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# **ENVIRONMENT CANADA'S INTERVENTION ON THE PRAIRIE CREEK MINE PROJECT**

**Mackenzie Valley Environmental  
Impact Review Board  
Fort Simpson, NWT  
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Environmental Protection Operations  
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# Overview

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- Mandate
- Technical comments:
  1. Water and effluent
  2. Contaminants management
  3. Air quality
  4. Wildlife
- Conclusion



# Mandate

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- The primary relevant legislation and standards administered or adhered to by Environment Canada which influenced the content of this submission are:
  - *Canadian Environmental Protection Act 1999;*
  - *Department of the Environment Act;*
  - Section 36(3) of the *Fisheries Act* – Pollution Prevention Provisions;
  - *Migratory Birds Convention Act and Migratory Bird Regulations;* and
  - *Species at Risk Act.*

# Technical Comments – Water Quality

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## 1. Water and Effluent:

- a) Receiving Environment Objectives
- b) Effluent Quality
- c) Nutrients
- d) Toxicity
- e) Aquatic Effects Monitoring



## a) Receiving Environment Objectives

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## a) Receiving Environment Objectives

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- It is important to set appropriate objectives, as they will determine what the effluent quality criteria need to be.
- Must be no acute toxicity at end of pipe.
- The area of chronic toxicity is to be minimized to the extent possible.
- Further discussions may be warranted on the use of Reference Condition Approach objectives for all parameters.

## a) Receiving Environment Objectives

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- Site-specific water quality objectives (SSWQO) have been proposed for 15 parameters:
  - Total Dissolved Solids, iron and selenium are based on the reference condition approach;
  - Antimony, arsenic, cadmium, copper, iron, mercury, silver, zinc, ammonia, nitrate, and sulphate are based on existing guidelines which are toxicity-based;
  - Phosphorus is based on the Canadian Council of Ministers for the Environment's (CCME) framework to protect the ultra-oligotrophic status.
- The proposed objectives would be expected to avoid or minimize the potential for chronic toxicity effects in the receiving environment, with some possible potential exceptions.



# a) Receiving Environment Objectives

- There is the potential for synergistic interactions between the effluent parameters to cause an increased potential for sublethal effects.
- Whole-effluent testing may be used to monitor this.
- But - environmental monitoring may not pick up shifts or changes in the ecosystem due to the higher hardness levels in Prairie Creek acting protectively, and the confounding effects of nutrient addition on productivity.





## a) Receiving Environment Objectives: Recommendations

1. Any change from background water quality will potentially result in changes to the ecosystem. Setting objectives for Prairie Creek downstream of the proposed mine involves a value judgment as to the degree of change which is acceptable, and how far down the receiving environment stream change is acceptable. EC recommends further discussions on appropriate SSWQO.
2. EC notes that low detection limits will be needed for the onsite analytical instruments, if they are to be used for aquatic effects monitoring, and thus to evaluate whether the mine is meeting water quality objectives.

## a) Receiving Environment Objectives: Recommendations

3. Winter baseline water quality data for Prairie Creek should be augmented to strengthen the dataset, and Canadian Zinc Corp. (CZN) should subsequently review the SSWQO.
4. Low level mercury analysis should be done for upstream samples, both in summer and under ice, and results used to re-evaluate the SSWQO for mercury.
5. The nitrite SSWQO discrepancy should be clarified, with the lower value deemed more appropriate.

## b) Effluent Quality

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## b) Effluent Quality

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- To avoid predicted exceedences of analytes in Prairie Creek, CZN proposes to base discharges on loading limits.
- This involves varying the proportion of treated process water in the discharge to maintain receiving environment water quality objectives at the edge of the initial dilution zone (IDZ).

## b) Effluent Quality

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- Management would require:
  - Real time continuous measurement of creek flow volumes, which could be done by re-establishing the Water Survey of Canada flow station, and relaying creek water levels to the water treatment plant control room in real-time using telemetry. The data would be converted to flows using an established relationship;
  - Sampling and analysis of upstream water quality to identify background contributions of a given parameter;
  - Knowledge of the concentrations of analytes of concern in the effluent;
  - Calculation of volumes which could be released without exceeding downstream water quality objectives.

## b) Effluent Quality

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- Use of the load-based approach to managing process water concentrations adds another layer of complexity to a water management regime that does not have a lot of excess storage capacity in the event of system upsets and other events that limit the ability to discharge.
- This approach could substantially manage the predicted exceedences of water quality objectives during periods of low flow, but would be difficult to implement.
- Upstream flow levels can likely be monitored on a real-time basis, but Prairie Creek would have to be measured to determine winter flows as an established relationship wouldn't exist during the winter as ice amounts change from year to year and throughout the season.

## b) Effluent Quality

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- An additional factor is the lack of baseline data for under-ice water quality.
- Effluent quality would need to be analysed on an ongoing basis, as it is expected that there will be variation in quality with aging as well as with minewater quality.
- If this approach is to be implemented, it should be after commissioning of the processing and treatment systems during a period of higher flows, such that loads would not need to be managed until a good understanding of effluent quality is gained.

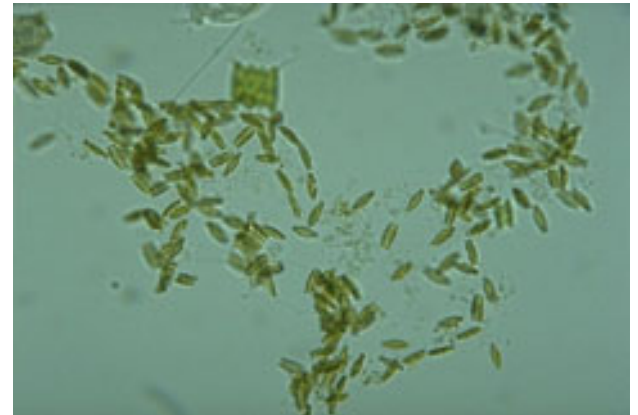
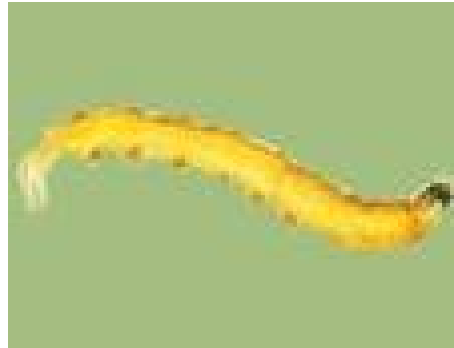


## b) Effluent Quality: Recommendations

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6. Alteration of the water quality in Prairie Creek will need to be minimized through achieving the best possible effluent quality, and careful management of discharges. Further details should be developed to determine if the use of a load-based approach would be feasible.
7. Maintaining the 500:1 ratio of creek water to process water would also rely on real-time flow data; this option should be further developed.
8. Increasing storage capacity of the water storage pond (WSP) should be evaluated for feasibility and implications on water balance and management.

## c) Nutrients

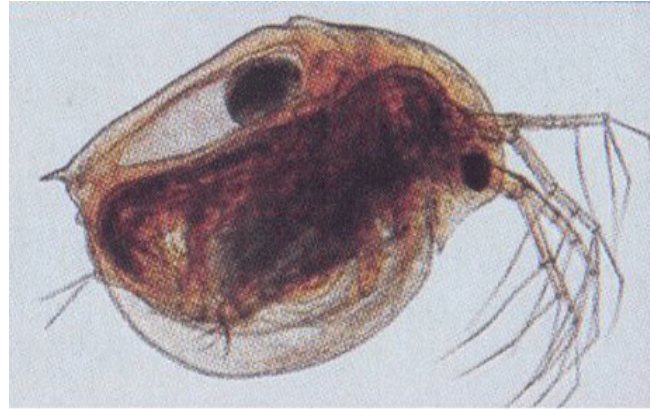


## c) Nutrients: Recommendations

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9. Nutrient releases should be minimized through the use of mitigation measures to prevent releases of nitrogen compounds, and to reduce phosphorus releases through optimizing wastewater treatment.
10. Monitoring of nutrient concentrations in discharges and the receiving environment should be done on an ongoing basis, with results linked to observations of biota under the Aquatic Effects Monitoring Plan (AEMP).
11. The proposed licence limit of 0.2 mg/L maximum average for phosphorus is supported by EC. It is recommended that this be revisited if the AEMP identifies changes that may become ecologically significant impacts.

## d) Toxicity



## d) Toxicity

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- Chronic toxicity was observed in the first 2011 tests, with an IC25 of <5% indicating chronic toxicity would be expected to occur in the receiving environment.
- Subsequent testing did not replicate this result, showing higher IC25 values, but some uncertainty remains as to the degree of chronic toxicity which could occur.
- If higher concentrations of minewater are seen, following on the 2009 results, there is the potential for some chronic toxicity associated with the minewater fraction as well as the (proportionately lower) process water contributions.

## d) Toxicity

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- Acute and sublethal toxicity testing will be required under the *Metal Mining Effluent Regulations* and will include testing with *Ceriodaphnia* for survival and reproduction endpoints.
- If the effluent exhibits chronic toxicity, CZN will be required to delineate the extent of such toxicity in the receiving environment.



## d) Toxicity: Recommendation

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12. Predictions for mixing and receiving environment concentrations should be validated at the commencement of operations, and conditions monitored on an ongoing basis to ensure chronic toxicity does not extend beyond the 100m IDZ.





## e) Aquatic Effects Monitoring

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## e) Aquatic Effects Monitoring

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- EC has concerns with the two monitoring program proposals which have been presented to date, notably around extent and timing for monitoring, use of the data in a timely fashion for adaptive management, and the proposed triggers for action.
- Need a solid understanding of the baseline conditions, and a robust sampling design that will fulfill the various regulatory requirements without duplication or overlap, and that will provide timely information on receiving environment conditions for management response.
- An effective AEMP must be designed, which will enable the proponent to detect change to the downstream environment, and provide clarity about how this information will inform adaptive management.

## e) Aquatic Effects Monitoring: Recommendations

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13. EC recommends that further work be done to develop an aquatic monitoring plan that will enable the proponent to detect change to the downstream environment and act upon it before changes become impacts.

The monitoring plan should have the elements of other requirements (SNP, EEM, Water licence) harmonized with respect to sampling sites and reporting, acknowledging that there will be different timing cycles for different monitoring requirements.

EC supports use of the INAC Guidelines for Designing and Implementing Aquatic Effects Monitoring Programs for Development Projects in the NWT – 2009.

## e) Aquatic Effects Monitoring: Recommendations

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14. An adaptive management plan should be drafted that does not incorporate multiple exceedances of objectives before action is triggered.
15. EC supports the input of the stakeholders committee mentioned in the commitments table, line 2, into design of monitoring programs.

# Technical Comments – Contaminants & Air

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## 2. Contaminants Management

- Transportation
- Incineration

## 3. Air Quality

- Air quality and emissions monitoring



# Contaminants Management

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- **Contaminant Loading:**

- Contaminated dust depositing on land and water

- **Sources:**

- **Mine Site**

- Dust generated by mining activities
    - Dust from materials handling
    - Dust from mill and concentrate storage facilities
    - Wind-blown dust from mine surface

- **Transportation of concentrate**

- Tracking along roads
    - Concentrate spillage and escapement from haul trucks
    - Loading and unloading at transfer facilities

# Contaminant Management

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## Examples:

- **Red Dog Mine**

- Elevated levels of metals (lead, zinc and cadmium) near mine site and haul road
  - Elevated levels of metals found in vegetation, soils, streams, streambed sediments and fish
- Implemented mitigation strategies and monitoring program

- **Pine Point Mine**

- Soil samples of railway bed exceed CCME Soil Quality Guidelines for lead and zinc



# Contaminant Management

- Transportation
  - Risk of contaminant loading from the transport of lead/zinc concentrate
  - Need secondary containment to minimize risk of concentrate spillage and escapement
  - Need monitoring – dustfall and soil sampling
  - Need contingency plans



# Contaminant Management

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## Contaminant Loading Management Plan

- Objective:
  - To minimize the release of contaminants into the Environment
- Approach:
  - Prevention;
  - Evaluation; and
  - Adaptive Management

# Contaminant Management

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- Conclusions:
  - Potential to adversely impact
    - Water quality
    - Sediments
    - Soil
    - Vegetation
    - Fish & Wildlife
  - Environmental risks can be managed and mitigated but there needs to be regulatory and enforcement certainty.

# Contaminant Management and Air Quality: Recommendations

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16. Develop a Contaminant Loading Management Plan in consultation with EC and the GNWT.
17. Employ secondary containment on the flat deck trailers during the transport of lead/zinc concentrate to mitigate spillage or escapement due to bag malfunctions or accidents.

# Incineration Management Plan (IMP)

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## Objective:

Minimize the risk of the formation and release of incineration contaminants to the environment.

## Recommendation:

18. Proponent develop and implement an Incineration Management Plan that is consistent with the advice provided in the *Technical Document for Batch Waste Incineration*. The incineration management plan should be developed in consultation with EC and the GNWT.

# Monitoring Program and Mitigation and Adaptive Strategies

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## **Objective:**

Minimize the risk of adverse environmental impacts from project air emissions

## **Recommendation:**

19. Proponent develop and implement the Monitoring Program and Mitigation and Adaptive Strategies management plan in consultation with EC and GNWT.

# Technical Comments – Wildlife

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## 4. Migratory Birds and Species at Risk

- a) Water Storage Pond
- b) Species at Risk
- c) Vegetation clearing and maintenance activities
- d) Predator/scavenger attraction



# a) Water Storage Pond



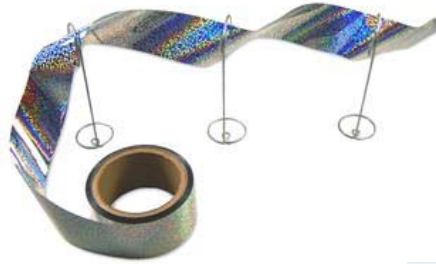
## a) Water Storage Pond

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- The WSP will contain concentrations of arsenic, lead and mercury that may exceed CCME water quality guidelines for livestock.
- Waterfowl/waterbirds are known to use the WSP in spring and summer.
- Elevated levels of contaminants may pose a health risk to birds that use the pond.
- CZN proposes to use scare tactics to deter birds from using the WSP and to monitor use of the pond by birds and the efficacy of scare tactics.



# a) Water Storage Pond



## a) Water Storage Pond: Recommendations

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20. CZN should follow-up on their commitment to implement scare tactics to prevent waterfowl and waterbirds from using the WSP and should monitor the use of the WSP by birds and the efficacy of the scare tactics employed to deter them.
21. Monitoring reports should be sent to EC, and the reports should also include the results of water quality monitoring in the WSP from the SNP program.
22. If CZN finds that scare tactics are not effective in deterring birds from using the WSP, CZN should work with EC to identify alternative deterrents.

## b) Species at Risk

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- Section 79 (2) of the *Species at Risk Act* requires that, during an assessment of environmental effects of a project:
  - the adverse effects of the project on listed wildlife species and its critical habitat must be identified,
  - that measures are taken to avoid or lessen those effects, and
  - that the effects need to be monitored.
- 11 Species at Risk could be impacted by the Prairie Creek Mine project.

## b) Species at Risk



Woodland Caribou  
(boreal population)



Woodland Caribou  
(Northern mountain  
population)



Grizzly Bear



Short-eared  
Owl



Peregrine Falcon  
(*anatum* subspecies)



Wood Bison



Wolverine



## b) Species at Risk

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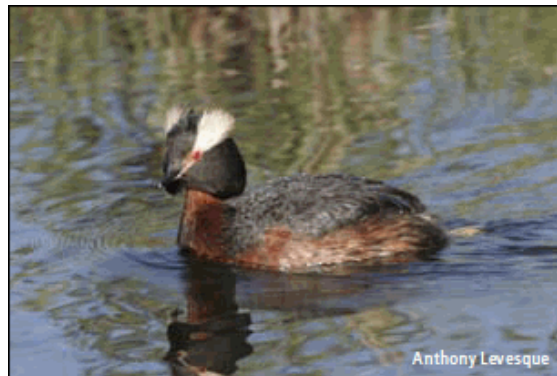
Rusty Blackbird



Common Nighthawk



Olive-sided  
Flycatcher



Horned Grebe



## b) Species at Risk: Recommendations

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23. The primary mitigation measure for each species should be avoidance. The proponent should avoid contact with or disturbance to each species.
24. CZN should consult with Parks Canada and the Government of the Northwest Territories (GNWT) and appropriate status reports, recovery strategies, action plans, and management plans to identify other appropriate mitigation measures to minimize impacts on Woodland Caribou (Boreal and Mountain populations), Grizzly Bear, Wolverine, Peregrine Falcon, Wood Bison, Short-eared Owl, Rusty Blackbird from the project.
25. The proponent should develop monitoring plans for each species in accordance with any applicable status reports, recovery strategies, action plans, and management plans and in consultation with Parks Canada, the GNWT and EC.

## c) Vegetation Clearing & Maintenance

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- Section 6 (a) of the *Migratory Birds Regulations* states that no one shall disturb or destroy the nests or eggs of migratory birds.
- Vegetation clearing during the migratory bird breeding season (May 7 – Aug 10) increases the risk of disturbing or destroying nests and eggs.
- Construction of the winter access road will require clearing of trees and brush
  - CZN has scheduled this to occur between November 1 and January 15.

## c) Vegetation Clearing & Maintenance

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- 6 ha of Spruce-Lichen habitat will need to be cleared for the waste rock storage area
  - no dates specified for vegetation clearing.
- Summer road maintenance will occur along upper portions of the access road from the Mine Site to Sundog Creek.
- CZN has committed to sending out a wildlife monitor to check for bird nests along sections of the road undergoing maintenance before work commences.

## c) Vegetation Clearing & Maintenance: Recommendations

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- 26. Vegetation clearing and roadbed preparation for existing and proposed sections of the mine access road should be conducted either before May 7 or after August 10, to avoid the migratory bird breeding season.
- 27. Vegetation clearing for the waste rock storage area should also take place outside of the migratory bird breeding season.
- 28. For upper sections of the access road undergoing summer maintenance, CZN should conduct nest surveys before work commences. If an active nest is found, the area should be avoided until nesting is completed (i.e. the young have left the vicinity of the nest).

## d) Predator/scavenger attraction

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- Artificial increases in predator abundance from attraction to wastes and the provision of nesting, denning or roosting sites can increase local predation on birds and their nests.
- CZN has proposed several measures to limit the attraction of predators and scavengers:
  - skirting all buildings and stairs
  - surrounding sewage sludge cell with a chain link fence,
  - daily incineration of food wastes,
  - bear-proof areas or containers
  - no littering policy, no food or beverage containers in outdoor areas
  - segregation of wastes at source.

## d) Predator/scavenger attraction

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- There is also the potential for the development to provide additional nesting and roosting sites for avian predators and scavengers (e.g. Ravens).



Raven nesting on  
light fixture (Diavik)

## d) Predator/scavenger attraction: Recommendations

29. The following predator control measures are recommended:
- All wildlife should be prevented from gaining access to liquid and solid waste and other wildlife attractants such as petroleum products;
  - Orientation for project personnel should include best practices with regard to waste management and avoiding wildlife; and,
  - Regular surveillance of facilities and project waste sites for the presence of wildlife to ensure that the predator control measures are effective.
  - All structures should be designed to preclude nesting and roosting sites for avian predators (including ravens) or den sites for mammalian predators. The proponent may consult with EC-CWS staff regarding design measures that could be taken;



## d) Predator/scavenger attraction



Bird spikes



Bird wire



Wedges to reduce angles

# Concluding Statement

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- Environment Canada has provided recommendations on aspects of the proposed project which are within our mandated responsibilities.
- EC's overarching concern is with the complexity of the project, and the need for activities to go as planned in order for the management activities and proposed mitigation to be effective and protective.
- EC would be pleased to participate in any technical committee(s) as necessary.

- EC would like to thank the Board for the opportunity to provide our comments.

- **Questions?**

