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MEMORANDUM

TO:	Dr. Ginger Gibson, Kwe Beh Working Group	400081
FROM:	SENES Nico Project Review Team	September 12, 2012
COPIED TO:	Gerd Wiatzka, Randy Knapp, Stacey Fernandes and Sarah Baines	
SUBJECT:	Public Hearing Undertakings – Responses to MVEIRB Questions	

During the public hearing held by the Mackenzie Valley Environmental Impact Review Board (Review Board), Review Board staff requested that the Tlicho Government provide further responses to two questions as a post-hearing undertaking. At the request of the Tlicho Government, SENES Consultants Limited (SENES) has reviewed the two questions and provides the following comments for use by the Tlicho Government in responding to the Review Board's questions.

Please note that a detailed technical answer to Question 1 would require multiple days of analysis not currently within the approved Scope of Work. Since a detailed technical analysis for Question 1 will most likely result in little change to our final recommendations, a "big picture" approach to providing a response to Question 1 has been taken.

Question 1 - Do you accept the updated water quality predictions that are provided in the August 20th memo submitted by Fortune Minerals?

Question 1 Response

The two questions assigned to the Tlicho Government as undertakings appear to suggest that if the water quality predictions provided in the August 20th memo are considered acceptable, then the uncertainty associated with wetlands is less of an issue because the water leaving the mine site and entering the wetlands is for the most part of satisfactory quality. In this view, wetlands provide a "polishing" function rather than being used as primary treatment. This link between the August 20th water quality predictions and wetland function is too simplistic because predictions are inherently uncertain, even when the best information available at the time is used, and may prove to be inaccurate over time due to changing environmental conditions, variances in performance of the mine components and other factors.

Table 13.1 in the August 20th memo indicates that 13 parameters in receiving waters (Nico Lake) are predicted to exceed either CCME guidelines or SSWQOs if wetlands are not constructed. These predictions for Nico Lake suggest that the wetlands are required for more than just polishing but rather are integral to ensuring the quality of water in the receiving lakes remains acceptable.

The inherent uncertainty associated with water quality predictions and the uncertainties associated with wetlands as described in the response to Question 2 below need to be acknowledged. Acknowledging uncertainty does not mean that Fortune should not proceed with the project as described. Rather,

acknowledging uncertainty simply means that Fortune is aware of and respects potential challenges. Part of acknowledging uncertainty requires undertaking necessary monitoring and studies to manage the challenges before they cause significant impacts and developing contingency plans.

SENES recommends that Fortune be required to either:

a) include within its conceptual closure plan the use of an impervious cover at closure to essentially eliminate long term seepage (following drain-down, melting and consolidation); or,

b) provide financial assurance for the collection and mechanical treatment of seepage until such time that the testing confirms the success of wetlands. The success of the wetlands can be measured by the quality of water emerging from the wetlands and whether that water negatively impacts the receiving water bodies.

Question 2 - Does this apparent lack of need, a lack of reliance on the wetlands, reduce your concern about wetland performance and wetland uncertainty?

Question 2 Response

Fortune has provided a rational and consistent response that wetlands will function and that the quality of water entering the wetlands will be of good quality. We fully accept this is a good technology that has 'potential' to be successful and agree that Fortune should proceed with its designing and testing of wetland systems to be used at mine closure. However, until such time that the design work is advanced and the tests provide a greater degree of certainty that the wetlands will work, the uncertainty related to wetlands needs to be acknowledged and contingency plans developed.

The uncertainties with respect to quantity and quality of water entering the wetlands and wetlands performance, are many and include:

1. Quantity of water entering the wetlands: There will be seepage which Fortune has estimated will be 69,000 m^3/y (or less). This is an estimate and is reasonable. To suggest it can't be higher is simply unsupportable. The number may well be greater as a result of higher annual precipitation, erosion of the cover, lack of any design data to predict cover infiltration, drain-down of the porewater, lack of any cover testing, potential effects of climate change, additional seepage from consolidation, additional seepage from melting ice, etc. Flows could be materially higher especially for the initial 10's of years if consolidation and melting occur.

2. Quality of water entering the wetlands downstream of the CDF:

    a) Fortune undertook extensive testing of the tailings and waste rock but no data on comingled material. There were long term humidity cell tests to obtain the rates of metal dissolution from tailings and waste rock samples. Rather than use the metal rate data (the purpose for kinetic tests) Fortune's consultant chose to simply pick the highest value from the test and state this cannot be worse. Where peak levels are controlled by solubility, this is a rational method. However, where solubility is not controlling, this method is simply incorrect for assessing long term seepage quality. What should have

been done was to use the rate data from the humidity cell (e.g. mg/kg/unit time). This data would be corrected for quantity of tailings and rock in the pile, temperature, surface area of the reactive tailings and waste rock open to oxidation and the amount of material exposed to flushing from infiltration. Concentrations could be much greater or possibly even less than predicted. We simply don't know. Another way to look at this is that the humidity cell is 15 cm deep while the pile is 20 000 cm high. Would water draining through a 15 cm column have the same quality as water passing through 20 000 cm column? Fortune is currently asserting that the water would have the same quality which may not be the case.

b) Unproven Technology- Although co-disposal is a unique and attractive concept, it has not been done on a similar scale in this environment.

3. Wetlands Cold Temperature Performance: A number of examples were provided. Of the 21 references sited, only four relate to constructed wetlands in Canada's North. Of these four most are simply small scale test plots and not full scale applications. For example:

   i. Bell Copper- To our knowledge this was simply a test program which never was implemented. Work was completed in the early 1990's.
   ii. United Keno Hill-Sobolewski work was a 167 m^2 test plot that was run during the summer for 3 months. A large scale plant was not constructed and no winter performance data was collected.
   iii. United Keno Hill- Laberge Environmental Services evaluated natural wetlands and Sobolewski's plot. No wetland was constructed and the primary conclusion was wetlands have potential but need operational data for winter operations.
   iv. Unknown Uranium mine: The mine was not named. We are aware of a mine in Saskatchewan that uses a large scale natural wetland which was expanded upstream by transplanting species to increase the wetland size. To our knowledge, this system does not consistently meet objectives.

Our position remains unchanged. Although we are encouraged by Fortune's commitment to producing high quality discharges from passive systems in the future, there remains considerable uncertainty. Therefore, at least one of the following contingencies needs to be in place until such time that the wetlands prove to be successful:

I. The use of an impervious cover at closure to essentially eliminate long term seepage (following drain-down, melting and consolidation) incorporated into the closure plan as an alternative.
II. Provision of financial assurance for collection and treatment of seepage.