendment request is granted. The main reason for this is that there is no evidence that additional effluent treatment is needed to meet Objective 1. However, we also note that adding additional treatment needs to be balanced with the following: . Economically, adopting sand filtration will cost ~\$100K to install; and, . Environmentally, GHG's are generated from the transport and use of the filters. The Policy states that "protection of water quality is the primary objective". We submit that the costs/effects of additional treatment are only</p> |
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| | | | warranted if Objective 1 isn't met, which we believe it would be. |
| 4 | SSWQO and Action Level - Total Zinc | <p>Comment The Amendment Application before the Board is to adopt the existing EQC for total zinc for the dissolved zinc fraction and eliminate the regulation of total zinc concentrations in the discharge through EQC. CZN has not proposed any operational management approach to minimize the release of total zinc to the receiving environment. In fact, CZN has indicated that sand filtration will not be considered if an EQC for dissolved zinc is approved despite laboratory testing showing promising results on reducing total zinc concentrations. While the toxicity is greater in relation to the dissolved fraction, continued loading of total zinc still needs to be considered because it has the potential to accumulate in sediments and remobilize under certain conditions, which means total zinc is considered a Waste based on the definition in the Waters Act (see MVLWB ID-1). As per the Board's Policy (see MLVWB ID-2), implementation of EQC is one way that the Board regulates the deposition of Waste, but alternative approaches that are still enforceable do exist and could be applicable for total zinc. Has CZN considered establishing a SSWQO and appropriate Action Levels to guide adaptive management in relation to total zinc? This approach would be enforceable through a specific management plan (e.g., MTCP or ETP). This approach could allow some level of operational flexibility for total zinc while still meeting the Board's requirement to minimize the deposition of a Waste to the receiving environment.</p> <p>Recommendation CZN to comment on the option to establish a SSWQO and</p> | <p>Feb 17: We disagree with Board staff's conclusion that "CZN has not proposed any operational management approach to minimize the release of total zinc to the receiving environment". We have and will continue to treat mine water to significantly reduce the load of metals in the discharge from the levels they would be at if there were no treatment. To illustrate this point, we have provided an example of the reduction of Total Zinc concentrations through treatment of mine water in Attachment 1, Table 1 of the uploaded letter. Table 1 indicates that the concentration of Total Zinc is reduced 30-50 times as a result of treatment. We are not proposing to stop or reduce water treatment, we are only proposing to change the method in which we are judged to be in compliance with the licence. Because we are not reducing anything operational at the site, the concentrations of metals in the discharge and conditions in the receiving environment (i.e., Prairie Creek) will also not change if this amendment request is granted. EQC are only one of the tools the Board has to regulate the amount of waste discharged from the site. Not having an EQC for Total Zinc does not mean that Total Zinc levels are unregulated. The Board still regulates waste discharge, including Total Zinc, through the Effluent Treatment Plan and the Mine water Treatment Contingency Plan. The Surveillance Network Program regulates what we monitor and when. Reporting of results is also regulated through SNP reporting and the Annual Water Licence Report.</p> |

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| | | <p>associated Action Levels for total zinc through an appropriate management plan.</p> | <p>We also disagree with the comment that total zinc "has the potential to accumulate in sediments and remobilize under certain conditions". There is no evidence that this is occurring currently - our application provided evidence that dissolved zinc concentrations have remained low and below the CCME guideline.</p> |
| 5 | Amendment Application | <p>Comment The existing condition of the abandoned existing mine is a factor that needs to be considered in the establishment of EQC. While it is recognized that there is an on-going discussion between CZN and GNWT regarding responsibility for treating the mine water originating from the underground mine workings, it should not be forgotten that CZN has previously committed to treating this water. On p. 62 of the Developer's Assessment Report (DAR) from EA0809-002, CZN states that "...as part of the underground Decline Development project, CZN undertook during EA to treat the mine water discharging from the 870 level portal. This flow pre-dated CZN's operations on site. Thus, CZN planned to treat mine water from the existing workings in addition to water pumped from the new Decline." CZN further notes on p. 63 of the DAR that "CZN fully complied with an extensive list of commitments made for the Decline and Pilot Plant projects. As part of Decline development, CZN undertook to treat all water discharging from the mine, including drainage from the existing 870 level portal and that from the new Decline. CZN originally planned to create a new portal for the Decline. However, the Decline was developed from the existing 870 level, the starting point being approximately 1 km from the 870 level portal. Flows from the Decline discharge to the 870 level. The</p> | <p>Feb 17: The comment refers to CZN's commitment to treat mine water from the old workings in addition to water from the Decline, but it omits an important point that CZN did not commit to manage water from the old workings indefinitely. We believe the commitment made was to treat this water during the "undertaking", which is decline development. We intend to continue to operate the Polishing Pond. It performs an important function in enabling the settling of the majority of sediment, even though Total Zinc EQC have not consistently been met.</p> |

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| | | <p>combined mine water flow is treated at the point where it exists the 870 level portal." Although applying an EQC to dissolved zinc is possible, the total zinc fraction still remains at elevated concentrations. While the toxicity of the total fraction is lower than the dissolved fraction, it does not negate total zinc being considered a Waste under the Waters Act. CZN has indicated the intent to continue using the Polishing Pond, but since this has not been previously successful in consistently reducing the total zinc load, it is unclear if that is a commitment being made by CZN, as well as what difference this would make to total zinc concentrations given past performance. Although CZN has researched and identified some potential options for additional or modified treatment approaches, completion of field testing has not occurred. This leaves the outstanding question of what can be done to further mitigate the total zinc concentrations and reduce the on-going loading to the receiving environment.</p> <p>Recommendation CZN to (a) confirm the commitment to continue operating the Polishing Pond to allow for settling of particulates associated with the total zinc; and</p> | |
| 6 | Amendment Application | <p>Comment See above.</p> <p>Recommendation (b) provide further information regarding potential mitigation options that could be implemented to reduce the total zinc loading to the environment.</p> | <p>Feb 17: We disagree with the comment "what can be done to further mitigate the total zinc concentrations and reduce the on-going loading to the receiving environment". This seems to presume that further reductions are necessary, which based on our evidence, they aren't. We also note that other regulators, in their comments, are not suggesting this. However, we are amenable to testing the sand filter already</p> |

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| | | | acquired to evaluate it's effectiveness, and to provide data with which to consider the necessity and magnitude of further total zinc mitigations. |
| 7 | Amendment Application | <p>Comment According to the Board's Water and Effluent Quality Management Policy, the Board must set protective EQC that proponents can reasonably and consistently achieve. CZN has faced an on-going challenge with meeting the EQC related to total zinc; however, Board staff note that data provided in the Minewater Treatment Contingency Plan (MTCP) V3.1, which contained more data from SNP 3-4 than presented in Table 1 of the application letter, indicates that CZN would have exceeded the proposed Maximum Grab Concentration (MGC) EQC for dissolved zinc on four occasions in 2020 and the Maximum Average Concentration (MAC) EQC until 17 Sep 2020 (which is eight weeks into the 2020 discharge period). No information regarding potential contingencies to address elevated dissolved zinc concentrations was provided in the amendment application.</p> <p>Recommendation CZN to provide further information regarding potential contingencies for addressing dissolved zinc concentrations that exceed the proposed EQC.</p> | <p>Feb 17: We have provided information on how we resolved the four instances in 2020 when dissolved zinc concentrations were elevated (refer to our application and comments on the revised ETP and MTCP, v3). Proposed MAC and MGC EQC would have been achieved in 2020 absent of the four instances. However, we will be further reviewing our sulphide dosing and oversight protocols to increase contingencies and awareness prior to the 2021 treatment season. We can detail the results in updates to the ETP and MTCP.</p> |
| 8 | Amendment Application | <p>Comment CZN has proposed to retain the existing EQC concentrations of 0.4 mg/L and 0.8 mg/L for MAC and MGC, respectively. Although there were elevated total and dissolved zinc concentrations observed in 2020, CZN has identified the issues contributing or causing these elevated concentrations. Once these issues were addressed, dissolved zinc concentrations decreased dramatically to a range of 0.001 to 0.088 mg/L,</p> | <p>Feb 17: See Attachment 2 of the uploaded letter. Note, dissolved zinc is only available for 3-4 and some 3-11 samples. DOC is only available for some 3-11 samples.</p> |

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| | | <p>which are much lower than the proposed MAC and MGC. The Effluent Treatment Plan (ETP) V3.1 includes a graph showing total and dissolved zinc concentrations at SNP 3-4 from 2018 to 2020, but the scale of the y-axis limits the ability to discern actual concentrations, although most appear to be quite low (i.e., well below 0.4 mg/L). It would be helpful if a table containing the available total and dissolved zinc, hardness, pH and dissolved organic carbon data from the period following the flooding of the first Decline until present at SNP 3-4 and any downstream monitoring stations was provided. It would also be helpful for CZN to provide additional rationale as to why such a high level of operational flexibility is required for dissolved zinc and why lower EQC values would not be possible.</p> <p>Recommendation CZN to provide (a) available total and dissolved zinc, hardness, pH, and dissolved organic carbon from the period following the flooding of the first Decline from SNP 3-4 and downstream stations in tabular format; and</p> | |
| 9 | Amendment Application | <p>Comment See above.</p> <p>Recommendation (b) provide further rationale supporting the need for the existing concentrations for a dissolved zinc EQC.</p> | <p>Feb 17: The lower dissolved zinc range of 0.001-0.088 mg/L occurred in September and October, months when flows are steady and declining into winter. Dosing consistency and predictability is much easier during these months. The months of July and August are different, particularly when site experiences intense rainfall events. Therefore, the appropriate EQC should not be set based on the quoted low range. A greater level of operational flexibility is required for the July-August period. Of course this does not mean that we will treat with any less vigour. The target will still be 0.001 mg/L dissolved zinc.</p> |

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| 10 | CCME long-term exposure equation | <p>Comment The 2018 CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life Factsheet for Zinc (Dissolved) states water hardness, dissolved organic carbon (DOC) and pH are the most important toxicity-modifying factors (p. 3). The CCME equation used to derive a guideline for long-term exposure to dissolved zinc is valid between pH 6.5 and 8.13. (p. 1). When discussing toxicity-modifying factors, the CCME Factsheet indicates that studies have demonstrated that the toxicity [of dissolved zinc] to fish and algae increases with increased pH in natural waters, which may be a result of a decrease in zinc binding to organic ligands. CZN reports that samples of surface water collected in 2020 at SNP station 3-11 (Table 1 of the Amendment Application letter) resulted in a pH ranging from 8.15 to 8.47, above the valid pH range of the equation (8.13 pH units). In CZN's amendment request, CZN utilized 8.13 pH units for their calculations to conform to the validity of the CCME equation; however, CZN does not discuss the potential implications of utilizing a pH value lower than that measured at SNP 3-11 in the context of toxicity to fish and algae.</p> <p>Recommendation CZN to provide rationale as to whether utilizing a lower pH in their calculations (8.13) than what was recorded in Prairie Creek at SNP 3-11 in 2020 (8.15-8.47) is appropriate and what the potential implications are regarding toxicity of dissolved zinc.</p> | Feb 17: See our reponse to ADKFN 2. |
| 11 | Amendment Application | <p>Comment CZN has proposed to cease monitoring at SNP 3-11 and establish a new SNP station approximately 100 m downstream of the Harrison Creek confluence. Establishing a new SNP station seems appropriate as it is reflective of the edge of the mixing</p> | Feb 17: We are amenable to maintaining SNP 3-11 for one year. |

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| | | <p>zone that the Board selected for MV2008L2-0002 and the Licence MV2020L2-0003 currently before the Minister; however, maintaining monitoring at SNP 3-11 may be beneficial because it will enable the use of the historical data collected at that location without losing continuity. Results from this station may also be used to help inform the Aquatic Effects Monitoring Program Design Plan that will be required under Type A MV2020L2-0003 (if signed by the Minister). While ECCC monitors at station NW10EC0006 in Prairie Creek, it is located approximately 1.6 km downstream, which is too far for a meaningful assessment of the effluent plume entering Prairie Creek. SNP 3-11 could be removed at a later date once some data has been compiled from the newly established SNP at the edge of the mixing zone.</p> <p>Recommendation CZN to comment on the potential to maintain SNP 3-11 (even for a period of time) in addition to establishing a new SNP station at the mixing zone boundary in Prairie Creek.</p> | |
| 12 | Amendment Application: Effluent Mixing Ratios | <p>Comment Under the Effluent Mixing Ratios section, CZN indicates that "Polishing Pond flows recorded in 2020 were used as opposed to averaging flows including previous years because 2020 flows were higher than in previous years". However, no data has been submitted to support this statement is true in all months reported in Table 2 (Jun - Nov). It would be helpful if CZN provided a comparison of the 2020 flow data from 3-4 to the average flow data from previous years.</p> <p>Recommendation CZN to provide additional evidence that Polishing Pond flows recorded in 2020 were higher than in previous years, including</p> | Feb 17: See Attachment 1, Table 2 of the uploaded letter. |

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| | | flow data from 2020 compared to average flow data from previous years. | |
| 13 | Amendment Application: Effluent Mixing Ratios | <p>Comment It is indicated under the Effluent Mixing Ratios section of the Amendment Application that the Prairie Creek flow data used to generate dilution ratios presented in Table 2 is from a Water Survey of Canada hydrometric station on the west side of Prairie Creek Opposite the Mine that generated average monthly flow data from October 1974 to December 1990. It is further indicated that WSC reactivated the flow station in October 2013, although data has not yet been analyzed. It is unclear if using flow data that is now >30 years old with 2020 data from SNP station 3-4 is appropriate for calculating Dilution Ratios, or if data from a nearby hydrometric station could be examined and a comment on the appropriateness of using this historical data be provided.</p> <p>Recommendation CZN to provide further evidence to support the use of historical flow data that is 30-46 years old for calculating the dilution ratios presented in Table 2.</p> | <p>Feb 17: See Attachment 1, Table 3 of the uploaded letter. Comparing mean monthly flows, while those for the 2013-2019 period are slightly lower in summer, importantly they are slightly higher in winter, including the months of October and November, which are the more difficult months to assimilate effluent discharge.</p> |
| 14 | Amendment Application: Predicted Dissolved Zinc Concentrations in Prairie creek Downstream | <p>Comment In the Predicted Dissolved Zinc Concentrations in Prairie Creek Downstream section of the Amendment Application it is indicated that CZN "...arithmetically mixed effluent discharge with creek flows set at 25%. Mean and minimum monthly creek flows were simulated. Polishing Pond discharge was set at the monthly average flows recorded in 2020 (Table 4), and at the 90th percentiles of monthly flows recorded in 2020 (Table 5). Mill Ditch flows were included in the model as these flows are a significant contributor to Catchment Pond discharge, and contribute to the Prairie Creek loading. We also included loads for bypass seepage, as defined in</p> | <p>Feb 17: See Attachment 3 of the uploaded letter.</p> |

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| | | <p>Schedule 5, item 5 of MV2008L2-002." Based on the details provided by CZN, it is unclear to Board staff how the values in Table 4 and 5 were generated.</p> <p>Recommendation CZN to include a step-by-step method of how values in Table 4 and Table 5 were generated, including submitting relevant data used to generate the values. This should include, but not be limited to, all applicable water quality data, mill ditch flows and loads for bypass seepage.</p> | |
| 15 | <p>Amendment Application: Proposed SNP Change TPH to EPH</p> | <p>Comment CZN has requested to change the EQC for total petroleum hydrocarbons (TPH) to extractable petroleum hydrocarbons (EPH). Board staff note there have been discrepancies and data lacking from CZN's SNP reporting in 2019 and 2020, as follows: on September 11, 2020, in response to a comment from Board staff on CZN's 2019 Annual Water Licence Reports (MVLWB-2), CZN acknowledged that the values presented in the 2019 Annual Water Licence Report for Licence MV2019L2-0006 reflect EPH and not TPH; in recent SNP Reports submitted to the Board for 2020, some concentrations of hydrocarbons have been for EPH, not TPH; and, data for benzene, toluene, ethylbenzene and xylene (BTEX, part of the F1 fraction excluded from EPH analysis) has not been provided as part of SNP reports for SNP 3-5 and 3-6. Additionally, an SNP report from 2019 indicates TPH was detected at SNP 3-4 on September 10, 2019. With respect to hydrocarbon products at the site, the Spill Contingency Plan indicates gasoline and other petroleum products are used/stored on site.</p> <p>Recommendation CZN to provide rationale for altering the EQC from TPH</p> | <p>Feb 17: We did not previously monitor for TPH because we assumed (and had done so for many years without question) EPH was adequate. However, we don't think this is relevant to the request. The 'TPH' detection on Sep 10, 2019 was 0.14 mg/L as EPH 10-19. We note the EQC is 5 mg/L. When we requested TPH analysis, the lab provided TPH data (C10-50) based on F2 (C10-16), F3 (C16-34) and F4 (C34-50). Yes, gasoline and other petroleum products are used/stored on site, but those areas have no way to report to 3-4 because mine water flows from the portal via a pipeline to the Polishing Pond, which is a raised structure with four sides.</p> |

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| | | to EPH given the following: CZN has not consistently monitored TPH and have not provided data for all monitoring periods in 2019 and 2020; TPH was detected on September 10, 2019 at SNP3-4; the lack of BTEX data for 2019 and 2020; and the Spill Contingency Plan indicating that gasoline and other petroleum products are used/stored on site. | |
| 16 | Amendment Application: Proposed SNP Changes total petroleum hydrocarbons (TPH) | <p>Comment Under the Proposed SNP Changes section of the Amendment Application CZN requests that the EQC be changed from total petroleum hydrocarbons (TPH) to extractable petroleum hydrocarbons (EPH). In the next paragraph, CZN requests that the current EQC for ammonia and TPH only be required during underground activities. As these requests address the same EQC (TPH), further clarity about the second request is necessary. If the Board did approve CZN's request to change TPH to EPH, the second request to change the applicability of the TPH EQC would no longer be necessary. Is the request from CZN to alter the applicability of a petroleum-related EQC applicable to either TPH or EPH, if the parameter change request is approved?</p> <p>Recommendation Is CZN requesting that if an EQC change from TPH to EPH is approved by the Board, CZN would also like EPH to only be required during underground activities? Please clarify.</p> | Feb 17: Correct, since hydrocarbons and/or blasting residues can only potentially be generated and present at 3-4 during underground operations. |
| 17 | Amendment Request: Ammonia and TPH | <p>Comment CZN has requested that the Board consider a mechanism so as to not require samples to be analyzed for ammonia and TPH when underground activities are not occurring. Following completion of underground activities, Board staff understand there is potential for the flooding and subsequent dewatering of the underground to transport nitrogen species and hydrocarbons generated as</p> | Feb 17: After decline development, a period of exploration drilling follows. Drainage water is pumped out during this period. Any blasting residues would be pumped out in the process. The presence of hydrocarbons is a possibility, however, after decline flooding, the decline produces relatively little water. Dewatering would be considered underground operations, and all SNP 3-4 analyses |

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| | | <p>a result of underground activities. Has CZN considered establishing thresholds to determine when residual concentrations are no longer a potential concern?</p> <p>Recommendation Board staff recommend CZN propose an approach for the removal of ammonia and TPH when underground activities are not occurring, and, when proposing such an approach, to consider the subsequent dewatering periods that follow flooding of the underground.</p> | <p>would apply. For greater certainty, we propose that CZN is to provide results of a decline water sample after flooding with ammonia and EPH concentrations less than EQC before those analyses in 3-4 samples can be suspended.</p> |
| 18 | Amendment Request: removal of BTEX from SNP 3-12 | <p>Comment CZN has requested the removal of benzene, toluene, ethylbenzene and xylene (BTEX) from SNP 3-12, which monitors the water discharge from the containment berm that houses storage tanks that contain and/or historically have contained petroleum products.</p> <p>Recommendation CZN to provide rationale for the removal of BTEX from SNP 3-12 considering the historic use of all tanks within the containment berm and that the Spill Contingency Plan indicates two 350 barrel gasoline tanks appear to be stored within the containment berm.</p> | <p>Feb 17: The Tank Farm containment has only stored diesel and oil. The two 350 barrel gas tanks are riveted tanks that now do not meet code, and have been empty and not used during CZN's tenure (since at least the early 90's).</p> |
| 19 | Effluent Treatment Plan V3.1: Section 2.2 Water Chemistry | <p>Comment On p. 4, CZN refers to elevated zinc concentrations occurring in early summer as a result of elevated rainfall; however, there is insufficient information provided in the ETP V3.1 to support this statement. In addition, concerns have been raised regarding elevated concentrations of other metals (e.g., cadmium, mercury) during the reviews of previous versions of this plan. A comprehensive summary of the available water chemistry data should be included as supporting information and should extend to when flooding of the first Decline was completed.</p> <p>Recommendation CZN to provide a comprehensive summary of available water chemistry data from the post-</p> | <p>Feb 17: Are we talking about decline water quality or mine water quality in general? For the latter, SNP and annual reports provide a comprehensive summary. We are currently not required to provide, and do not have, comprehensive data for the flooded decline. We do have water quality data for pumped decline water and individual holes drilled from the decline. However, we believe that the mine water quality in general should address the comment.</p> |

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| | | flooding of the first Decline to present to support statements made in the ETP V3.1 regarding water treatment. | |
| 20 | Effluent Treatment Plan V3.1: Section 3.1 Water Treatment Process | <p>Comment On p. 5, CZN states that "While settling of particles may not be necessary to meet a dissolved zinc EQC, CZN proposes to maintain the above-noted procedures in order to limit sediment discharge and elevated total zinc concentrations". How does CZN propose to consistently and effectively meet the objective of the waste minimization principle in relation to total zinc in the absence of an EQC?</p> <p>Recommendation CZN to provide further information regarding how the management of total zinc will meet the objective of minimizing waste discharged to the receiving environment.</p> | <p>Feb 17: This is a question of what is reasonable for limiting sediment discharge. The goal of waste minimization cannot be zero. We submit that what we're currently doing is reasonable, only it doesn't meet the current EQC. Given the absence of a total zinc receiving water quality guideline, and no evidence of total zinc accumulation and subsequent elevation of dissolved zinc concentrations downstream, we believe actions over and above what we're currently doing would be unreasonable.</p> |
| 21 | Effluent Treatment Plan V3.1: Section 3.3 Polishing | <p>Comment On p. 7, CZN refers to "off-site testing of a bulk sample". This term is typically applied to large rock samples and the statement makes no reference to the type of sample that this "bulk sample" consisted of (i.e., minewater, polishing pond water post-treatment).</p> <p>Recommendation CZN to clarify the nature that constituted the bulk sample referred to on p. 7.</p> | <p>Feb 17: Untreated mine water.</p> |
| 22 | Effluent Treatment Plan V3.1: Section 3.3 Polishing | <p>Comment On p. 7, CZN lists a filtering capacity of 5 L/s for the trial sand filter (as does the Minewater Treatment Contingency Plan V3.1 [MTCP]), but the previous version of the ETP (i.e., version 3) stated a filtering capacity of 5-6 L/s. Is 5 L/s the maximum capacity or is there a range of filtering rate?</p> <p>Recommendation CZN to confirm maximum rate of filtering capacity of the sand filter.</p> | <p>Feb 17: The supplier estimates 5-6 L/sec based on the selected media.</p> |
| 23 | Effluent Treatment Plan V3.1: Section 3.3 Polishing | <p>Comment On p. 9, CZN states that any sludge removed from the Polishing Pond will be deposited in an area</p> | <p>Feb 17: This question is answered in responses to comments on the Closure and Reclamation Plan. In</p> |

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| | | <p>isolated from drainage, but that if metal leaching does occur, that this leachate will report to the mine drainage and be subject to treatment. Details on location(s) for sludge deposit are not provided. Can CZN confirm if potential areas for sludge deposit may occur in the old mine workings, and how this may influence treatment of water originating from that area?</p> <p>Recommendation CZN to discuss potential areas for sludge deposit and how this may influence treatment of water originating from the old mine workings.</p> | <p>brief, there is a blind heading off the 880 level adit about 200 m from the 870 Portal. The heading is dry, so sludge placed there will not contribute to mine drainage and will not influence water treatment.</p> |
| 24 | <p>Minewater Treatment Contingency Plan V3.1: Section 3.1 Mitigation of Excess Water</p> | <p>Comment Exceedances of system capacity were encountered in 2020 and CZN states that changes were immediately made to add volumetric capacity as well as add additional redundancies. This wording is vague and it is unclear where and how volumetric capacity was added as well as what the additional redundancies include.</p> <p>Recommendation CZN to provide further details regarding the increases to the system capacity volume and additional redundancies.</p> | <p>Feb 17: This question was answered in our responses to comments on the ETP/MTCP v3.</p> |
| 25 | <p>Minewater Treatment Contingency Plan V3.1: Section 3.1 Mitigation of Excess Water</p> | <p>Comment The figure showing the 870 portal and Polishing Pond is not referenced in the text. Is this intended to show an overview of these aspects or is there something in the figure that should be highlighted?</p> <p>Recommendation CZN to clarify the purpose of this figure.</p> | <p>Feb 17: To show how the system is configured.</p> |
| 26 | <p>Minewater Treatment Contingency Plan V3: Section 3.3 Treatment System Malfunction</p> | <p>Comment CZN states that no malfunctions related to the treatment system pump failures and the clogging or freezing of chemical delivery lines occurred in 2020; however, on p. 4 and Table 1 of the MTCP V3.1, CZN states that the exceedance observed on 05 Nov 2020 was related to the flocculant pump failing overnight due to ice in the mix. There appears to be a</p> | <p>Feb 17: This question was answered in our responses to comments on the ETP/MTCP v3.</p> |

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| | | contradiction in this information. Recommendation CZN to clarify the apparent contradictory statements related to the flocculant pump failure on 05 Nov 2020. | |
| 27 | Minewater Treatment Contingency Plan V3.1: Section 3.1 Mitigation of Excess Water | Comment Board staff note that there is no further mention of baffle modification in the Polishing pond. It is unclear if this has that been eliminated as a treatment option and, if so, what rationale supported this decision. Recommendation CZN to confirm if the option to modify the baffles in the Polishing Pond has been eliminated and provide the rational supporting this decision. | Feb 17: The baffles were re-oriented as proposed. |
| 28 | Minewater Treatment Contingency Plan V3.1: Section 3.1 Mitigation of Excess Water | Comment On p. 6, CZN states that the MAC of 0.4 mg/L was exceed four times when applied to dissolved zinc. This is incorrect. The MAC is calculated based on a rolling average of four consecutive samples and, based on the results provided, the MAC was exceeded until 17 September 2020. The MGC was exceeded on four occasions and this contributed to the MAC exceedances. Recommendation Board staff would like to remind CZN that if a dissolved zinc EQC were approved by the Board based on this Amendment Request, CZN must assess EQC compliance related to both MGC and MAC. | Feb 17: OK |

Parks Canada: Audrey Steedman

| ID | Topic | Reviewer Comment/Recommendation | Proponent Response |
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| 1 | Topic: Zinc EQC Reference: Amendment application | Comment The Proponent has provided an estimate of the zinc concentrations downgradient of the point of discharge for a theoretical mixing zone. No predictions of zinc concentrations are provided at the Park boundary. It is understood that the location of the predicted concentrations would be upgradient of the Park boundary, and that additional downgradient mixing could occur to further reduce the zinc | Feb 17: Since our predictions indicate the CCME guideline would be met 100 m downstream, and that the guideline is set to avoid effects to all aquatic life, we assume ecological integrity in the Park is addressed. |

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| | | concentrations in Prairie Creek. Recommendation The Proponent is reminded that Project activities must be completed in a manner that ensures the ecological integrity of the Park is maintained and any future amendments should demonstrate how this is achieved. | |
| 2 | Topic: TPH EQC Reference: Amendment application | Comment The Proponent has requested to change the EQC for TPH to EPH. The Proponent's spill contingency plan notes two locations for gasoline storage (two tanks that are empty and not suitable for use) and 45 gal drums. Thus, gasoline is stored and used at the Project site, and in the event of a spill there is potential for this product to enter the receiving environment. Monitoring of TPH at the discharge point for the mine provides an additional method to identify if a spill has occurred at the Project site. Recommendation It is recommended that TPH, not EPH, be maintained as the EQC. | Feb 17: The requested change is for SNP 3-4. The author is not understanding that the wider site cannot contribute to this location, which reflects mine discharge only. |
| 3 | Topic: Ammonia and TPH Reference: Amendment application | Comment The Proponent has requested to only monitor for ammonia when underground activities are occurring and that currently, ammonia concentrations are low and below EQC levels. Recommendation It is recommended that following a period of underground activity, monitoring ammonia should continue if ammonia concentration in each of the 3 prior years is more than 50% of the EQC. | Feb 17: See our response to MVLWB 17. We do not think that ammonia concentrations prior to the suspension of underground activity are relevant to the monitoring after suspension. The ammonia concentrations at that time are what is important. |

Racher Consulting: Kathy Racher

| ID | Topic | Reviewer Comment/Recommendation | Proponent Response |
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| 1 | Joint submission of ŁÍÍDLĬ KÚĚ FIRST NATION (LKFN) and NAH?Ā DEHÉ DENE BAND (NDDB) | Comment Note the KRacher Consulting is submitting these comments on behalf of the LKFN and the NDDB. Recommendation None | |
| 2 | Amendment request 1: Zinc EQC | Comment CZN has presented a reasonable case for why changing the | Feb 17: Thank you for the support. |

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| | | <p>EQC from 0.4 mg/L Total Zinc to 0.4 mg/L Dissolved Zinc. They have presented evidence that this change would be operationally achievable and protective of the receiving environment of Prairie Creek. CZN's rationale for changing the Zinc EQC aligns with the logic of the Canadian Council of Ministers of the Environment (CCME).</p> <p>Recommendation LKFN and NBDB generally support CZN's request to change the EQC from 0.4 mg/L Total Zinc to 0.4 mg/L Dissolved Zinc, subject to appropriate operational practices and environmental monitoring.</p> | |
| 3 | Amendment request 1: Zinc EQC | <p>Comment CZN argues that assuming only 25% of the Prairie Creek width is available for dilution during November is unrealistic since the width of the creek decreases during this time. They say that an assumption of 50% creek flow being available for dilution is more reasonable.</p> <p>Recommendation Can CZN give more detail as to why the assumption of 50% creek flow being available for dilution is more reasonable than 25%? For example, does CZN have evidence of the changing width of Prairie Creek over the year?</p> | <p>Feb 17: The end of the proposed IDZ is a natural narrowing of the creek channel and riffle, creating turbulent water. This applies to all seasons. In early winter, the channel will be even narrower. Only 25% mixing is much too conservative. Prairie Creek clearly varies in width significantly seasonally, typical of a mountain stream. This is the reason 2 pipes of differing length were proposed for the exfiltration trench planned for operations, with the shorter pipe to be used for winter when the creek channel is narrower.</p> |
| 4 | Amendment request 1: Zinc EQC | <p>Comment With respect to achievability of 0.4 mg/L Dissolved Zinc at SNP station 3-4, there were four instances of when that EQC was exceeded in 2020. In the application, CZN discusses each incident and how they have responded to those issues.</p> <p>Recommendation Can CZN provide further details on how they propose to implement mitigations to ensure that the four incidents that resulted in exceedances of the proposed Dissolved Zinc EQC could have been avoided? In particular, can CZN reference operational policies that would be in place to respond to these situations?</p> | <p>Feb 17: Refer to our responses to comments on the ETP/MTCP v3, and to MVLWB 7 in this review..</p> |