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Your file *Voire référence*

Our file *Notre référence*

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RE: Giant Mine Remediation Project – Human Health and Ecological Risk Assessment (HHERA)

As requested at the Baker Creek meeting held on November 26, 2009, Fisheries & Oceans Canada (DFO) has reviewed the Giant Mine Tier 2 HHERA report produced by SENES (2006), as well as the final report from the Baker Creek sediment investigation completed by Jacques Whitford (2006).

The purpose of the review is to provide input to the Giant Mine Remediation Team on the results of the reports and to make recommendations regarding further studies that could be undertaken to fill information gaps related to the aquatic health of Baker Creek.

At the November 26th meeting, DFO had an opportunity to ask questions and get clarification regarding the 2006 HHERA from Bruce Halbert of SENES. Specifically, questions were asked regarding the pathways modelling (INTAKE model), the aquatic toxicity reference values used in the hazard assessment and the predictions used in the risk characterization.

The challenges associated with conducting ecological and human health risk assessments are recognized, as there are often a number of limitations to the available data which can create uncertainties in the results. These uncertainties are outlined in the report and I believe that there is an opportunity to revisit these and identify new information available and/or required to augment the results of the risk assessment.

The results of the ecological risk assessment suggest that fish in Baker Creek may potentially be at risk of adverse effects, specifically bottom-feeding fish species. There are acknowledged uncertainties in the estimates of Arsenic (As) loadings, the toxicity data and the As speciation. The aquatic assessment section only considers water column impacts and it was suggested within the report that further tests are necessary on the sediments to establish a site-specific Toxicity Reference Value (TRV) for organisms residing in the sediment. The risk assessment states that more biological studies on aquatic species are needed to validate the results and to provide a weight of evidence that adverse effects are not occurring in fish populations using Baker Creek.

The Dillon reports (2002, 2004) on biological sampling on Baker Creek, which were used to support the risk assessment, also make recommendations for future studies on both

fish and benthic communities to increase the sample size and statistical power of the study. This would provide more concrete answers to the mine's potential effects on the Baker Creek watershed and aquatic life (upstream vs. downstream and/or between different fish species).

The Jacques Whitford (2006) final report on the sediment investigation of Baker Creek provides additional information regarding the nature of the sediments that could be compared with or used to update the data used in the HHERA. Specifically, data on pore water concentrations, Arsenic bioaccessibility, speciation and sediment toxicity. This report used an EC₂₀ or a 20% difference to identify an effect on sediment toxicity endpoints, which differs from the EC₂₅ used in the HHERA to identify effects on organisms. Of note, the report concluded that the creek is heterogeneous and there is no clear trend in the physical and chemical composition of the sediments and water. This differs from the approach used in the HHERA to assess Baker Creek where water and sediment quality predictions were averaged across the creek as a whole.

The Jacques Whitford sediment study concluded that the sediments in both Baker creek and Baker pond are highly toxic to the organisms studied. But it did not provide an assessment of the health of the existing Baker Creek benthic community (density, diversity or toxicity), and sampling was not conducted below the culvert (lower Reach 1 and Reach 0). The report also indicated that more information would be required to better understand what is driving the toxicity of the sediments.

As a result of this review and the Baker Creek remediation discussions that have taken place over the past few months, DFO has several recommended actions to improve our understanding of the health of the creek and the aquatic life it supports. In moving forward, DFO recommends that:

1. **The existing HHERA findings for Baker Creek could be augmented to reflect new information that is available on some of the parameters and lines of evidence used in the assessment.** For example,
 - a. Benthic invertebrates
 - i. Jacques Whitford – toxicity and pore water concentrations
 - ii. EEM results
 - b. Fish – data sets
 - i. Simone de Rosemond study in Back Bay - Long-nose sucker results
 - ii. EEM results – slimy sculpin
 - c. Fish – Toxicity Reference Values (TRVs)
 - i. Toxicity testing is being conducted on cold water fish species, so additional TRVs specific to northern fish species will be available this FY. (DFO, Ontario MOE and University of Guelph)
 - d. Sediment characteristics
 - i. Jacques Whitford study - Arsenic bioaccessibility , speciation and pore water concentrations
2. **The Arctic grayling specimens (adult and young-of-year) taken from Baker Creek in the spring of 2009 and the sediment sample from Reach 4 should be analysed for Arsenic concentrations to supplement the data sets available for fish species utilizing Baker Creek and Back Bay. Suggested parameters for the analysis are:**

- a. Reach 4 sediment – full metals, particle size and TOC
- b. Fish tissue analysis – Total As and As speciation
 - i. Young-of-year (YOY) - whole body
 - ii. Adult – liver, GIT and muscle

Analyzing Total As in the fish tissue would allow for comparison to the existing data set used in the HHERA and As speciation would provide a more detailed analysis of potential toxicity that could be compared to the Back Bay study (Simone de Rosemond) and used to inform human health risk assessment on consumption of locally caught fish.

DFO has funds available this fiscal year to support the Giant Mine Remediation Team in undertaking the analysis and reporting on the 2009 Arctic grayling tissue. There may be a possibility of obtaining tissue samples from Arctic grayling on the Kakisa River in the spring of 2010, which could be compared to the results of the Baker Creek grayling. There could also be a potential to partner with the researchers from the University of Saskatchewan that conducted the Back Bay study who indicated that, ideally, more research could be done to determine concentration and type of Arsenic species in fish tissues from Back Bay.

3. **Further aquatic studies on Baker Creek could be undertaken to address the data limitations and information gaps identified in both the above referenced studies and in our discussions to date on the remediation of Baker Creek.** Some of the key areas that have been identified are:
 - a. Aquatic health – collect more field evidence (larger sample sizes and data sets) on fish and benthos tissue to support the risk assessment results.
 - i. Assessing fish and benthic communities in Baker Creek – comparison upstream and downstream of the mine site and/or with a “pristine” reference site.
 - b. Habitat and fish use – more information is needed on fish use of the existing habitat in the creek as a whole in order to better understand and assess the potential effects of existing conditions.
 - i. Some habitat assessment information is available (Dillon 1998 and Golder 2001), but more work could be done to characterize the creek habitat in order to determine existing use by fish and the full habitat potential of the creek. Specifically, more information on Baker Pond (Reach 6) and below the culvert (lower Reach 1/Reach 0), as these are productive areas and potentially provide important forage and rearing areas for fish.
 - ii. Resident fish communities – a question still remains as to whether there are any resident fish that remain in Baker Creek throughout the summer and potentially over winter. The Dillon 1998 study found no fish in August, but they did not sample in Baker Pond (Reach 6). A sampling program could be conducted during the winter to assess potential over wintering habitat and fish residency.
 - c. Traditional knowledge – a TK study could be conducted with local aboriginal groups to identify traditional knowledge on the creek, to provide input and guidance into the monitoring and remediation plans and to assist in identifying a potential reference site in the Yellowknife Bay area that could be used to compare against the results from Baker Creek.

DFO would like to work in partnership with INAC to undertake these activities and studies. We have funds available this fiscal year to support work on Baker Creek. We will also be identifying Giant Mine/Baker Creek items in our work plan for next fiscal year in order to continue to provide support in moving forward with the remediation of Baker Creek. There could also be an opportunity to collaborate with the proposed EEM studies for Giant Mine to collect some of this data.

We believe that this information will help to better understand the current health of the creek and the potential effects from both the existing conditions and future remediation scenarios. It will assist in answering questions during public discussions on the ecological and human health risks associated with Baker Creek and will hopefully serve to inform the selection of targets and objectives for the future remediation of the creek.

Thank you for the opportunity to comment and provide input on this material. Please do not hesitate to contact me @ 669-4944 if you have any questions or wish to discuss any of the foregoing in more detail.

Sincerely,



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