BRITISH
COLUMBIA

File: 30200-25/PROS-19

Reference: 103250

July 30, 2013

Livain Michaud
Panel Manager
Canadian Environmental Assessment Agency
160 Elgin St
Ottawa ON K1A 0H3

Dear Mr. Michaud:

The BC Environmental Assessment Office (EAO) has coordinated the written submissions of provincial Ministries to the New Prosperity Federal Review Panel (Panel).

In my letter of July 19, 2013, I indicated that provincial Ministries had not yet had an opportunity to fully review the Proponent's July 17, 2013 supplemental response to the Panel's technical information request. Enclosed is the Ministry of Energy and Mines' (MEM) supplemental review of this information.

As before, MEM is willing to respond in writing (via email) to any questions the Panel may have on the Ministries' submissions. They will endeavour to provide responses as soon as possible after receiving any questions from the Panel. Any questions should be directed to Kim Bellefontaine at Kim.Bellefontaine@gov.bc.ca and Tania Demchuk at Tania.Demchuk@gov.bc.ca, and copied to EAO.

Yours truly,

<original signed by>

Nathan Braun
Project Assessment Manager

Enclosure: Ministry of Energy and Mines Supplemental Review Comments

…/2

cc: David Morel, Assistant Deputy Minister
Ministry of Energy and Mines

Kim Bellefontaine, Manager of Environmental Geoscience and Permitting
Ministry of Energy and Mines

Tania Demchuk, Senior Environmental Geologist
Ministry of Energy and Mines

Shelley Murphy, Executive Project Director
Environmental Assessment Office

Ministry of
Energy and Mines

Mines and Mineral
Resources Division

MEMORANDUM

July 29, 2013

To: Shelley Murphy, EAO Executive Project Director
Nathan Hagan-Braun, EAO Project Assessment Manager

Re: New Prosperity – MEM Supplemental Review Comments on Environmental Impact Statement

The Ministry of Energy and Mines (MEM) has reviewed the supplemental documentation submitted in support of the New Prosperity Project and is providing its overall assessment and conclusions on the Environmental Assessment (EA) project information to the Federal Panel. The additional information prepared by Taseko Mines Limited is contained in the following documents:

- Responses to the Technical Information Requests from Taseko Mines Limited to the Federal Panel (July 17, 2013), and,
- Taseko Memorandum entitled New Prosperity Hydrogeological Design Process (July 18, 2013).

1. Hydrogeology and Seepage

The Proponent has revised the estimates of the dewatering rates of the open pit from 11,000 m^3/day to 13,000 m^3/day. Additional summary information was also presented to compare Natural Resources Canada's (NRCAN's) and Taseko's modelling results for seepage from the tailings storage facility (TSF), which stated that NRCAN's results were within the sensitivity bracket of the proponent's modelling.

The July 18, 2013 memorandum states that the current information is at a sufficient level of detail that provides proof of concept that the water management systems will perform within the *"predicted parameters"* and that additional site investigation work would be undertaken after EA decisions to support *Mines Act* permitting. This includes a range of investigative work (including densification of wells, geotechnical drilling, test pits, pump tests and packer tests) for the areas between the open pit and Fish Lake, the tailings embankment foundations and downgradient of the TSF basin foundation.

1.1 MEM Conclusions:

- MEM has considered the NRCAN and Taseko seepage modelling information and the implications for the TSF water balance and potential for oxidation of PAG waste rock stored in the impoundment. The upper bound of the NRCAN seepage predictions suggests that a deficit in the TSF water balance (average conditions) during the post-closure period is possible. This presents potential that oxidation and acidification of PAG wastes stored in the impoundment could occur. With the level of uncertainty with seepage estimates, it is unclear whether the PAG waste rock would remain saturated at all times. However MEM notes that evaporative losses may not be accurately assessed, as the amount of evaporation would decrease if the water level dropped below the surface of the tailings. This combined with the covering of PAG waste rock with 3m of non-PAG tailings could be mitigating factors that could possibly keep the waste rock fully saturated, although this is uncertain without further assessment and sensitivity of the water balance.

- The response information related to seepage estimates highlights the large uncertainties associated with the seepage model predictions irrespective of the modelling approach taken (NRCAN vs. Taseko). This further emphasizes MEM's previous conclusions stated to the panel on July 19, 2013, which are further restated and refined as follows:
  - There is large uncertainty with the presence/thickness of till within the tailings facility to limit seepage. It is also uncertain whether the hydraulic conductivity could be sufficiently enhanced over the large TSF area to meet (or exceed) the modelled hydraulic conductivity used in the Taseko numerical groundwater model.
  - There is large uncertainty with the TSF seepage estimates. The approach taken by the Proponent is not conservative due to the uncertainty in hydraulic conductivity of the hydrostratigraphic units underlying the TSF. It is possible that significantly more seepage would occur from the TSF.
  - The groundwater capture system proposed is conceptual and it is not possible, based on the current information, for MEM to assess the effectiveness of the groundwater pumping/mitigation system to capture at least 70% of the seepage that would otherwise report to Fish Lake (i.e. 30% bypass evaluated in the effects assessment of Fish Lake and tributaries). Based on the significant potential for fracture controlled seepage flow, there is uncertainty around the effectiveness of this mitigation concept.

2. Water Quality Mitigation

The water quality predictions and effects assessment indicate that water quality in Fish Lake will likely be adversely affected by the project during the operational and post-closure phases. The proponent has committed to implementing a range of water treatment methods using an adaptive management approach, if and when monitoring results exceed pre-determined thresholds. In our previous comments to the Panel, MEM recommended that additional information be provided on water treatment to demonstrate that the concepts are effective and technically and economically achievable to prevent adverse effects to Fish Lake water quality.

The proposed water treatment plan includes the reduction of secondary key indicators (including metals, sulphate, arsenic and selenium) to below BC and CCME water quality guidelines using a nanofiltration water treatment system in combination with sulphide/lime precipitation and subsequent ion exchange circuits for sulphate and selenium removal. A portion of the water that is recirculated to Fish Lake (i.e. a maximum of 2 million m^3/year, representing 35% of recirculated Fish Lake water) would be treated in the water treatment facility. Water would be collected through an intake structure on a barge located at the north end of Fish Lake which would take water from either the epilimnion or the hypolimnion. The location of the water treatment has not been specifically defined, but is conceptualized to be on a branch of the pipeline that will feed the Fish Lake tributaries near the east side of the main embankment.

Additional information has been provided on the conceptual design for water treatment. The treatment plan includes pre-treatment filtration to deal with TSS, followed by nanofiltration (for concentration of heavy metals Al, As, Cd, Cr, Cu, Fe, Hg, Ni and Ag). Nanofiltration is a membrane filtration treatment method that uses high pressure to drive water across a membrane to remove ions from solution. The effluent would be devoid of ions (*i.e.* too clean) and would need to be reconstituted to allow discharge to Fish Lake. The reject waste stream from the membrane nanofiltration system would then be treated by sulphide precipitation (for removal of metals), followed by an ion exchange circuit for sulphate removal and an ion exchange circuit for selenium removal. The treated effluent from the sulphide precipitation and ion exchange circuits would be directed back to the membrane nanofiltration circuit.

Additional information was provided on water management concepts and some of the major risks and challenges with these treatment systems were identified. Estimated reagent use, power consumption and their associated costs were presented ($1.29 M per year). Labour and maintenance costs were estimated at $1.9 M annually. Capital costs were not presented.

If treatment is required during the operational mining period, the metal sulphide hydroxide waste that would be generated from the sulphide/lime precipitation water treatment system would be blended into the mill concentrate along with the selenium waste from the sulphate ion exchange (or sold as products). The gypsum waste from ion exchange is proposed to be blended into tailings. The response information included alternate disposal strategies for treatment wastes during the closure period including facilities located in Drayton Valley Alberta and Tacoma Washington. The amount of waste that would be generated was not specifically detailed in the response, but it appears to be on the order of 2 tonnes per day based on reagent volumes consumed. The cost per tonne for offsite waste disposal is estimated at $200/tonne and $3000/tonne respectively for Alberta and Tacoma locations.

2.1 <u>MEM Conclusions:</u>

- MEM's understanding of seepage and water treatment proposals has been clarified by the Proponents July 17, 2013 submission. MEM wishes to update several points made to the Panel in our July 19, 2013 comments related to the treatment of TSF seepage. TSF seepage is not proposed to be treated; only Fish Lake water itself is proposed to be treated via the water recirculation intake structure located at the north end of Fish Lake. During operations TSF seepage would be pumped back to the TSF, and at closure TSF seepage will be routed to the open pit. This updated understanding (Fish Lake water treatment, not TSF seepage water treatment) should be applied to the following previous MEM comments:
    - Last bullet, Section 4.4.4 – This should refer to treatment of Fish Lake, not TSF seepage.
    - Second bullet, Section 8.1.1 – MEM clarifies that treatment to reduce metals in Fish Lake would likely have some benefit for reducing metals in Fish Lake sediments.
    - Section 8.1.2 – MEM acknowledges that there will be no direct effluent streams to Fish Lake that can be separately managed and that the proposed trigger system would apply to Fish Lake itself.
    - Section 9.1 - MEM notes that the reference to TSF seepage treatment should be replaced with water treatment of Fish Lake.
    - Section 11, bullet 7 - This should be updated as water treatment of Fish Lake for metals (year 17 to >100 years)
    - Section 11.1 – This bullet should make reference to the likely treatment of Fish Lake and pit lake water.
- The water quality modelling and effects assessment results indicate that significant adverse changes to water quality in Fish Lake and its tributaries will occur in the future, even if an effective groundwater capture system could be implemented (which is uncertain; see Section 1.1). Thus MEM concludes that water treatment should be considered as a primary mitigation requirement for the project and not a contingency strategy. It is unclear exactly

when water treatment would be required to be implemented, however it would be appropriate to assume that this could be during the operational mining period given the modeled water quality predictions and especially given the level of uncertainty with the seepage modeling and effectiveness of the proposed groundwater collection system. MEM also concludes that water treatment (along with water pumping of Fish Lake and TSF seepage) would be required in perpetuity.

- The technical response information states that *"The design flows and system effectiveness for the water treatment have been sized in order to handle the worst case scenario predicted in the EIS. This takes into account the largest rate of increase in concentration of metals in Fish Lake through-out all phases of the project."* MEM notes that the treatment system has not necessarily assumed the worst case scenario. It is expected that concentrations of contaminants in the uncollected TSF seepage groundwater plume (i.e. bypass) would continue to increase over time during the mine closure phase as the groundwater plume migrates to Fish Lake. At the end of operations (Year 17), the model predicts the plume is influencing Fish Lake tributaries, but will not yet have reached Fish Lake. Thus Fish Lake water quality could deteriorate further once the plume migrates further downgradient and reaches the lake. This further emphasizes the need for monitoring and adaptive management, including effective water treatment, to mitigate effects to Fish Lake. The full effects of the groundwater plume may not occur well into the post closure period (~100 years based on the model).

- Although additional information was requested by the Panel to demonstrate that proposed water treatment systems would be effective to achieve the stated treatment efficiencies and proposed water quality for Fish Lake, no information or evidence of the achievability of treatment efficiencies has been provided. No analogue information on influent/effluent concentrations from other mines or bench/pilot scale data has been provided. It is noted that publicly available data for the Minto Mine, does not appear to support that the proposed water quality targets for Fish Lake could be achieved. There is also no detailed rationale provided in the additional information as to how the conclusions on high effectiveness of the mitigation plan and low residual effects were reached.

- The stated primary goal of the water quality mitigation plan proposed by BioteQ is *"to protect and maintain a habitat capable of supporting a viable and self-sustaining rainbow trout population in Fish Lake during the life and post-closure period of the New Prosperity Copper Mine"*. The nutrient status of Fish Lake and the potential to induce eutrophication is a key issue for the project and MEM requested clarification as to how the BioteQ systems would affect the eutrophic status of Fish Lake. The additional information provided states that nanofiltration would be expected to remove some additional constituents from Fish Lake water. However the response did not identify these constituents or provide information to demonstrate the effectiveness of these strategies to remove nutrient loadings. MEM concludes the effectiveness of the proposed BioteQ system to mitigate eutrophication of Fish Lake is uncertain and other measures, such as oxygenation, should be considered the primary mitigation strategies.

- As previously commented by MEM, secondary waste products generated by water treatment processes can be expensive and onerous to dispose of. The newly proposed offsite removal strategies for the closure phase would be acceptable to MEM; however, it is not clear whether these secondary wastes would meet the requirements for transportation and disposal. It is also noted that the projected disposal costs for waste are very high. MEM considers that the proposal to store the gypsum cake (i.e. sulphate ion exchange wastes) onsite as an acceptable disposal strategy. However, disposal of uncontained gypsum cake in the tailings stream during operations will lead to the ongoing circulation of sulphate into the tailings streams that will require perpetual treatment.

- MEM previously noted to the Panel that the proposed membrane water treatment, sulphide reduction, and ion exchange water treatment technologies are not widely used in mining applications, and none are currently in use at British Columbia minesites. These water treatment technologies are complex treatment systems (as compared to lime treatment for instance) and not conventionally used in mining applications due to their high costs and known challenges for full-scale implementation and reliability. These systems are known to be prone to upset and have significant maintenance issues (for example pre-treatment filtration, fouling of membranes, fouling of ion exchange resins). There is also additional risk posed by the large amounts of chemicals and reagents that would be needed for the treatment steps and additional risk of upset to Fish Lake and tributaries with concentrated salty regenerants within the treatment systems. These types of risks were not assessed in the accidents and malfunctions section of the EA.

- Individually, the proposed water treatment components are considered to be very high cost treatment technologies. In sequence, this could be even more costly. Capital costs have not been stated, but are expected to be very high for these types of systems. Based on the information provided, annual operating costs appear to be on the order of $10 million annually (reported opex $1.29M, labour and maintenance costs $1.91M, closure water pumping and monitoring costs from IR#4a $6.5M, and unspecified volumes of waste requiring offsite disposal). While detailed costing is reviewed at the *Mines Act* permitting stage when setting the financial security requirements, the full costs of treatment should be fully evaluated by the proponent at the EA stage as it has the potential to affect the economics of a project. MEM expects that the amount of financial security that could be required to fund this scale of long-term liability would be very high and are likely unprecedented in the province. The capital and operating costs for water treatment (along with long term water pumping, conventional reclamation costs, monitoring and maintenance, including impoundment dams etc.) would be considered in any future evaluation of financial security requirements by MEM.

- The information provided on water treatment for the New Prosperity Project does not provide confirmation that the proposed target water quality objectives for Fish Lake are likely to be either technically or financially achievable. Given these are key requirements to preventing adverse water quality affects to Fish Lake and its tributaries, MEM concludes that there is significant uncertainty whether adverse effects to Fish Lake water quality could be prevented with the current project design.

- In addition to the requirements for Fish Lake water treatment, the open pit lake may require water treatment prior to spilling at Year 48. The potential additional treatment requirements and costs associated with it have not been scoped in the EA or in these review comments.

3. Overall Conclusions

MEM recognizes the significant efforts of the proponent to redesign the New Prosperity project to mitigate effects and protect Fish Lake; specifically the relocation of the tailings, waste rock and ore facilities, and the commitments to manage water and treat Fish Lake water quality in an effort to protect Fish Lake. However, despite these modifications to the project, MEM believes that the project presents significant environmental risks due to the uncertain ability to limit and collect TSF seepage and to effectively and economically treat water to maintain water quality in Fish Lake and its tributaries.

MEM concludes that it is unlikely that the project can be developed as currently designed without adverse effects to the water quality of Fish Lake and its tributaries from TSF seepage. Even with expensive and long-term measures to mitigate TSF seepage, the protection of Fish Lake water quality may not be assured.

Thank you for the opportunity to comment on the EIS Application and supplemental information for the New Prosperity Project. Follow-up questions from the Panel to MEM during the hearings should be directed via email to Kim.Bellefontaine@gov.bc.ca and Tania.Demchuk@gov.bc.ca (MEM) with a copy to the BC Environmental Assessment Office at Nathan.Braun@gov.bc.ca.

Sincerely,

<original signed by>

Kim Bellefontaine, M.Sc., P.Geo.
Manager Environmental Geoscience and Permitting

<original signed by>

Bruce Mattson, M.Sc., P.Geo.
Senior Environmental Geoscientist