Environment Canada | Environnement Canada

July 9, 2004

Robert Carreau
Corporate Manager, Environmental Affairs
Breakwater Resources Limited
Suite 2000, 95 Wellington Street West
Toronto, ON.
M5J 2N7

Dear Mr. Carreau:

Re: Environmental Effects Monitoring (EEM) Study Design Review

The Canzinco Limited, Nanisivik Mine EEM Study Design review has been completed by the Technical Advisory Panel (TAP). Appended is a hardcopy of the compiled review comments that were sent to you electronically on July 8, 2004. These review comments should be addressed in the form of a simple addendum to the Study Design.

If you have any questions concerning the review of your EEM Study Design, please feel free to contact me at (780) 951-8754.

Sincerely,

Jenny Ferone
Regional EEM Coordinator

Attachment

cc:

Peter Blackall	Environment Canada
Malcolm Stephenson	Jacques Whitford Environment Limited
Dionne Filiatrault	Nunavut Water Board, Gjoa Haven
Meighan Wilson	Indian and Northern Affairs Canada, Yellowknife
Christopher Baron	Freshwater Institute, Fisheries and Oceans Canada
Stephen Harbicht	Environment Canada, Yellowknife
Anne Wilson	Environment Canada, Yellowknife

EEM TECHNICAL ADVISORY PANEL'S REVIEW COMMENTS ON 'CANZINCO LIMITED, NANISIVIK MINE METAL MINING EEM STUDY DESIGN'

General Comments

1. In general, the TAP found the report to be thorough and well presented. The complex nature of the site and the rationale for the site specific design were clearly explained. The content of the report reflected decisions reached during prior TAP – mine discussions. Most TAP review comments are minor or represent requests for clarification.

2. The TAP noted that the Study Design report incorporated the guidance in the *Metal Mining Guidance Document (MMGD)*. The mine is encouraged to continue to follow this guidance throughout field work and data analysis. Other new material available for use is posted on the EEM web-site at **http://www.ec.gc.ca/eem/English/Whatsnew.cfm**.

3. A simple map identifying the proposed the locations for the fish and benthic survey exposure and reference areas should be provided with the response to this Study Design review.

Executive Summary

4. P. *ii.* As the fish tissue analysis is a major component of the EEM biological monitoring program, the rationale for the mine's exemption from this requirement should be clearly presented in the Executive Summary, as it is in section 3.3 of the report (see comment #10).

Introduction

5. P. 3. Figure 1.1. Please provide the scale for the map. It is indicated that the map is NTS: is this NTS 1:50 000, 1:250 000 etc.?

Site Characterization Information

6. P. 29, P. 32-33. The description of the effluent plume mixing within Twin Lakes Creek was well presented. Is there an estimate of what the effluent concentration is upon reaching the Strathcona Sound? During the field work, the TAP recommends the following plume estimates be made:
    - An estimate of the effluent as a percentage of the total flow within Twin Lakes Creek, since stream flow values may be much lower than during the July 2003 site characterization work, as acknowledged in the study design.
    - Effluent tracers should be measured in the sampling areas to estimate the percentage effluent. The Study Design indicates that conductivity will be measured at each benthic station, which should represent a suitable tracer for the benthic program. Is there an effluent tracer suitable to estimate effluent concentrations in the marine fish exposure area?

7. P. 39. Minor Point. The caption for Figure 2.5 should refer to station 159-4 rather than station 159-9.

Fish Study

8. P. 46. For clarification, in addition to examining fish condition and reproduction, the EEM fish study also examines if there are effects on the growth and survival of fish.

9. P. 50. With respect to the null hypothesis statement in section 3.3.2, please note that the EEM fish survey "effect" endpoints also include "age", which is not included in this statement. Also, "length at age" is considered a "supporting response variable, rather than an "effect" endpoint. (MMGD p. 4-30 to p. 4-31).

10. P. 51. Generally, the standard approach for the EEM fish survey is to sample two sentinel species per area (exposure and reference area). In terms of fishing effort, it is recommended that fish sampling should be conducted for a minimum of 1 week per area, using different fishing methods and sampling at different times of the day. Based on the information presented in the study design and the reconnaissance work conducted in 2003, it appears that only one species (shorthorn sculpin) is available in the exposure area of Strathcona Sound near Nanisivik. However, if during the field work, it is determined a second sentinel species is available in sufficient numbers (e.g. fourhorn sculpin), and can be caught within the expected fishing effort (1 week per area), this species should also be targeted for the fish survey.

11. P. 52. For clarification, the fish tissue analysis is required, if during effluent characterization for EEM, a concentration of total mercury in the effluent is Identified that is equal to or greater than 0.10 μg/L. The comment regarding mercury concentrations in the tissue of fish greater than 0.45ug/g should refer to what is considered an "effect" on fish tissue.

Benthic Invertebrate Community Study

12. P. 58. The mine should be commended for the proposed benthic design that includes three exposure areas representing decreasing effluent concentrations.

13. P. 59. The EEM guidance for benthic invertebrate survey data analysis is to design the study with enough statistical power to detect an effect size of 2 standard deviations, while setting alpha equal to beta. For an effect size of 2 standard deviations, if 5 stations per area are to be used, then alpha=beta will be 0.1 (power = 0.9). For alpha = beta = 0.05 (as reported in the study design), 8 stations per area would be required in order to detect an effect size of 2 standard deviations.

14. P. 60. The report states that particle size analysis will not be measured at the benthic stations due to the characteristics of the substrates in the reference and exposure area (boulders and cobbles). For erosional habitats with no fines, the EEM program still recommends estimating the substrate composition; for example, a visual particle size analysis based on the Wentworth Scale and an estimation of embeddedness are recommended. For more detail on this, please feel free to contact the EEM coordinator.

15. P. 60. Although not required as decision endpoints to determine "effects" on the benthic invertebrate community, Evenness, Taxon (family) density, Taxon (family) proportion, and Taxon (family) presence/absence, are strongly recommended benthic endpoints for supporting information (MMGD p. 5-73).

16. P. 62. Minor point. There is no mention of an ANCOVA being used in the benthic survey data analysis except in the discussion of outliers.

Effluent and Water Quality Monitoring

17. P. 65. Was total phosphorus considered for water quality monitoring during the biological monitoring in Twin Lakes Creek?

Summary and Schedule

18. P. 70. This section provides a good overview of the proposed study design.

References

Environment Canada. 2002. Metal Mining Guidance Document for Aquatic Effects Monitoring. June 2002.