Environment Canada Environnement Canada

Prairie & Northern Region
Environmental Protection Operations Directorate
Room 200, 4999-98th Avenue NW
Edmonton, Alberta
T6B 2X3

January 11, 2012 7834-3-37/M111-1

Sharleen Hamm
Manager, Environment and Community Affairs
Elgin Mining Inc.
#1104 – 750 West Pender Street
Vancouver, BC
V6C 2T8

Dear Ms. Hamm:

Subject: Metal Mining Effluent Regulations – Evaluation of 2011 Environmental Effects Monitoring (EEM) Interpretative Report – Lupin Gold Mine, Nunavut

This letter is to advise you that the report entitled, 'Lupin Gold Mine Environmental Effects Monitoring Cycle 3 Interpretative Report', submitted by June 6, 2011, has been evaluated and meets the requirements specified in the Metal Mining Effluent Regulations of the *Fisheries Act* for environmental effects monitoring studies. The evaluation is based on the review of the report by a Technical Advisory Panel consisting of representatives from Environment Canada, Nunavut Water Board, and Aboriginal Affairs and Northern Development Canada.

The compiled review comments are appended. These comments should be addressed in the form of a simple addendum to the 2011 Interpretative Report.

Please be reminded that an EEM Study Design must be submitted in writing at least 6 months before the biological monitoring study is conducted. Therefore, mines planning biological fieldwork for the summer/fall of 2013 should submit Study Designs during winter/spring 2013.

If you have any questions concerning the evaluation of your 2011 EEM Interpretative Report, please contact Erik Allen, the EEM Coordinator for this facility [Email: erik.allen@ec.gc.ca, Tel: (780) 951-8750, Fax: (780) 495-2444].

Sincerely,

David Ash
Acting Regional Director
MMER Regional Authorization Officer

cc.

Paula Smith	Environment Canada, Iqaluit
Ian Parsons	Aboriginal Affairs and Northern Development Canada, Iqaluit
David Hohnstein	Nunavut Water Board, Edmonton
Dionne Filiatrault	Nunavut Water Board, Gjoa Haven
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Technical Advisory Panel (TAP) Review Comments on 'Lupin Gold Mine Environmental Effects Monitoring Cycle 3 Interpretative Report'

General comments

1. The interpretative report for the Phase 3 Environmental Effects Monitoring (EEM) program at Lupin presented the results of an Investigation of Cause (IOC) study. The TAP appreciated the inclusion of detailed maps and figures and the discussion of results in the context of published studies.

2. The IOC study investigated possible causes of lower condition in arctic grayling from the exposure area. It was hypothesized that the effect on condition was caused by habitat differences, specifically lower water temperatures in the exposure area relative to the reference area. This hypothesis was not supported by the current study, which found slightly higher mean water temperatures in the exposure area over a seven week period during July and August. At the request of the TAP, the proponent investigated the potential effects of elevated trace metal concentrations in the exposure area. Based on a literature review of trace metal toxicity studies, it was determined that aqueous copper concentrations in the exposure area were within the range of concentrations previously shown to have effects on fish.

3. The proponent has indicated that the site should resume normal intervals for EEM monitoring studies. Consideration could be given to conducting another phase of IOC, with an interpretative report submitted by June 6, 2013. Otherwise, the next study should include a complete biological study (site characterization, fish, fish tissue (if applicable), and benthos), with an interpretative report submitted by June 6, 2014. Please note that the study design report must be submitted to the authorization officer at least 6 months before the biological monitoring study is conducted. Please refer to the Metal Mining Effluent Regulations (MMER), Schedule 5, Sections 19 to 22.

Executive summary

4. p. *i.* The main conclusions suggest that metal concentrations in the exposure area are too low to cause differences in fork length and YOY body mass. However, the historical range of aqueous copper concentrations in the exposure area (Table 5-2) overlaps with the range of concentrations shown to have sublethal and lethal effects on fish in laboratory studies (Figure 8-1, Table 8-2); please comment.

5. p. *i.* The report suggests that differences in grayling size between reference and exposure areas are not likely attributable to effluent discharge. It is acknowledged that two out of three EEM studies were conducted during years without effluent discharge, suggesting another causative factor. However, it seems possible that historical effluent discharge has contributed to elevated concentrations of trace metals in the exposure area, which may be related to effects in grayling; please discuss.

6. p. *i.* The report recommends the resumption of normal intervals for EEM monitoring studies, and subsequently indicates that the next interpretative report would be due within 24 months of the submission date for the current report. Please note that standard biological monitoring studies are conducted on a 36 month timeline (refer to the MMER, Schedule 5, Section 22).

7. p. *iii*. It is indicated on p. *iii* and elsewhere in the report (e.g., p. 60, 66, 68) that condition was not significantly different between reference and exposure areas. Please note that the statistical results from the current study indicate that there was a significant effect on condition in YOY and age 1+ grayling, as indicated by the significant difference between y-intercepts (Table 7-6). The effect is similar to that reported in earlier phases (i.e., lower condition in the exposure area).

Introduction

8. p. 1. Please note that the Metal Mining EEM Technical Guidance Document is in the process of being updated and revised chapters are available on the EEM website (http://www.ec.gc.ca/esee-eem).

9. p. 8. The report states that a fish survey was required to assess the difference in fish age and length observed in Cycle 2. Please note that the IOC study was triggered by a confirmed effect on condition in arctic grayling in Phases 1 and 2.

Study area and setting

10. p. 14. The TAP appreciated the inclusion of Figures 2-1 to 2-5. The figures show numerous exceedances of CCME water quality guidelines for priority contaminants As, Cd, Cu, Ni, and Zn, particularly in the latter half of the July-October discharge period in 2009. Please discuss possible explanations for increased concentrations of these metals towards the end of the effluent discharge period.

11. p. 15. Please identify the location of the LUP-01 station.

12. p. 25. The report notes that "best attempts" were made to use the same sampling stations as in previous phases. Please note that the latitude and longitude of sampling areas are required under the MMER (Schedule 5, Section 17(b)), therefore the field crew should be able to locate the sampling stations with a GPS unit, based on coordinates provided in previous interpretative reports.

Methods

13. p. 31. Regarding the analysis of dissolved metals, were the samples filtered on site or at the analytical laboratory? What filter pore size was used?

14. p. 32. During a site visit by the EEM coordinator on August 23, 2010, sediment samples collected from the Seep Creek Ponds were observed to be loose, which prevented the crew from isolating the top 3 cm of sediment. Was this similar for all three sampling areas? Were any of the sediment samples sufficiently intact to allow for subsampling of the top 3 cm?

15. p. 32. Please describe QA/QC protocols for the sediment survey. Were replicate samples collected and analyzed as proposed in the Phase 3 Study Design Addendum (see study design review comment #23)?

16. p. 36. The report indicates that 10 grayling from each age class were sacrificed for ageing structures, but the results appear to suggest otherwise; please clarify.

17. p. 36. It was reported that less than the target number of grayling (100 age-0+) were collected during the fish survey, which was completed from August 18-29.

Please note that all reasonable effort should be made to collect the target number of fish (please refer to Sections 3.9.3.1 and 3.9.4 of the guidance document). The EEM program generally recommends a fishing effort of 7 days per sampling area.

18. p. 37. The Phase 3 study design indicated that Dam 1a would be sampled for fish as in Phases 1 and 2, however the interpretative report indicates that all fish were collected further downstream near the Seep Creek Ponds. Given that the Dam 1a pond is adjacent to the tailings impoundment area and has historically had higher metal concentrations in water and sediment compared to downstream sites, please discuss how its exclusion from the fish survey might confound the comparison of Phase 3 results to Phases 1 and 2.

19. p. 40. Please describe the QA/QC protocols for the fish ageing analyses; were ageing data independently verified, as recommended in Section 3.9.6 of the guidance document?

20. p. 40. How many fish were combined for each composite sample for tissue analysis?

Effluent and water quality results

21. p. 43. Please discuss possible causes of elevated conductivity in the immediate receiving area (Dam 1a pond, SCD1), given that there was no effluent discharge in 2010.

Sediment Results

22. p. 45. Please discuss how differences in sediment grain size between exposure and reference areas might influence the interpretation of the sediment metal concentrations.

23. p. 46. Identical values were reported in each of the sampling areas for many of the trace elements (e.g., Sb, Be, Cd, Pb, Hg, Se, Ag, Sn, U). Were the concentrations of these elements below detection levels?

24. p. 47. The report identifies several trace elements that were significantly higher in concentration in the exposure sediments compared to reference areas (e.g., As, Co, Cu, Mo, Ni, Sr, Zn). Were there any exceedances of sediment quality guidelines?

Fish survey

25. p. 49. The fish habitat data in Appendix C, Table C-6 show considerably higher pH values for each of the study areas as compared to the water quality data reported in Tables 5-2 and 5-3 (p. 43-44). Please discuss possible sources of error for the pH measurement.

26. p. 51. Fish tissue concentrations of As and Co were found to be higher in the exposure area than in reference area 1 (Table 7-2). It is noted that sediment concentrations of As and Co were also considerably higher in the exposure area compared to reference (i.e., ~7- to 8-fold). Please discuss possible pathways for the transfer of contaminants from sediments to YOY fish.

27. p. 51. Please confirm that trace metal concentrations in fish were reported as dry weight, as suggested by the second column header in Table 7-2.

28. p. 58. Why were only 14 exposure fish included in the analysis of YOY condition? According to the fish data provided in Appendix C2, it would appear that there were 21 grayling in the YOY size class as defined by size ranges in Figures 7-5 and 7-6. Similarly, it would appear that 13 YOY grayling were collected from reference area 1, however only 7 fish were included in the analysis. Please discuss.

29. p. 60. Please calculate the magnitude of the effect on condition as the difference in adjusted mean weight between exposure and reference areas, expressed as a percentage of the reference adjusted mean (refer to Table A2-3 in Chapter 8 of the guidance document).

30. p. 62. Please note that the weight-length relationship is log-linear and thus analysis of condition is typically conducted on log-transformed data (as in Phase 1). The relationship may appear linear within cohorts, but is unlikely to be linear over a larger age range (e.g., Figure 7-8).

31. p. 63. The data in Figure 7-9 indicate that age-0+ fish from 2010 were larger than age-1+ fish. Please clarify, and provide a corrected version of the figure.

32. p. 67. The summary suggests that differences in intercepts provide information on condition at hatching or emergence from the egg. Please note that the weight-to-length regressions should be not be extrapolated back to zero. ANCOVA assumes a common slope for the weight-to-length relationship in both areas, and the difference in the y-intercepts of these regressions is used to compare weight between areas at a given length.

33. p. 70. The proponent is recommended to consider the data compiled in the Lupin Gold Mine EEM Program Historical Information Report, which includes pre-disturbance studies on sediments, water, benthos and fish dating back to 1981, prior to the commencement of effluent discharge in 1985. Fish sampling at the site was historically conducted in late June/early July, precluding direct comparison to the YOY and age-1+ results from the EEM studies, however the historical studies suggest that older age classes of grayling were more predominant in Seep Creek early in the summer, likely moving downstream as flow decreased in later months.

34. p. 70. The report refers to differences in recruitment between areas, however it is not apparent that recruitment was measured in this study; please clarify.

35. p. 70. Does the proponent have any references to support the statement: "This would be consistent with observations by various researchers that condition increases through the growing season"?

36. p. 72. The TAP appreciated the summary of threshold concentrations for trace metal toxicity in fish.

Minor comments and errata

p. iv. Please clarify the final sentence in the second paragraph under Conclusions: "...we speculate that the standing stock biomass between the exposure area and reference areas would be sufficiently similar to impact the growth of sub-adult Arctic char in the exposure area."

p. 2. Regarding the last sentence in the second paragraph: "...the channels and small ponds within the Fingers Creek system are slightly deeper on average than the *reference* area." Should this refer to the *exposure* area?

p. 3. Please note that there was a statistically significant difference in benthic density in Phase 2 (exposure area density was 3.1 standard deviations higher than the reference area).

p. 4. The last line refers to a significant difference in the *ratio* of liver weight to total length for ninespine stickleback. Please note that it was not ratios that were compared, but rather the y-intercepts of liver weight to total length regressions, as per ANCOVA.

p. 17. The text under Figure 2-3 refers to the "CCME standard range (hardness dependent) for aqueous *cadmium*; this should refer to copper.

p. 47. The first sentence under 'Sediment Quality Highlights' states that "Reference Area 1 and 2 sediment predominantly sandy and was more silty with significantly more clay in the Exposure Area." However, it is noted on p. 45 that the exposure area had relatively higher silt content than the reference areas. Please clarify.

p. 49. The text indicates that 30 grayling were collected from the exposure area, however Table 7-1 indicates a sample size of 28, and Table 7-4 indicates 29; please clarify. Also, the total number of grayling collected from the exposure area is indicated as 223 in Table 7-1, however the text on p. 49 indicates that 308 fish were collected.

p. 54. The sample sizes for grayling reported in Figures 7-2, 7-3, and 7-4 do not appear to match those reported in Tables 7-1 and 7-4; please clarify.

p. 58. The report states that "...0+ fish in the reference area weighed 30% more and were 9% longer than individuals in the Exposure area." Please note that according to the data in Table 7-5, YOY grayling in the exposure had 28% lower length, and 7% lower weight than reference fish.

p. 61. Was the linear relationship reported for 2010 age-2+ arctic grayling actually based on fish collected from reference area 2, rather than from reference area 1 as indicated in the text on p. 61 and in Figure 7-8?

p. 78. Please provide units for Table 8-3.