Environment Effects Monitoring
Technical Advisory Panel Comments on "Lupin Gold Mine, Environmental Effects Monitoring Study Design" - DRAFT

General Comments

1. Mines are encouraged to follow guidance in the *Metal Mining Guidance Document (MMGD)*. Other new material available for use is posted on the EEM web-site at **http://www.ec.gc.ca/eem/English/Whatsnew.cfm**

2. Overall, the study design is well written and the pertinent plume delineation and historical information is nicely summarized.

Site Characterisation

3. p.21: Does the plume delineation model consider lake seiche effects?

4. p. 23: Please note that the MMER requires an estimate of effluent concentration at 250 m from each final discharge point

5. p. 23: Will the historical water quality monitoring point in Outer Sun Bay be used as the exposure area sampling point during the mine's effluent characterization and water quality measurements?

6. *p. 42: The concentrations of copper found in livers from lake trout captured in Inner Sun Bay(115 µg/g) and Contwoyto Lake (66.2 ug/g) are notably high. For example, those from Inner Sun Bay are five times higher than livers of lake trout from lakes in the Lac de Gras area[1] (22.42 µg/g in Ron Lake and 23.78 µg/g in Long Lake), and concentrations of copper in livers of lake trout captured in Back Bay of Great Slave Lake[2] ranged from 12.3 to 22.78 µg/g. The TAP is concerned that copper may be an issue in the receiving waters of the Lupin Mine.*

Adult Fish Survey

7. p. 52: Please note, page 4-15 of the MMGD outlines the options, in order of preference in situations where there are not two adult fish species. Please revise your study design based on that list of options.

8. *p. 52: **Both the exposure and reference areas must be sampled for fish**. The reference area must be sampled for comparison purposes even if low numbers of fish are caught in the exposure area. **The recommended level of effort for the fish survey is 7 days in each of the reference and exposure areas**. If the target sample sizes are achieved earlier, the fishing can stop earlier.*

9. *p. 53: As Lupin Mine has not discharged since 2002 and Seep Creek has had little flow outside the freshet, **the TAP strongly recommends a 2 day reconnaissance trip to determine if the fish have moved back into Seep Creek and allow the facility to finalize its sentinel species and sampling areas**.*

10. Please note that the latitude and longitude of sampling areas in both degrees, minutes and seconds, and UTM's, as well as a description of the sampling areas sufficient to identify the location of the benthic and fish sampling areas must be included in the Interpretative Report.

11. p. 54: Please redesign the flow chart to reflect the sampling options outlined in the MMGD (p. 4-15).

12. p. 55: Water quality characteristics will likely change over the period of discharge. The TAP recommends collecting water quality samples near the end of the field sampling program.

13. p. 55: Parasite loads in stickleback can skew the metrics which involve weight. If heavily infested, how will this be handled?

14. p. 62: Please note that guidance for the non-lethal sampling of fish has been updated and can be found on the EEM website (http://www.ec.gc.ca/eem/English/default.cfm). The TAP recommends that this guidance be followed during a non-lethal fish survey. Please note specific guidance concerning YOY sampling and total numbers of fish to be sampled. The small size of the YOY at this site during sampling may pose some additional challenges (e.g. accurate weights and lengths) and these should be discussed during the April TAP meeting.

Fish Tissue Analysis

15. *p. 64: Lupin Mine and EC EEM coordinators have discussed the lack of Hg effluent data at this site and reached the following agreement. As the water released as effluent is stored in Pond 2 prior to discharge, a sample will be taken from Pond 2 at the traditional sampling point after ice out but before discharge begins. This sample will be analyzed for Hg and for the full suite of deleterious substances as outlined in the MMER (Schedule 4). Provided the results of that sample are a) reviewed by the TAP before commencing discharge and b) has a Hg concentration below 0.1 µg/L, Lupin Mine will not be **required** to do a fish tissue survey.*

    However, the fish tissue mercury data presented are high and the TAP suggests that a fish tissue survey is still appropriate for this site. Although it appears that there is natural geological enrichment of mercury in this area it is possible that mercury may be mobilized by mining activities. Monitoring mercury in effluent will help to further evaluate this possibility.

14. p. 65: Technical procedures referenced in this study design should be provided for review.

Invertebrate Community Survey

15. *p. 64: given the variability in the historical samples due to things like habitat differences, the TAP recommends moving the benthic invertebrate survey into Seep Creek or considering a gradient design in Contwoyto Lake.*

16. p. 65: Considering the fact that past benthic invertebrate data has yielded variable results at this site, the TAP recommends that sampling precision be calculated, if possible, in order to determine whether 3 subsamples per station is sufficient.

17. p. 65: The recommendation for sieve and/or mesh size for all freshwater mines is 500 µm. While smaller mesh sizes can be used for comparison to historical data

(MMGD Section 5.21.1.1), MMGD states that '… it is highly recommended that a stack of screens be used which minimally have the mandatory sieve sizes and then any other smaller sizes which are appropriate. This procedure simultaneously allows site-specific concerns to be addressed and fulfills EEM objectives by allowing for national or regional comparisons to be conducted on the standardized mesh sizes. Note, that sieving with the finest scale sieve can be done in the field, as long as the appropriate fractionation of the sample is performed in the laboratory before processing.' **Given that the critical effect sizes for the benthic invertebrate endpoints may be determined based on 500 µm data, it is important that the 500 µm data be collected and analyzed at the family level for the MMER EEM program.**

18. p. 68: The TAP strongly recommends that the *in situ* variables listed be collected at each sampling station (page 5-64 of the MMGD).

19. *p. 68: At facilities with historical sediment concerns, it is suggested that the top 2-4 cm layer of an undisturbed Eckman sample be collected with a small core or a ruler and scoop. This method has also been suggested to other mines in the north (e.g. diamond mines). In order to maintain a consistent approach regionally, and considering that sediment deposition has appeared to influence the results of past studies, the TAP recommends this method be followed.* ***NOTE TO TAP : THIS COMMENT IS BEING DISCUSSED WITH EEM SCIENCE ADVISORS AND MAY NEED FURTHER DISCUSSION***

20. p. 68: A description of the volumes proposed for sediment sampling is needed.

21. p. 68: Water quality monitoring must be done at **both** the fish and benthic reference and exposure areas, during the field surveys. Water quality parameters to be measured are the same as those measured for effluent characterization, plus temperature, dissolved oxygen, deleterious substances and pH (as stated in the MMER).

22. 67: Will conductivity be used as the water column tracer in the benthic invertebrate survey? If not, please outline what parameters will be measured at each station and used as a tracer.

Schedule

23. P. 68: Please clarify that the fish survey will be done during effluent discharge.

24. *p. 68:* ***The TAP recommends that the timing of the fish survey be discussed during the April TAP meeting as there are several questions and concerns****. Fish in some other systems migrated downstream upon commencement of mine discharge supporting the need to start sampling near the onset of discharge. However, it is quite possible that ninespine stickleback will still be spawning in mid-July and therefore will not be an appropriate species for sampling at that time. Moore (Appendix D) sampled at the end of July and states that "young sculpins with unabsorbed yolk sacs, as well as mature eggs were observed near the mouth of Stream A." suggesting that sculpin should be finished spawning by the end of July. With respect to a non-lethal arctic grayling survey, young of the year arctic grayling in the region are thought to emerge 21 to 24 days after*

spawning [3], so assuming spawning is finished around July 15, YOY grayling should emerge around August 5.

Minor Point

25. p. 15: Please clarify the first sentence under Table 3-1.

26. p. 68: one of the sentences on the last line is incomplete ("…they spawn in…").

References

[1] Martin, K.A. 2001. A Limnological study of selected lakes in the Lac de Gras area, Northwest Territories with special reference to fish contaminants. Canadian Technical Report of Fisheries and Aquatic Sciences, No. 2385: viii + 78 p.

[2] Jackson, F.J., C.N. LaFontaine, and J.F. Klaverkamp. 1996. Yellowknife – Back Bay study on metal and trace element contamination of water, sediment and fish. Dept. of Indian and Northern Affairs Canada. Yellowknife, N.W.T. 195 p.

[3] Jones et al., 2003, Ecological Characteristics of Streams in the Barrenlands near Lac de Gras, N.W.T., Canada. Arctic. 56(3): 249-261.