

**Comments on the Comprehensive Study Report for the Sisson Project
(Tungsten and Molybdenum Mine),
New Brunswick
CEAR #11-03-63169**

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**Conservation Council of New Brunswick
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1. Introduction

1.1 Background to CCNB's comments on the Comprehensive Study Report for the Sisson Project

Sisson Mines Ltd. (SML, the proponent) has proposed to construct and operate a 30,000 tonnes per day tungsten and molybdenum mine approximately 60 kilometres northwest of Fredericton, New Brunswick (the Sisson Project). As described in the project's environmental impact assessment (EIA) report, the project would consist of a 145 hectare open pit mine, a 751 hectare tailings impoundment, numerous water management ponds, an ore crushing and processing plant, a water treatment plant, an ore storage area(s), a transmission line to bring power to the project site, and use of provincial roads. As proposed, the construction and operation of the mine will require the destruction of portions of streams that are headwaters of the Nashwaak River. The Nashwaak River, a tributary of the St. John River, is a main refuge for the endangered St. John River population of Atlantic salmon. The Villages of Napadogan and Stanley are located approximately 10 km and 20 km respectively from the proposed mine.

As the Sisson Project will have environmental impacts on areas of both federal and provincial constitutional jurisdiction, it has been subject to two environmental assessment processes, one under the *Canadian Environmental Assessment Act (CEAA)*, and another under the *New Brunswick Environmental Impact Assessment Regulation - Clean Environment Act (NB EIA Reg.)*. Because the project commenced under the *CEAA*, the federal environmental assessment of the project continued under that act rather than the *Canadian Environmental Assessment Act, 2012*, which repealed and replaced the *CEAA*. Due to the amount of ore to be processed, the Sisson Project was subject to a "comprehensive study" type of environmental assessment under the *CEAA* (rather than a "screening").

Provincially, the Minister of Environment determined the Sisson Project was subject to a "comprehensive review" under the *NB EIA Reg.* A provincial comprehensive review sets out a number of steps in the environmental assessment process, such as the development of terms of reference for the EIA report, the writing and filing of the EIA report, and the holding of a public meeting(s) by the Minister of Environment.

The provincial and federal governments agreed to conduct a "harmonized" environmental impact assessment process for the Sisson Project. The EIA report described the harmonized process as being:

"Under this approach, both levels of government have agreed to cooperate in the carrying out of the EIA to meet the requirements of their respective legislation, beginning with Terms of Reference being issued jointly to define the scope of the EIA federally and how Northcliff [now SML] will meet the Final Guidelines provincially. They have also agreed that a single EIA Report prepared by the Proponent to meet the requirements of the Terms of Reference would suffice to fulfill the respective provincial and federal EIA requirements. The CEA Agency will then prepare its comprehensive study report (CSR), relying upon the EIA Report and the results of the review process." (at EIA p. 4-4).

The Canadian Environmental Assessment Agency (CEA Agency) sometimes provides participant funding to individuals, not-for-profit organizations, and Aboriginal groups, to assist them in participating in a federal environmental assessment process, such as the comprehensive study for the Sisson Project. The Conservation Council of New Brunswick (CCNB) applied for and received participant funding. The two main purposes of this funding were for CCNB to hire experts to review and provide comments on 1)

sections of the Sisson Project EIA report and 2) the CEA Agency's comprehensive study report (CSR) for the project.

Further to purpose #1 of CCNB's participant funding, on August 30, 2013, the CEA Agency released the proponent's EIA report for the Sisson Project to the public for review and comment. The public had 45 days (to October 14, 2013) to submit its comments to the Agency. As per its contribution agreement with the CEA Agency, CCNB provided a lengthy and thorough review of the EIA report.¹ CCNB used most of its participant funding at this stage of the EA for the Project. The reason for this was because comments at this earlier time were more likely to result in changes to the Project compared to those made in response to the CSR.

Further to purpose #2 of CCNB's participant funding, on April 15, 2016, the CEA Agency released its CSR for the Sisson Project to the public for review and comment. The public has 30 days (to May 15, 2016) to submit its comments to the CEA Agency. *The purpose of this report is to document the findings of CCNB and its experts' review of the CSR for the Sisson Project and to detail CCNB's position as to whether the construction, operation, and closure of the project should receive federal approval.*

1.2 CCNB's position on the CSR report and adverse environmental effects of the Sisson project

As will be discussed more fully below, CCNB and its experts have identified five main failings of the CSR and subsequently the Project:

1. The Project should not be approved until impacts on Aboriginal and treaty rights are fully addressed and accommodated.
2. Fundamental questions regarding the impacts of the Project on the environment still remain unanswered.
3. The need for the Project will not be met.
4. The CSR does not require the use of best available practices for mitigation measures.
5. The conclusions of the CSR are based on improper reliance on undefined adaptive management strategies.

Based on: 1) the fact that many of the impacts of the project continue to be unknown; 2) our experts' previous findings from their reviews of the EIA report that many of the Project's adverse environmental effects are significant; and 3) the application of the precautionary principle, it is CCNB's continued position that the adverse environmental effects of the Project must be accepted as being significant. Given this, plus our other concerns listed above, it is clear the obvious risks posed to the environment by the Project, such as the release of air and water contaminants, the physical destruction of valuable fish habitat, metal leaching and acid rock drainage, and impacts on Aboriginal and treaty rights, significantly outweigh the unsubstantiated need for or benefits of the Project.

For all of the above reasons, it is the position of CCNB that the conclusions of the CSR cannot be supported. Instead the CEA Agency should have 1) concluded that there is no need for the Project and

¹ See CCNB, October 11, 2013. Expert Comments on the Environmental Impact Assessment Report for the Sisson Project (Tungsten and Molybdenum Mine), New Brunswick CEAR #11-03-63169. (See: <http://www.conservationcouncil.ca/sisson-mine-project/>.)

that it is likely to cause significant adverse environmental effects, and 2) recommended that the Project not be allowed to proceed.

Following from the above, we will be requesting that the Minister use her authority under s. 23(1) of the old CEAA to issue an environmental assessment decision statement that states the project is likely to cause significant adverse environmental effects that cannot be justified under the circumstances. Given this, we will further request that the Governor in Council not provide any approval that would allow the responsible authorities to take any course of action under s.37(1)(a) of the former Act that would permit the project to proceed in whole or in part.

1.3 General comments on the Project's "Benefit to Canadians" and conduct of the EA of the Project

The CSR section 12 "Benefits to Canadians" focuses on the outcomes of the EA for the Project. CCNB and many of its experts have a fundamental disagreement with how the EA for the Project has been conducted, the methods used for the CSR, and the conclusions of section 12 "Benefits to Canadians". This disagreement is the genesis for most of our findings regarding the CSR and the Project. As such, even though section 12 "Benefits to Canadians" is near the end of the CSR, we feel it is appropriate to discuss it at the beginning of this report.

To put it plainly, participating in the EA for this Project has been a frustrating experience. As CCNB's earlier comments on the EIA Report made clear, the EIA Report was missing so much basic baseline data and technical information, e.g., acid-base accounting, seepage rates from the TSF, etc., and had so many errors, that the Proponent's environmental effects analysis could not be substantiated or accepted with any confidence and its statements regarding the environmental benign-ness of the Project could only be seen as self-serving. (A review of the EIA Report by Maliseet First Nations also found many similar shortcomings in the EIA Report.)

We recognize that after the public review of the EIA report, many federal departments posed Information Requests (IRs) to the proponent in an effort to address deficiencies with the EIA Report. However, these IRs and the proponent's responses have not been made available to the public on the CEAA Registry website. Also, an amended EIA Report was never made available to the public. (Which if it was should have had trackable changes.) As a result, the public has no idea about the outcome of these IRs and in turn whether the deficiencies of the EIA Report have been rectified.

For example, the CSR occasionally discusses how the proponent responded to IRs (e.g., CSR section 4.2.3 Tailings Storage Facility Embankment Design). However, no documentation, analysis, or amended EIA Report is provided to support the CSR's acceptance of the proponent's responses. In addition, the proponent's answers to some IRs clearly do not address initial problems with the EIA report. For example, CEAA commenced a series of IRs seeking further details regarding the impacts of a failure of the TSF (IRs: CEAA 01-24 and CEAA 11-02, e.g. CEAA 11-02, "For the Mount Polley Report ... Update your analysis as appropriate."). Reviewing the proponent's response shows no updated analysis. So unconfident are CEAA and the NB DELG in the proponent's present design and analysis for the TSF embankment that they are requiring "the proponent to undertake tailing storage facility failure modelling by a qualified third party for the final engineered design and for each approved lift of the tailing storage facility structure" (CSR p. 103).

What the above example identifies is that the IR process is not complete and certain serious shortcomings of the Project and EIA Report have still not been addressed. (This will be discussed further in section 2.2 below.) As a result, without documentation, such as an amended EIA Report, how can the public be expected to accept the CSR's acceptance of the proponent's responses to proposed changes?

Further to this, CCNB received no feedback from the CEA Agency on its report on the EIA Report. Did the CEA Agency consider the points raised by our experts to be valid? Other than IRs, how was the proponent required to respond to CCNB's report? Again, we found serious shortcomings with the EIA Report and without an amended EIA Report we can only conclude these shortcomings remain. (This is discussed more fully in section 2.2 below.)

In response to the specific conclusions of CSR section 12, the points CCNB raised in our response to the EIA Report's assessment of "Benefits to Canadians" continue to hold true (see Appendix A).² In addition, other than requiring the proponent to prepare an EIA Report and incorporate some environmental considerations into the design of the Project, participating in the EA for the Project has yielded little benefits to the public. The listed modifications to the Project because of the EA are minimal at best and in fact their earlier omissions demonstrate a lack of care in preparing the EIA Report and/or a cavalier attitude towards the Project's impacts on the environment by the proponent.

CSR identified modification	CCNB response
Compensating for the loss of function for affected wetlands following the principles of the federal and provincial wetland policies.	Should never have been at issue.
Considering comments from the public and First Nations to help identify suitable projects to offset impacts on fish habitat.	The proponent was told by stakeholders long before the EIA was prepared that its proposed project (Long Lake) was not acceptable.
Providing an opportunity for First Nations to harvest plants of value to them prior to clearing.	A proponent that understood Aboriginal concerns in the first place would have made this a matter of course.
Monitoring of potential effects at two to three traditional use sites identified by First Nations for harvesting of country foods (e.g. fiddleheads, berries, medicinal plants) prior to construction, and within five years of the start of operations.	How else would you monitor impacts of the Project on country foods?
Developing and implementing an avian species at risk monitoring and follow-up plan.	How else would you determine the Project's impacts on avian species at risk?

To conclude this section, as one of CCNB's experts, Dr. Curry, wrote in response to his review of the CSR:

"I realize the CEAA and the Provincial EIA processes are being followed, but so far I find very little government effort to understand the environmental impacts, their probability of occurrence, the financial costs necessary to overcome an impact when it occurs, and how the proponent will actually be penalized for a failure."

² See also the comments of MiningWatch Canada in section 3 below regarding CSR section 12 "Benefits to Canadians".

2. Five main failings of the CSR and Project

Again, CCNB and its experts have identified five main failings of the CSR and subsequently the Project:

1. The Project should not be approved until impacts on Aboriginal and treaty rights are fully addressed and accommodated.
2. Fundamental questions regarding the impacts of the Project on the environment still remain unanswered.
3. The need for the Project will not be met.
4. The CSR does not require the use of best available practices.
5. The conclusions of the CSR are based on improper reliance on undefined adaptive management strategies.

Each of these issues will be discussed more fully below.

2.1 The Project should not be approved until impacts on Aboriginal and treaty rights are fully accommodated

At page 121, the CSR states, “The Agency concludes that the Sisson Project is likely to result in significant adverse environmental effects on the current use of lands and resources for traditional purposes by Maliseet First Nations.” CCNB is in agreement with this conclusion.

However, the CSR goes on to note that Maliseet First Nations and the provincial government are negotiating ways to accommodate or compensate for these effects. This and the remainder of the CSR imply that because of these negotiations these adverse environmental effects will be addressed and the Project should proceed. What is not explained is how these negotiations fulfill the federal government’s fiduciary duties to the Maliseet First Nations in regard to the Project. CCNB cannot support the approval (federal or provincial) of a project that is given prior to the full accommodation of Aboriginal and treaty rights. Given this, it is our position that at a minimum the CSR should state that the Minister and responsible authorities will make no decisions regarding approval of the Project until all Aboriginal and treaty rights infringed by the Project have been accommodated.

2.2 Fundamental questions regarding the Project’s environmental impacts are still unanswered

There was a public comment period on the EIA Report for the Project in the fall of 2013. CCNB commissioned an expert review of the EIA Report which we submitted to the CEA Agency.³ Based on this review, CCNB identified five significant problems with the EIA Report and Project in 2013 (see Table 1).⁴

Our experts’ review of the CSR shows that these problems still have not been addressed (see Table 1). Without this information, the Project’s environmental impacts cannot be known. Because of this missing information, it is unclear how the CSR could conclude the Project is not likely to cause significant adverse environmental effects; there is not enough information to accurately make this prediction.

³ See Note 1.

⁴ A full description of Project’s problems identified in 2013 can be found in Appendix B.

Table 1. Status of problems identified for EIA Report and Project in 2013.

Identified problem in 2013	Status as per CSR, 2016
1. The EIA study was fundamentally incomplete. Missing information included details regarding potential acid mine drainage, specifics about the design of the tailings pond and dam, mine site hydrogeology, impacts on downstream water quality, etc.	Vital information is still missing. (See section 2.2.1 below for more details.)
2. No true economic cost - benefit analysis was done for the Project.	Still not done. (See MiningWatch Canada review of CSR, section 3.3 below.)
3. No proper assessment of the potential failure of the tailings dam.	Still not done. CSR mitigation measures require that tailings storage facility failure modelling be conducted by a qualified third party.
4. The closure plan for the mine was missing significant details, such as how toxic mine wastewater would be treated in perpetuity.	Length of “in perpetuity” still not defined.
5. Costs of closure of the mine not explained.	CSR leaves this to NB DELG conditions of approval.

2.2.1 Overview of continued missing baseline and technical information

In our 2013 report on the EIA Report for the Project, CCNB’s experts identified a lengthy list of deficiencies in the baseline and technical information for the Project (see Appendix C for complete list). As we discuss in section 1.3 above, an amended/revised EIA Report has not been made available to the public. Without having information to the contrary, it can only be assumed these deficiencies remain. As such, the EIA for the Project remains incomplete. Without a complete EIA, the CSR should not have been written.

However, leaving aside CCNB’s experts’ earlier concerns with the EIA Report, there is still ample evidence in the CSR that fundamental questions regarding the Project and its impacts on the environment still remain. Throughout the CSR, the CEA Agency relies on the NB DELG’s 40 conditions of approval⁵ as the Agency’s basis for concluding the mine will not have significant adverse environmental effects. Several of these conditions require SML to conduct further studies of and gather information on the current state of the environment around the mine. Other conditions require further details regarding technical aspects of the mine. A few key examples are discussed below.

Atmospheric environment:

- Baseline air quality sampling is still required (NB DELG Condition #20).
- A follow-up measure recommended by the CEA Agency states “Conduct additional analysis on the potential for contaminant transport from overburden stockpiles, including but not limited to, windblown material transport ...” The requirement for this measure strongly suggests not enough is known about this potential impact.
- See also the comments of I. Milewski in section 3.6 below.

⁵ Available at:

http://www2.gnb.ca/content/gnb/en/departments/elg/environment/content/environmental_impactassessment/comprehensive_reviews/sisson.html).

Water resources:

- Hydrogeologic and groundwater data still needs to be collected (NB DELG Conditions #24, 25, 26).
- Seepage rates from the tailings pond to the environment need to be clarified (NB DELG Condition #4).
- Overburden acid rock drainage and metal leaching has not been completed (CSR section 5.3.2). As Dr. Chambers notes (see section 3.2 below):

“Environment and Climate Change Canada and Natural Resources Canada requested data on the potential of overburden material to generate acid and leach metals. They also requested information on how this material would be managed. The proponent indicated that an acid based accounting would be undertaken in the future if preliminary analysis indicated the presence of sulphur concentrations greater than 0.1 percent, a level below which the buffering potential of material was expected to exceed the acid generating potential.”

It is obvious from this statement that even “preliminary analysis” of the overburden material has not been done. This information is simple to obtain, and is essential to proper project management. Providing this information should be required before the project can proceed.”

- Why ferric co-precipitation process was chosen as water treatment method. As Mr. Parker notes (see section 3.3 below):

“[The proponent] provide a lot of conceptual plans about how that water will all be collected but provide almost no information about how they will treat the waste water to achieve the prescribed limits. There is reference to a “ferric co-precipitation process” on Page 29 of the CSR and a reference to a “ferric sulphate treatment” on page 34 of the CSR. In the EIA, there was one reference to using ferric sulphate treatment (Volume 1, Page 7-85). **There is no explanation as to why this treatment method was chosen, what contaminants it is targeting to remove or the efficacy of the method to remove those contaminants. So in response to your questions, I am not able to answer them because no detailed information about waste water treatment is provided.** I can only assume that specific information regarding waste water treatment will be provided as part of the project detailed design phase.”

- Comprehensive plans for waste rock and wastewater management are not complete. (See comments of Dr. Chambers.)

Note: CCNB wants to raise a serious concern about two of the mitigation measures to protect water quality post-closure.

1. Flood the open pit to minimize potential metal leaching and acid rock drainage from remaining pit walls (decommissioning, reclamation, and closure). (CSR p. 133)
2. Maintain pit lake level post-closure and monitor peizometric levels in the vicinity of the pit to ensure it is a groundwater sink until water quality meets discharge requirements described in the approval to operate (decommissioning, reclamation and closure). (CSR pp. 133-134)

The first measure would require raising the water level in the pit while the second measure requires water levels in the pit to be kept low. It is unclear how this can be done at the same time.

Fish and Fish Habitat:

- Confirm amount of loss of fish habitat caused by the mine (NB DELG Condition #22(b)).

Wetland Environment:

- The mitigation measures outlined in the CSR make it clear the impacts of the Project on the wetland environment are still unknown, despite the Project potentially resulting in “the single largest direct loss of wetland area and/or impacts on function from a single project in New Brunswick” (CSR p. 64).

Mitigation measure:

“Develop a conceptual Wetlands Compensation Plan in consultation with New Brunswick Department of Environment and Local Government, New Brunswick Department of Natural Resources, and Environment and Climate Change Canada for any loss or alteration of wetland habitat due to the project. ... The Wetland Compensation Plan must include, but is not limited to: 1) *additional baseline field data on habitat and functions*; 2) *identification of all wetlands within the local assessment area*; 3) *on the ground determination of total area of wetland that would be altered by project activities*; 4) description of proposed compensation activities (i.e. restoration, enhancement, creation) ...” (CSR p. 136, *emphasis added*)

Human Health:

- The CSR follow-up measures show that baseline studies of the Project’s impacts on human health are still required:

“Provide updated results of additional air quality modeling (i.e. that would be conducted in support of the provincial permitted process), should these results differ from those presented in the proponent’s EIA report. *Revisit the Human Health Risk Assessment with any updated concentrations to more accurately predict human health risks from inhalation exposure*” (CSR p. 143, *emphasis added*).

- Further baseline studies of traditional country foods that might be impacted by the project, e.g., contaminated by dust from the mine site, are still required (NB DELG Condition #18).
- See also the comments of I. Milewski in section 3.7 below.

Accidents, Malfunctions and Unplanned Events

- Impacts of a catastrophic failure of the tailings dam still need to be modeled, despite this matter being raised as a chief matter of concern many times by the public and First Nations peoples (NB DELG Condition #26).

To conclude this section, it is unclear how the CEA Agency determined that the Project mine will not have significant adverse environmental effects when key details regarding the mine and surrounding environment remain unknown.

2.3 There is no need for the Project

Assessing the need for a project allows decision makers and the public to balance or weigh the need for a project vs. the environmental harm it may cause. The CEA Agency defines “need for” a project as, “The problem or opportunity that the proposed project is intending to solve or satisfy.” (from: <http://www.ceaa.gc.ca/>.) Looking at the need for a project helps fulfill the two main purposes of environmental assessment, being 1) to minimize or avoid adverse environmental effects before they occur, and 2) incorporate environmental factors into decision making. The greater the need for a project the more environmental harm we are generally prepared to accept. For example, in an emergency like a flood, no environmental assessment is required. *At the same time, significant or potentially significant environmental damage is not justified if there is no need for a project or the need is trivial or minor.*

The stated needs of the Project are to, “mine tungsten and molybdenum containing ore from the Sisson deposit, process ore to meet market demand for the mineral products, and create return on investment for the shareholders of Sisson Mines Ltd” (CSR at 11). However, as one of our experts MiningWatch Canada notes (see section 3.3 below for MiningWatch’s full report), there is no longer a shortage of tungsten and molybdenum on world markets (other mines are closing) and the prices for tungsten and molybdenum have plummeted since the mine was first proposed (with an upswing in prices unforeseeable in the near future). As MiningWatch Canada makes clear, combining these facts with the very low quality grade of the Sisson Brook mine ore makes the profitability of this project very uncertain.

MiningWatch Canada’s recent analysis also confirms the validity of our earlier comments on the EIA Report regarding the market for tungsten (CCNB Sisson Project EIA Report at p. 140):

“The section on tungsten should include a review of projects coming online in the short to medium term that could affect supply and price for the minerals. Without such context it is impossible to assess both the need for this project and the risks of price shifts that could affect the project’s viability. The National Instrument technical report notes that this may be a significant issue (p. 249):

“From 2012, primary production of tungsten is likely to grow relatively strongly as a number of tungsten projects are at later stages of feasibility, construction and/or financing. However, not all of the potential new primary tungsten supply will be commissioned in the short-term and may be delayed until market demand increases.”

Other projects are delaying their start up due to a soft market – what makes the Sisson Project any different from these? While there aspects of the Sisson Project that make it distinct from these others, this should be explained in the EIA report. The National Instrument technical report further indicates that a “pessimistic”, some might say realistic or conservative, scenario has the current supply of tungsten meeting demand through to 2025 (p. 250).”

Given all of the above, the CSR should have concluded that the “Need for” the Project will not be met and as such, the Project should not be permitted to proceed.

Note: The poor economics of the Project also raise serious concerns about how catastrophic events will be able to be dealt with by the Proponent. The CSR (at p. 140) requires as a mitigation measure that the Proponent, “Be accountable and responsible for any environmental impacts resulting from catastrophic events due to the Project. Be financially responsible for addressing any catastrophic events ...” However, as Dr. Chambers notes:

“Mining companies may be legally liable for all damage associated with a catastrophic failure, or with unanticipated long-term water treatment, but only the largest mining companies in the world can actually afford to meet this requirement. Most companies, like Imperial Metals at Mt Polley, do not have the financial resources to pay all the cost associated with these events. These catastrophic events occur worldwide on an average of approximately one per year. At present there have been no payments to users for natural resource damages (e.g. loss of salmon fishing) from Mt Polley, and reimbursements for business interruption have been difficult to obtain.

There is no “insurance policy” or “bond” available to mining companies for a catastrophic loss, so ultimately the public is liable for the cost of mitigating such accidents, should the mining company not be able to pay, and/or the public bears the burden of the environmental and social damages.” (emphasis added)

2.4 The CSR does not require the use of best available practices and technologies for mitigation measures

Throughout the CSR, the CEA Agency regularly accepts Sisson Mine Ltd.’s “economically feasible” proposals rather than requiring the Project to be operated using the best available practices. Nowhere is this more evident than with the design of the tailings pond and dam. As Dr. Chambers wrote (see section 3.2 below for full report):

“With regard to the tailings dam design the Comprehensive Study Report notes that:
The centreline method was selected as the preferred alternative by the proponent ... (CSR, p. 14).

In the Environmental Impact Assessment, the tailings dam design is more correctly called a “modified centerline” (EIA, p. 3-24), which is really a code for modified upstream-type construction ...

This is the same type of construction design that failed at Mt Polley. All of [the] guarantees given for the Sisson dam were also given for the dam at Mt Polley. There have been no modifications to the dam design proposed since the EIA, so the dam design and operating parameters have not been modified in accordance with the Mt Polley Expert Panel recommendations.

Specifically, the Mt Polley Expert Panel “actively encourages” dry closure for new tailings facilities (Expert Panel, p. 121, 125). This strong recommendation has obviously been lost to both the proponent’s engineering advisors, and to the technical reviewers of the CSR. A simple way to achieve this would be to place drains underneath the impoundment, but this option is not considered.”

Dr. Chambers further added:

“In addition to dry closure, the Mt Polley Expert Panel recommends that excess water (stormwater, excess process water, etc.) NOT be stored in the tailings facility (Expert Panel, pp. 121, 122), yet the CSR notes:

If regular monitoring were to indicate that the water treatment plant effluent exceeds specifications, then the discharge would be immediately stopped and redirected to the tailings storage facility. The tailings storage facility would have adequate capacity to manage water during temporary shut-down of the water treatment plant.

This operating plan is in direct contradiction to a Mt Polley Expert Panel recommendation, which again suggests that the Panel's recommendations were either not understood or ignored for dam design and operation.”

Other CCNB experts also noted the CSR's support of “economically feasible” measures versus best practices:

“The CSR examined alternative methods for tailings disposal including the location of the TSF, the method of disposal and the type of dam construction. **It appears that economic factors put forward by the proponent were a key factor in determining the outcome.** The least expensive way to proceed was always supported. None of the concerns that I raised in my review of the EIA report for the project were addressed in CEAA's review and decisions.” (Mr. Roy Parker, see section 3.4 below for full report.)

Obviously, the poor economic forecast for the Project discussed in section 2.3 above has influenced the proponent's proposed design and operating choices for the Project. CCNB cannot support a mining project, particularly in light of the lessons that should have been learned from the recent Mt. Polley TSF failure, that puts profitability before the use of best available technology and practices. Accordingly, we disagree with all the CSR's listed mitigation measures put forth by the proponent and CEA Agency that require anything less than the use of best available practices and technologies for the Project.

2.5 The CSR places too much reliance on undefined adaptive management strategies

As discussed in section 2.2 above, not enough baseline work has been done to truly understand the impacts of the Project and determine whether it should proceed. The proposed remedy for this in the CSR is reliance upon monitoring and adaptive management; “when we find a problem we'll fix it.” While adaptive management should be encouraged, there are several problems with how its use is currently envisioned for the Project.

First, there may be impacts that can't be fixed and if we knew about them today we wouldn't permit the Project.

Second, as proposed, the adaptive management proposals do not contain clear “triggers” or thresholds to initiate corrective actions. (“A trigger specifies what actions will be taken by an agency if monitoring information shows x or y.”)⁶ As Dr. Chambers notes in his review, “Adaptive management requires the

⁶ Decision-making Triggers, Adaptive Management, and Natural Resources Law and Planning, Courtney Schultz & Martin Nie, Natural Resources Journal, Vol. 52, Fall 2012 at p. 444.)

delineation of decision points, and defined guidance to be applied when those decision points are reached.”⁷

Finally, the proposed reliance on adaptive management is contrary to CEA Agency policy:

“If, taking into account the implementation of mitigation measures, there is uncertainty about whether the project is likely to cause significant adverse environmental effects, a commitment to monitor project effects and to manage adaptively is not sufficient.

A commitment to implementing adaptive management measures does not eliminate the need for sufficient information regarding the environmental effects of the project, the significance of those effects and the appropriate mitigation measures required to eliminate, reduce or control those effects.

Where additional information collection or studies are needed over the life-cycle of the project, such studies in themselves should not be considered “mitigation measures”. (CEA Agency at: <https://www.ceaa-acee.gc.ca/default.asp?lang=En&n=50139251-1>.)

Adaptive management is part of, but not a replacement for, proper environmental assessment. As our report demonstrates, the environmental assessment of this Project is far from complete. As such, CCNB cannot support the CSR’s over-reliance upon adaptive management to mitigate the Project’s as yet unknown impacts.

⁷ See also the comments of Dr. Curry who raises concerns about a lack of decision points. Mr. Parker’s review is supportive of the proposed adaptive measures, describing them as “usual”.

3. **Expert reports commissioned by CCNB**

Using the remainder of our participant funding, CCNB hired experts to review and comment on the CSR. Reviewers were asked *not* to comment on the merits of the Project.

In order of their appearance, the experts' reports are:

1. Dr. David Chambers (Center for Science in Public Participation (CSP2))
 - Comments focus on:
 - CSR in general
 - Tailings Storage Facility Embankment Design
 - Tailings Storage Facility Seepage, adaptive management
 - Accidents and malfunctions, re: flooding
 - Seismic activity
 - Inadequate impact analysis & baseline data collection
 - Note: The report from CSP2 was commissioned by CCNB. CSP2 submitted their review of the CSR directly to the CEA Agency but it has also been included in this report for convenience.
2. MiningWatch Canada, Joan Kuyek, DSW
 - Comments focus on:
 - Need for the Project
 - Benefits to Canadians
 - Lack of Socio-Impact Assessment
 - Mitigation measures
3. Mr. Roy Parker, M.E.S.
 - Comments focus primarily on CSR sections dealing with proposed water management plans for the Project during operation and closure.
4. Dr. Allen Curry
 - Comments focus on EA process and outcomes of CSR.
5. Ms. Inka Milewski
 - Comments focus on CSR section, re: Atmospheric Environment
6. Ms. Inka Milewski
 - Comments focus on CSR section, re: Public Health with a focus on the methodology used for the baseline public health assessment.

The credentials of these experts can be found in CCNB's October 2013 report on the EIA Report for the Project.

CENTER for SCIENCE in PUBLIC PARTICIPATION

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"Technical Support for Grassroots Public Interest Groups"



May 4, 2016

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Re: Comments on Sisson Project Comprehensive Study Report, CEAA Apr16

The Center for Science in Public Participation provides technical advice to public interest groups, non-governmental organizations, regulatory agencies, mining companies, and indigenous communities on the environmental impacts of mining. CSP2 specializes in hard rock mining, especially with those issues related to water quality impacts and reclamation bonding.

GENERAL COMMENTS

There are several overall issues of concern with the Sisson Project as proposed in the Environmental Impact Assessment (EIA) in 2013,¹ and with the CEAA's apparent approval of the project, as amended, in this Comprehensive Study Report (CSR).

First, the CSR neglects to reflect the recommendations of the Mt Polley Expert Panel for dry impoundment closures and the removal of most or all water from the impoundments during both operation and closure. Merely adopting the Panel's recommendations for Independent Tailings Review Boards and adequate geotechnical research is just, in the words of the Panel, "business as usual."

Second, the Environmental Impact Assessment is woefully inadequate in both its impact analysis and its collection of baseline data in a number of areas. The only way this project can be justified in moving forward without a major halt to provide the needed data and analysis would be to assume that (1) the project will move forward regardless of the impacts, and (2) that mitigation, no matter the level of success, and reactive planning and management, will govern the project. This will likely not only lead to more impacts than necessary, but can also lead to further damaging the reputation of mining in general by promoting a project that is not ready, if able, to "do things right."

SPECIFIC SECTION COMMENTS

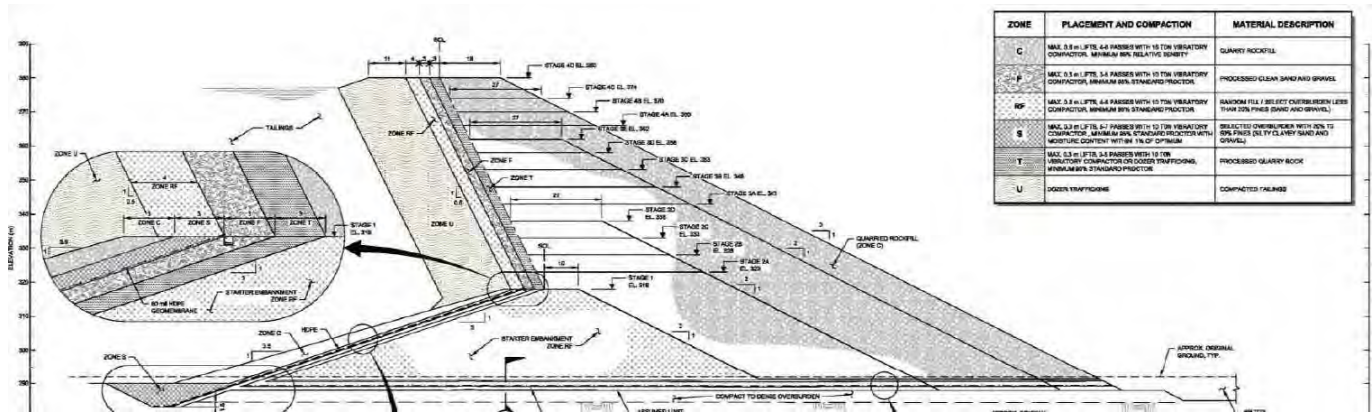
4.2.3 Tailings Storage Facility Embankment Design

With regard to the tailings dam design the Comprehensive Study Report notes that:

The centreline method was selected as the preferred alternative by the proponent ... (CSR, p. 14)

¹ Sisson Project: Environmental Impact Assessment (EIA) Report, Stantec, July 2013

In the Environmental Impact Assessment, the tailings dam design is more correctly called a “modified centerline” (EIA, p. 3-24), which is really a code for modified upstream-type construction, as can be seen from EIA Figure 3.2:



This is the same type of construction design that failed at Mt Polley. All of guarantees given for the Sisson dam were also given for the dam at Mt Polley. There have been no modifications to the dam design proposed since the EIA, so the dam design and operating parameters have not been modified in accordance with the Mt Polley Expert Panel recommendations.

Specifically, the Mt Polley Expert Panel “actively encourages”² dry closure for new tailings facilities (Expert Panel, p. 121, 125). This strong recommendation has obviously been lost to both the proponent’s engineering advisors, and to the technical reviewers of the CSR. A simple way to achieve this would be to place drains underneath the impoundment, but this option is not considered.

5.3.2 Views Expressed / Tailings Storage Facility Seepage / Water Quality Guidelines Exceedances

It is noted that:

Maliseet First Nations requested that contingency water quality management systems be developed and presented as part of the Adaptive Management Plan and include the following components:

- *explicitly defined triggers and an implementation plan for the proposed contingency mitigation technologies;*
- *a conceptual design of the proposed systems to show their feasibility and approximate capital and long-term costs (including design parameters such as pumping distances, flow rates, and treatment inflow and outflow water quality); and*
- *a demonstration that the Project has been designed to enable the addition of the proposed contingency infrastructure.*

The Province of New Brunswick indicated that its permitting process is adaptive in nature and would impose monitoring and reporting requirements, including that the proponent demonstrate that project discharges meet permitted criteria or further mitigative action would be required. (CSR, p. 35, emphasis added)

² Report on Mount Polley Tailings Storage Facility Breach, Independent Expert Engineering Investigation and Review Panel, Province of British Columbia, January 30, 2015, p. 125

The items the Maliseet First Nations are requesting are exactly what an adaptive management plan/approach should be providing. The approach being suggested by the Province of New Brunswick, and by default the proponent, is not adaptive management, but **reactive management**. Adaptive management requires the delineation of decision points, and defined guidance to be applied when those decision points are reached.³ This is what the Maliseet First Nations have requested, and what should be required as a minimum for adaptive management.

6.1.2 Effects of Accidents and Malfunctions / Views Expressed

The Agency asked the proponent to consider recommendations of the Report on Mount Polley Tailings Storage Facility Breach (January 2015) and whether additional or strengthened mitigation was necessary as a result of the report. The proponent responded that it reviewed the reported causes of the Mount Polley tailing storage facility failure, and concluded that its current design and operational plans would ensure that these causes would be avoided for the Project.

As previously mentioned the dam design and operation plan has not changed since the Mt Polley accident, even though both the design and operational plan are essentially the same as at Mt Polley. In addition to dry closure, the Mt Polley Expert Panel recommends that excess water (stormwater, excess process water, etc.) NOT be stored in the tailings facility (Expert Panel, pp. 121, 122), yet the CSR notes:

If regular monitoring were to indicate that the water treatment plant effluent exceeds specifications, then the discharge would be immediately stopped and redirected to the tailings storage facility. The tailings storage facility would have adequate capacity to manage water during temporary shut-down of the water treatment plant.

This operating plan is in direct contradiction to a Mt Polley Expert Panel recommendation, which again suggests that the Panel's recommendations were either not understood or ignored for dam design and operation.

Dry closure and eliminating water from tailings impoundments were two critical recommendations of the Mt Polley Expert Panel, yet the only recommendations that are being acknowledged by the proponent (and industry in general) and Natural Resources Canada (and government in general) are for Independent Tailings Review Boards (a good idea) and adequate baseline geotechnical data (a no-brainer).

In the larger scheme of things, the Expert Panel noted:

“The Panel firmly rejects any notion that business as usual can continue.” (Expert Panel, p. 118)

Independent Tailings Review Boards (which have been employed at mines in the past) and adequate baseline geotechnical data are business as usual. Dry closures and the elimination of excess water on impoundments would be new, and necessary, norms.

6.2.1 Effects of the Environment on the Project / Proponent's Assessment of Potential Environmental Effects and Mitigation / Seismic Activity

Natural Resources Canada confirmed that the proponent's analysis was acceptable and noted its commitment to “design for geotechnical stability for the most significant earthquake loading relating to the largest applicable seismic event (known as the Maximum Design Earthquake)”.

³ Decision-making Triggers, Adaptive Management, and Natural Resources Law and Planning, Courtney Schultz & Martin Nie, Natural Resources Journal, Vol. 52, Fall 2012

A dam that must stand in perpetuity should be engineered to withstand the maximum events it could experience. For a tailings dam the largest seismic event it experience is called the Maximum Credible Earthquake. The International Commission on Large Dams recommends that tailings dams be designed for the Maximum Credible Earthquake.

“According to the current ICOLD guidelines, large dams have to be able to withstand the effects of the so-called maximum credible earthquake (MCE). This is the strongest ground motion that could occur at a dam site. In practice, the MCE is considered to have a return period of several thousand years (typically 10,000 years in countries of moderate to low seismicity).”⁴

The Maximum Design Earthquake is not necessarily the Maximum Credible Earthquake, which should be used for the design event. However:

The proponent advised that project and related infrastructure would be designed to account for a one-in-2,500-year seismic event. The tailings storage facility would be constructed to meet the Dam Safety Guidelines of the Canadian Dam Association for a one-in-5000 year seismic event.

By using an earthquake that is less than the Maximum Credible Earthquake as the Maximum Design Earthquake there is unnecessary increased risk associated with dam failure from a seismic event. If the “related infrastructure” that is associated with the one-in-2,500-year seismic event includes the waste rock piles, then failure of a waste rock pile could also potentially release/expose contamination.

6.2.2 Effects of the Environment on the Project / Proponent’s Assessment of Potential Environmental Effects and Mitigation / Views Expressed

For a tailings dam the largest hydrologic event it could experience is the probable maximum flood. Stormwater facilities are engineered to lesser events, typically because of space limitations, and that exceedance events which overwhelm these facilities will not cause the failure of waste impoundments.

The proponent indicated that water management ponds and associated systems would have the capacity to handle extreme rainfall events, including a one in ten year event, 24-hour storm event (Type-III), as well as associated snowmelt and seepage.

An extreme rainfall event for a stormwater facility has typically been considered a 100-year event, but in today’s era of global warming many companies are using a 200-year event as the design basis.

If stormwater facilities at Sisson Brook are using a 10-year event, they will be significantly under-designed. For a 10-year storm event, over the 27-year lifetime of the mine there would be a 93% probability of these facilities being overwhelmed by a storm larger than the design event.

Appendix C – Mitigation Measures Identified by the Agency / Accidents, Malfunctions and Unplanned Events / Tailings storage facility failure

Be financially responsible for addressing any catastrophic events, including cleaning up any environmental impacts, ...

Mining companies may be legally liable for all damage associated with a catastrophic failure, or with unanticipated long-term water treatment, but only the largest mining companies in the world can actually afford to meet this requirement. Most companies, like Imperial Metals at Mt Polley, do not have the financial resources to pay all the cost associated with these events. These catastrophic events occur

⁴ “Earthquake Safety of Existing Dams for Irrigation and Water Supply in Rural Areas”, Dr. Martin Wieland, Chairman, Committee on Seismic Aspects of Dam Design; International Commission on Large Dams (ICOLD), December 2001

worldwide on an average of approximately one per year. At present there have been no payments to users for natural resource damages (e.g. loss of salmon fishing) from Mt Polley, and reimbursements for business interruption have been difficult to obtain.

There is no “insurance policy” or “bond” available to mining companies for a catastrophic loss, so ultimately the public is liable for the cost of mitigating such accidents, should the mining company not be able to pay, and/or the public bears the burden of the environmental and social damages.

Requiring a financial assurance for a catastrophic loss would not only protect the public, but it is also something that is already required of other industries, like pipelines and tankers. It is logical and feasible to make this requirement, but it will also take a joint regulatory and industry effort to make it work.

INADEQUATE IMPACT ANALYSIS & BASELINE DATA COLLECTION

There are numerous examples of inadequate baseline data collection. Inadequate baseline data has two effects.

First, it means that measurement of impacts to existing resources cannot be documented. This is especially important for water resources and aquatic organisms.

Second, and more importantly, it means that design decisions are limited, or need to be postponed, because the data needed to guide these decisions is missing. For example, the lack of acid-base accounting for mine overburden means that decisions about the use of this material for road and other construction purposes, or alternatively, the classification of this material as potentially acid generating/metals leaching cannot be made, and must be postponed to a later stage in the project. This effectively removes the public’s ability to analyze and comment on the issue.

5.3.2 Views Expressed / Tailings Storage Facility Seepage / Acid Rock Drainage and Metal Leaching

Environment and Climate Change Canada and Natural Resources Canada requested data on the potential of overburden material to generate acid and leach metals. They also requested information on how this material would be managed. The proponent indicated that an acid based accounting would be undertaken in the future if preliminary analysis indicated the presence of sulphur concentrations greater than 0.1 percent, a level below which the buffering potential of material was expected to exceed the acid generating potential.

It is obvious from this statement that even “preliminary analysis” of the overburden material has not been done. This information is simple to obtain, and is essential to proper project management. Providing this information should be required before the project can proceed.

5.3.3 Agency Analysis and Conclusion

The Agency recognizes that the treatment of water prior to release would need to continue after closure and in perpetuity or until monitoring results indicate that pit water quality meets all applicable criteria thereby enabling discharge without treatment.

The Agency received expert advice indicating that potential effects on water quality as a result of acid rock drainage and metal leaching and proposed mitigation had been adequately assessed and considered. A Waste Rock Management Plan and Water Management Plan would be developed during detailed engineering should the Project proceed.

A Waste Rock Management Plan and Water Management Plan are not only an essential part of designing mine facilities, including water treatment, but also necessary to conduct basic mine planning for waste

disposal. Lack of these plans as a part of the Environmental Impact Assessment process is a significant deficiency, and would not be allowed in most mining regulatory jurisdictions familiar to this reviewer.

Also, since there is no detailed explanation of the post-closure costs, including perpetual water treatment, it is difficult to see how the expert advising the Agency can judge that adequate mitigation measures are in place to address post-closure financial surety.

5.4.2 Fish and Fish Habitat / Views Expressed

The Province of New Brunswick and Maliseet and Mi'gmaq First Nations asked about the suitability of habitat for relocated fish, potential overcrowding of habitat, and potential mortality of relocated or displaced fish. As a condition of EIA approval, the Province of New Brunswick would require the proponent to conduct a pre-construction survey of fish, fish habitat, and population densities.

Habitat and fish density information is essential for making fisheries and aquatic organism impact decisions. This information should have been collected prior to the EIA.

Fisheries and Oceans Canada as well as Mi'gmaq First Nations asked about potential erosion and sedimentation from the release of water into Sisson Brook ... the design of water management structures would consider measures to reduce erosion (i.e. armouring the channel in Sisson Brook) and assure adequate conveyance in extreme events. Specific mitigation measures would be included in the proponent's Environmental Management Plan and in permit applications.

The design of water management structures should be done before the EIA stage. If the meteorology data is not adequate to predict design events at this stage in the application process, then the process should be halted until this data is available. Meteorology data is also essential to calculating a water balance for the mine.

5.5.3 Terrestrial Wildlife and Habitat / Agency Analysis and Conclusions

The Agency notes that the proponent would also be required to develop an adaptive monitoring program as well as an emergency and/or contingency plan for wildlife.

As previously discussed, an adaptive management plan is only “adaptive” if decision points are identified, and process steps defined. Otherwise this process is not adaptive, it is “reactive.”

5.6.2 Vegetated Environment / Views Expressed

As a condition of EIA approval, the Province of New Brunswick would require the proponent to develop a conceptual Closure and Post-closure Monitoring Program with appropriate regulatory authorities, First Nations, and stakeholders. The conceptual plan would establish targets and thresholds for determining reclamation success and mitigation effectiveness and integrate data generated from other monitoring programs.

It is not apparent why “conceptual” plans cannot be developed and discussed at this point in the permitting process. Closure and Post-closure are especially important issues to be disclosed and discussed at the public discussion stage. In addition to goals and means, the costs associated with Closure and Post-closure are typically tens of millions of dollars, and more when long term water treatment is required. These issues should not be deliberated and decided behind closed doors.

5.7.2 Wetland Environment / Views Expressed

The Province of New Brunswick reported that the Project would potentially result in the single largest direct loss of wetland area and/or impacts on function from a single project in New Brunswick. Through conditions of EIA approval, the Province of New Brunswick would require the proponent to develop a conceptual Wetlands Compensation Plan consistent with the Federal Policy on Wetland Conservation and New Brunswick Wetland Conservation Policy.

The critical issue here is whether and how much wetlands can be replaced. In allowing the proponent to develop this plan later there is an underlying assumption that these replacements are available and possible. It is very difficult to recreate/replace wetlands, and it can only be done in certain areas.

5.8.2 Human Health / Views Expressed

Health Canada recommended that the proponent also establish baseline conditions to verify ambient concentration predictions for total PM, PM2.5, and SO2.

Establishing baseline data for air quality is important, and can/should certainly be done prior to construction. This is also important data for air quality modeling, and should be in hand for deliberation before the Environmental Impact Assessment process.

Health Canada recommended that vegetation consumed by the public and First Nations (e.g. fiddleheads and berries) be resampled at the onset of operations to verify baseline values of arsenic, chromium, manganese, and thallium to confirm estimations and assumptions presented in the Human Health and Ecological Risk Assessment conducted by the proponent. ... As part of its conditions of EIA approval, the Province of New Brunswick would require the proponent to undertake soil sampling and collect additional baseline (pre-construction) surveys of traditional country food.

Baseline values for vegetation from a human health standpoint, and baseline soil sampling, are fundamental baseline surveys, and should have been required prior to the EIA.

5.10.2 Current Use of Lands and Resources for Traditional Purposes by Aboriginal Persons / Views Expressed / Provincial and Federal Authorities

... as part of its conditions of EIA approval, the Province of New Brunswick would require the proponent to conduct additional baseline (pre-construction) surveys of traditional country foods, which would include foods that are trapped, fished, hunted, harvested or grown for subsistence or medicinal purposes or obtained from recreational activities such as sport fishing and/or game hunting within the local assessment area. The baseline information would then be used to develop a traditional and country foods monitoring program to be undertaken during operations and decommissioning/post-closure.

In protecting traditional subsistence activities it is important to know what is there before the project begins, and whether and how the project could negatively impact these resources. Leaving these inventories until the project is launched both impacts potential resources and impedes discussion of mitigation measures.

6.1.2 Effects of Accidents and Malfunctions / Views Expressed

... Maliseet and Mi'gmaq First Nations requested that the Emergency Preparedness and Response Plan contain a specific notification and communications protocol for accidents and malfunctions, including measures to notify members of the public who may be adversely affected by accidental

events. The Assembly (Mi'gmaq First Nations) also requested that the proponent adopt the United Nations Environment Programme Awareness and Preparedness for Emergencies on a Local Level Protocol to guide the design of their Emergency Preparedness and Response Plan. Maliseet First Nations requested that they be provided an opportunity to be involved in the development of adaptive management plans and review the Emergency Preparedness and Response Plans in relation to fish and fish habitat.

The Emergency Preparedness and Response Plan is clearly something that can be developed, and even tested if desired, before project commencement. The UNEP APELL⁵ document is an excellent guide for preparing an emergency response plan, and asking to be a part of both the development and response testing of such a plan is not only reasonable, but essential if the plan is to be successful. This is another example of something that should have been done prior to the Environmental Impact Assessment.

Thank you for the opportunity to comment on this CSR.

Sincerely:

A handwritten signature in black ink, appearing to read "David M. Chambers".

David M. Chambers, Ph.D., P. Geop.

⁵ APELL (Awareness and Preparedness for Emergencies at Local Level) for Mining, United Nations Environment Programme, Technical Report No. 41, ISBN 92-807-2035, 2001



Review of the Sisson Mine Comprehensive Study Report

Socio-Economic & Environmental Issues

Prepared by Joan Kuyek, DSW & MiningWatch Canada

For:

Conservation Council of New Brunswick (CCNB)

Canadian Environmental Assessment Agency (CEAA)

May 14, 2016

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1. Introduction

MiningWatch has been engaged by the Conservation Council of New Brunswick to comment on the Comprehensive Study Review (CSR) socio-economic findings for the Sisson Mine Project in New Brunswick. The Comprehensive Study Review is the latest report in the Environmental Assessment of Sisson. The Government of New Brunswick, on December 3, 2015, approved the proponent's Environmental Impact Assessment with forty conditions (mitigation measures). In January 2016, the Summary Report of the New Brunswick Independent Panel publicly released its findings. The Independent Panel Review document summarized and commented on public interventions in the EA process to date.

The MiningWatch Canada Review and Comments are organized as follows:

- Section 3.3 The Purpose and Need for the Project
- Section 10. Benefits to Canadians
- Lack of socioeconomic impact assessment in the CSR
- Enforceability of mitigation and follow-up measures in the CSR
- Need for an independent environmental and socioeconomic oversight body and the ESMS
- Conclusions

2. Purpose and Need for the Project Not Demonstrated, Section 3.3¹

The CSR states at 3.3:

The former Act requires consideration of the need for and purpose of a project. The proponent stated that the need for the Project is to supply worldwide market demands for tungsten and molybdenum, and help alleviate supply shortages of tungsten caused by export restrictions implemented by China. Supplies from the Project would be available to meet market demands in North America and elsewhere. The purpose of the Project is to mine tungsten- and molybdenum-containing ore from the Sisson deposit, process ore to meet market demand for the mineral products, and create return on investment for the shareholders of Sisson Mines Ltd.²

The Sisson Mine would be 5-10 times bigger than most other tungsten mines in the world, but the ore grade (the percentage of tungsten and molybdenum in the ore) is 3-7 times lower. Therefore, this mine would generate more mining waste, be more marginal economically, and greatly increase the overall social, environmental and economic risks for investors, the public, governments, and affected communities.

In fact, Sisson would be one of the largest tungsten open pit mines in the world, with possibly the lowest grade ore, with tungsten (WO³) grading at 0.067% and molybdenum (Mb) at 0.021%.

Other producers have much higher grades, including Cantung in the Northwest Territories with WO³ of 0.47% (6 times higher) and Molyhil in Australia (WO³ 0.47% and Mb 0.21%, 6 to 10 times higher). In South Korea, the Sandong Mine has grades of WO³ 0.35% (5 times higher) and Mb 0.04% (2 times higher), and Vietnam's Nui Phao Mine grades 0.21% WO³ (3 times higher).³

For each ton of ore extracted and processed, the Sisson Mine would produce less than 0.09% marketable metal, and over 99.91% waste in the form of mining residues containing many toxic substances. This ratio of waste rock generated increases to over 100% when one considers all of the other material that need to be removed to access the ore (e.g. organic material and millions of tons of overburden and waste rocks). **In other words, the Sisson low ore grades appear to make the Sisson Mine the biggest tungsten waste management project in the world,** with more than 100% of the rock mined turned into water-saturated, face-powder fine, toxic tailings that will have to be managed in perpetuity, along with a pit and quarry that will also need water management forever.

Therefore, the ability of the proponent to remain financially solvent and able to meet its commitments becomes a real concern for protecting the environment, as well as for attaining true sustainable development and intergenerational equity. **We are of the opinion that Sisson Mine does not meet this threshold. Also, the need for this mine's product has not been demonstrated for the foreseeable future for the following reasons:**

- The proponent's feasibility study argues that China's restrictions on the export of tungsten and molybdenum have created the world wide need for their product. However as of May 20, 2015, after a lengthy trade dispute, China's export restrictions on tungsten and molybdenum were struck down by the World Trade Organization.⁴
- There are also many other sources outside China for tungsten (South Korea, Vietnam, Australia, UK.) which have a lower environmental impact, as the grades are significantly higher in most cases.
- There is little market for tungsten at this time and there are other tungsten mines developing. The USGS writes: *In late 2015 the sole tungsten mine in Canada [Cantung] suspended operations because of low W prices and was placed on care-and-maintenance status. Eight large Chinese tungsten producers plan to reduce output of W concentrates. Bucking this negative trend a new tungsten mine began production in Zimbabwe in 2015; a large new mine in Vietnam has ramped up production for APT and tungsten oxides, the Drakelands tungsten mine in Devon, UK, is scheduled to start full production in August 2016, and new ferrotungsten plants also began production in Russia and the Republic of Korea.*⁵
- **Tungsten tailings and scrap can be re-processed.** It is a very recyclable material, easily extracted from scrap steel and much of world's need for it can be met in this way.⁶ A report written for the USGS in 2000 states: *"The importance of scrap as a raw material*

in APT production was indicated by statistics compiled by the International Tungsten Industry Association. In 2001, an estimated 70 percent of the APT produced by companies that contributed data for Europe, Japan, and the United States was derived from scrap. The remaining 30 percent was derived from ore concentrates.⁷

Economic risk analysis of the Sisson Mine Proposal:

- Current prices for APT tungsten and for molybdenum are \$160US/Mtu⁸ for tungsten (WO³) and \$5.65US/lb for Molybdenum (Mb).⁹
- Prices in the feasibility study from January 2013 are overly optimistic -not realistic- with today's market, and were based on \$350US/Mtu for tungsten (two times higher than today's market) and \$15US/lb for molybdenum (nearly 3 times higher).¹⁰
- There is no reason to assume the prices will go up anytime soon. Historic prices for these metals can be seen in the following graphs:



- The company estimates cash costs for this mine currently as \$153.3 CAD/Mtu (after deducting a credit for moly byproducts of \$107.8CAD/Mtu). In US dollars, this works out to \$121US/Mtu with a moly byproduct credit of \$85US/Mtu.¹¹ Since the molybdenum credit is now only worth 1/3 of what it was in 2013, we can conservatively reduce the value of the credit by ½. **Assuming the molybdenum credit is reduced by ½ to \$43 US/Mtu, the cash cost from the Sisson Mine is now \$164US/Mtu, which exceeds current commodity prices for APT tungsten.**
- Forecasts by the USGS and analysts do not see a rise in tungsten or molybdenum prices in the near future.¹²

The mine will be subject to boom and bust and greatly at risk of premature closures. Bankruptcy is a real possibility.

Security of the investment. The Sisson Mine Project is a limited partnership that has been established for the express purposes of limiting liability for the mine. Its only asset is the mine itself, and the corporate structure will make it impossible for governments to seek restitution if it does not meet its environmental commitments. Given the current and foreseeable markets and the very low ore grades of this mine, experience suggests it is highly unlikely that it will be able to meet these commitments.¹³ The company is still seeking investors to make the project a reality.¹⁴ Currently, Northcliff Resources share price is \$0.12 CAD; in the past year, it has traded from \$.06 to \$.13, but never higher.¹⁵

The Sisson Project will not be able to guarantee a return to its investors given the metrics given above. In addition, one of the two partners in the mine is in trouble with another tungsten mine. The developing Wolf Minerals' Drakelands Mine, 32.3% owned by Todd Corporation, is said to have one of the Western World's largest reserves of tungsten at 37.5 million tonnes (WO³ grading at 0.19%), again a very low grade ore body, yet nearly three times as high as Sisson's. This project is not doing well either.

*"The firm developing Plymouth's vast open-pit tungsten mine has arranged a £25million safety-blanket finance facility, after doubts were raised about the project's viability. Wolf Minerals Limited shareholders have approved a standby subscription facility with Resource Capital Fund VI LP (RCF VI), a mining-focused private equity firm which normally specialises in buy-outs. The deal, which involves a flexible share offer, comes after Wolf announced a loss after tax of A\$24,250,452 in the last six months of 2015, and auditors raised concerns about the future of the Drakelands mine project at Hemerdon."*¹⁶ It is clear to this author, as it was to other intervenors in the public process,¹⁷ that this mine is not financially feasible currently or in the foreseeable future. It is highly unlikely to meet its commitments to operate for 27 years and close with "no significant environmental effects".

The existing purposes of the mine are no longer relevant: there is no longer any supply shortage of tungsten and molybdenum to fill; there is unlikely to be any substantive returns to investors or governments from the project; and a few hundred jobs could well be created with considerably less risk, less environmental damage and fewer costs elsewhere in New Brunswick. We recommend that the mine not be permitted at this stage, and that another environmental assessment be undertaken using more realistic technical and financial assumptions.

3. Section 10 of the CSR “Benefits to Canadians” Does Not Address the Subject

The text in CSR Section 10 is irrelevant to the section title. It describes the few areas where the proponent claims to have changed the project to reduce its environmental effects. It does not address proponent claims in the EIA regarding taxes, jobs and payments to government, and thus leaves them unassessed. These economic claims appear to be exaggerated. As an example, in “revenues to government” the EIA includes the income taxes paid by workers and contractors. Since employees and contractors are already paying taxes, the amount anticipated from the mine should be net of the amount they already pay.

The other estimates for taxation anticipated from the mine are significantly exaggerated. The mine will not pay taxes until all its exploration and development expenses have been repaid, and unless it makes a profit -which it will not in the current and foreseeable markets. The tax system is briefly described below.

According to Chen and Mintz,¹⁸ the New Brunswick Marginal Effective Total Tax Rate (for all taxes) for mining is 8.6 per cent and with an income tax METR of 4.1 per cent. If the mine does not make a profit, it does not pay tax, either federally or provincially.

- Statutory corporate tax, combined federal and provincial, is 26% of net profit,¹⁹ before deductions.
- The mining tax (resource rent) is 2% of net revenue less transportation and processing costs (tax exempt for the first two years); 2nd tier- 16% of net profits exceeding \$100K.

However, the following deductions and tax credits are allowed federally and provincially.²⁰

- Exploration and development expenses are fully deductible (and are transferable from one subsidiary to another). In New Brunswick, exploration expenses may be “super-expensed” and reported at 150% of true value.
- Depreciation is allowed at between 5-100% for equipment, activities and other costs.

- A processing allowance (in addition to depreciation allowance) is possible at 8% for milling costs - 15% smelting - 15% refining – for a total up to 65% of profit that is deductible (the APT plant is likely considered to be “refining”).
- Financing allowance on carry- forwards of 8% on the undepreciated base.
- All reclamation contributions are tax deductible.
- 15% deduction allowed for research and development expenses.

4. Socio-Economic Impact Assessment Not Carried Out

Although effects on *Labour and Economy* and on *Community Services* were Valued Ecosystem Components (VECs) in the EIA and were part of the New Brunswick Review, they are not VECs for the federal government CSR. The only sections of the report where socioeconomic effects are dealt with are in reference to Aboriginal peoples.

We are not commenting on Aboriginal issues, as the Maliseet and Mi'gmaq First Nations are making their own submissions, and we cannot speak for them. However, it is noteworthy that in the EIA, effects on “the traditional land uses of Aboriginal People”, which are also socio-economic issues, are treated separately from the economic section, and without reference to monetary gains or losses. “The Agency concludes that the current use of lands and resources for traditional purposes by Maliseet First Nations, in combination with the cumulative environmental effects of other projects and activities, are likely to be significant.”²¹

So, there is neither mitigation measures nor follow-up for the overall (or non-Aboriginal local) population proposed in the CSR. The New Brunswick EIA decision accepted the proponent's assessment that there would be little if any effects on labour and economy or on community services, except for some modest, poorly defined, positive ones.²² Even at closure, despite claims that the mine would greatly enhance the local and provincial economy during operations, there seemed to be little to no consideration in the CSR for the negative socio-economic effect at that stage, and no concrete and overarching mitigation measures.

In all the documents leading up to the CSR: the final EIA, the New Brunswick General Review Statement from the Technical Experts Committee, the NB Independent Panel Summary of comments from the public and First Nations, the NB Conditions of Approval, and the CSR itself, there was no effort to conduct a Socio-Economic Impact Analysis that integrates environmental impacts, social and cultural costs into the assessment of the economic effects of the mine (or its failure). Socio-Economic Impact Assessment (SEIA) is a well-developed field of expertise and

academic study,²³ but has generally been ignored by the consultants who undertook the studies for the Sisson EIA.

Instead the consultants relied on an input-output analysis²⁴ to study the labour and economic effects of the mine, which looked at GDP, jobs and revenues to governments.

The input-output template is the wrong tool to evaluate an environmentally destructive project such as a mine. The input-output model, like GDP, has no debit column and excludes all those effects which are not calculated in monetary terms. It also deals with gross amounts, not net, so that jobs created and taxes paid neglect the fact that most of the mine workers are already employed and already paying taxes. It ignores social and environmental costs, and - where they can be monetized - they are treated as benefits because they involve expenditures.

5. Enforceability of Mitigation Measures in the CSR

Most of the mitigation measures, although well-intentioned, are unenforceable as they are written; there are no standards, dates for compliance or enforceable bench marks. A considerable number depend on “adaptive management”.

The Agency's enforcement officers are designated to verify compliance and enforce CEAA 2012 and any conditions in decision statements. Enforcement officers also apply a number of compliance promotion and enforcement activities to foster compliance with CEAA 2012 and avoid adverse environmental effects. These activities include carrying out site inspections and investigations. Enforcement officers apply CEAA 2012 in a manner that is fair, predictable and consistent; and they use the authorities and powers founded in this Act.²⁵ (CEAA compliance and enforcement policy)

Sections 89-97 of CEAA provide for enforcement of mitigation and follow-up measures.²⁶ However, there is no evidence that the enforcement sections have ever been used, let alone on a regular and consistent basis. Although there is a reference to a report about actions taken under these sections, it could not be found. There are to be two employees hired to enforce this entire section of the Act across Canada.

The NB EIA conditions are more specific, but still without standards, and in most cases defer the completion of the mitigation measures to permitting processes in which the public and First Nations are not involved.

Although Condition 29 of the New Brunswick EA decision requires the establishment of a Community Liaison Committee and “consultation” with First Nations and “stakeholders,” the

form and process are not set out, and the decision and design still rest with the proponent and the NB DELG ministry. The condition does not mandate public participation in permitting decisions, only some involvement in monitoring.

Any transparency inherent in the EA process is abrogated to the secretive process of permitting. In New Brunswick mine permitting, only the *Clean Air Act*²⁷ requires notice to the public; consultation beyond that is at the minister's discretion. The *Clean Water Act*²⁸ does allow that the Minister may require consultation, but does not mandate it. It is likely that even Access to Information requests would not be able to identify what has happened in these processes, because of commercial confidentiality.²⁹ The same will be true of other provincial Acts referenced in the conditions of Approval, as well as for permits under the federal Fisheries Act, the Explosives Act and other federal Acts.

For example, there is a particular problem for reclamation and closure bonding. The proponent has proposed a three step bonding program.³⁰ However, the largest bond is put off until mine closure.³¹ This is considered to be a very poor practice that is not recommended by either national or international industry associations, and is not used anymore in many other Canadian jurisdictions³². For example, the Quebec legislation requires a 100% payment made within the first two years of operation, including 50% when receiving the permit. Without proper financial assurances paid early or in advance, the public/taxpayers and the government will have to foot the clean-up bill if the market crashes or the company is no longer solvent. Also, the amounts of Financial Assurance for mines are confidential information in New Brunswick; this is highly problematic in terms of transparency, public scrutiny, and accountability.

There will be insufficient time and funding to enable adaptive management to identify and respond to warning signs of system failure. The CSR relies on adaptive management to deal with effects on air quality, for seepage interception, for sound problems, water quality management, wildlife management, fish toxicity, ground water drawdown, tailings storage concerns, etc. In most cases, the CEAA agency relies on the adaptive management systems of the Government of New Brunswick. **We have considerable evidence now that adaptive management plans often miss the warning signs of system failure** (for example, the Mount Polley mine waste disaster in 2014,³³ which has led to a mine reclamation review in BC - ongoing), and the ample evidence of fisheries habitat compensation failures.³⁴

'Adaptive management' is often used as a euphemism for stumbling along, and keeping costs to a minimum. To be effective, the process needs to be adequately funded and designed to "cope with the uncertainty of ecosystems by creating spaces in which reflection and learning can occur and by allowing management systems to take action in light of new information."³⁵ However, problems are often identified at moments of crisis, when there is neither time nor

resources to stop and reflect. Being able to recognize warning signs that emerge as part of a slower moving process is also an issue.³⁶

How will these mitigation measures be enforced? By whom? What if fines would bankrupt the company: will it be considered to be “too big to fail”?³⁷ What will happen if mitigation measures are found to be inadequate or impossible to implement? What will happen in later years if it is found that the mine should not even have opened, as the problem is irremediable and the consequences are so serious?

6. No Independent Environmental and Socioeconomic Oversight Body

In the CSR, reliance is placed on an Environmental Socioeconomic Management System (ESMS), to be established by the proponent prior to construction, which is supposed to be revised annually.³⁸ The ESMS is described in condition 29 in the NB EIA conditions. The ESMS will establish a Community Liaison Committee and will involve affected First Nations and “stakeholders” and regulatory authorities. The proponent is to establish it and it will be approved by the NB DELG. It will track “adaptive management” performance against predictions over time. Funding is to be allocated for First Nations to participate in this process; there is no funding for public stakeholders. Monitoring is to include, but not be limited to: aquatic resources, wildlife access to tailings facility, country and traditional foods and socioeconomic benefits and employment for First Nations.

The CSR also relegates closure, post-closure and long term care to the development of a conceptual plan and monitoring program with First Nations and stakeholders which will be approved every two years.

From the point of view of the public stakeholders (we cannot speak for First Nations), this system has a number of flaws:

- There will be no way for affected public stakeholders to compel action on any of the findings;
- The process will be driven by the proponent and regulatory authorities, who will choose committee members, may outnumber First Nations and public stakeholders on the committee, have greater access to technical expertise and will provide the monitoring results according to their terms;
- The proponent will, in most cases, choose which data will be shared with the committee; and

- The process is likely to be very time-consuming and alien for affected public representatives who will have inadequate access to independent technical expertise.³⁹

What is required for this mine is an independent environmental and socio-economic oversight body, similar to that established for the Ekati Mine in the Northwest Territories. This monitoring method enabled First Nations to appoint their own representatives to the Monitoring group, which then hired its own consultants as required; it was entirely funded by the mining company, but operated independently.

One of the most thorough studies of independent environmental oversight in recent years is that prepared for the Giant Mine EA in 2011, by Natasha Affolder et al.⁴⁰ This document includes a number of case studies and draws conclusions about the effectiveness of different approaches in terms of oversight, independence, and accountability. *“Though oversight does not necessarily effect change, the transparency it promotes is a means of balancing power and ensuring public confidence. If subject to oversight – that is, inspection, evaluation, or investigation – the actions and practices of decision-makers do not go unseen and cannot be made with the same level of impunity. To this end, it has been argued that independent oversight leads to higher standards of performance by regulators and agencies.”*⁴¹

7. Conclusions

The CSR conclusions find that the project will have significant environmental effects on the First Nations, but expects this can be accommodated with alternative blocks of land that belong to the Crown. The Maliseet have now said “no” to the project and news reports indicate they intend to take the matter to the courts.

The finding that there are otherwise *“no significant environmental effects that cannot be mitigated”* is not supported by the following evidence:

- A very environmentally intensive process where less than 0.09% of the ore extracted and processed will be metal and over 99.91% will be waste residue. The waste will contain large quantities of toxic substances that will be stock-piled forever behind man-made dams prone to failure if they are not developed and maintained to the highest standards. Meeting these standards will require millions of dollars more than the proponent has planned for, or access to.
- The creation of an enormous pit lake and quarry lake that will need water treatment in perpetuity and that will never be fish-bearing or safe to use for recreational purposes

(irreversible effects). They will have to be fenced forever and be inaccessible, dangerous and unusable.

- The maintenance of tailings dams (using a mid-stream model) surrounding a water saturated tailings impoundment forever is contrary to best available practices and technologies recommended following the Mount Polley mine disaster in 2014 (BC).
 - No effective standards to enforce mitigation measures on which the mine approval is contingent.
 - Creation of a boom-bust industry in an area of the province that needs sustainable, long-term stable development. The existing purposes of the mine are no longer relevant or existent, nor demonstrated, with market prices 2 to 3 times lower than they were when the proponent filed its EA application. There is no foreseeable up-take in the market and there is no longer any supply shortage of tungsten and molybdenum to fill. Since the project is uneconomic, or at best very marginal, there will be likely very little, por no return at all to investors or governments from the project. On the flipside, affected communities, the public and governments would be exposed to significant financial and environmental risks & liabilities during and after operation, in perpetuity.
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Endnotes

- ¹ Federal Comprehensive Study Review (CSR) page 8, and section 16(1)e of the former CEAA Act.
- ² CSR 3.3
- ³ From company websites.
- ⁴ https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds433_e.htm
- ⁵ <http://minerals.usgs.gov/minerals/pubs/commodity/tungsten/mcs-2016-tungs.pdf>
- ⁶ <http://www.itia.info/tungsten-processing.html>
- ⁷ Shedd, Kim B. Flow Studies for Recycling Metal Commodities in the United States: Tungsten Recycling in the United States in 2000. USGS. Open-File Report 2005-1028
<http://pubs.usgs.gov/of/2005/1028/2005-1028.pdf>, page 5
- ⁸ A metric ton unit (mtu) is 10kg ; A metric ton unit of tungsten trioxide (WO₃) contains 7.93kgs of tungsten; (from <http://www.itia.info/tungsten-prices.html>)
- ⁹ <http://minerals.usgs.gov/minerals/pubs/commodity/tungsten/mcs-2016-tungs.pdf>
- ¹⁰ Northcliffs Feasibility Study, January 2013, pages 23 and 24. Downloaded from <http://sedar.com/DisplayCompanyDocuments.do?lang=EN&issuerNo=00030606>
- ¹¹ Northcliffs investor presentation December 2015. Slide 13, <http://www.northcliffresources.com/i/pdf/Presentation-Dec2015.pdf>
- ¹² <http://minerals.usgs.gov/minerals/pubs/commodity/tungsten/mcs-2016-tungs.pdf>
- ¹³ Northcliffs Annual Information Return (AIF), January 29, 2016 pages 8-10
- ¹⁴ Northcliffs Investor presentation, December 2015, slide 6
- ¹⁵ <http://www.bloomberg.com/quote/NCF:CN>, as of May 3, 2016.
- ¹⁶ Tungsten miner Wolf Minerals agrees £25m safety-blanket deal. April 22, 2016. William Telford, <http://www.plymouthherald.co.uk/Tungsten-miner-Wolf-Minerals-agrees-25m-safety/story-29157550-detail/story.html#ixzz46Y1vroH>
- ¹⁷ Only in the Independent Panel Summary is there reference by anyone to the ability (or lack thereof) of Sisson Mine Limited's economic ability to meet the commitments it has made to environmental management, to employment, taxation and reclamation and perpetual care
- ¹⁸ Chen, Duanjie and Jack Mintz. Repairing Canada's tax system to be less distorting and complex. The School of Public Policy. May 2013. <http://policyschool.ucalgary.ca/?q=content/repairing-canadas-mining-tax-system-be-less-distorting-and-complex> and Mining Effective Tax and Royalty Rate addendum. May 2013.
<http://www.policyschool.ucalgary.ca/sites/default/files/Mining%20Addendum.pdf>
- ¹⁹ <http://www.nrcan.gc.ca/mining-materials/taxation/mining-taxation-regime/8890>
- ²⁰ Chen and Mintz. page 9
- ²¹ Appendices to the CSR, page 206
- ²² EIA, Section 8.10.10.1
- ²³ The Canadian Handbook on Health Impact Assessment, published by Health Canada Chapter 3: Social Impact Assessment in Environmental Impact Assessment Protocols: A Social Science Perspective. http://www.hc-sc.gc.ca/ewh-semt/pubs/eval/handbook-guide/vol_3/social-sociales-eng.php
- ²⁴ EIA Section 8-10, page 8-491
- ²⁵ <http://www.ceaa-acee.gc.ca/default.asp?lang=En&n=429A25E6-1>
- ²⁶ <http://laws-lois.justice.gc.ca/eng/acts/C-15.21/index.html>
- ²⁷ Condition 6 of NB conditions of Approval
- ²⁸ Conditions 7 and 10 of the NB conditions of Approval
- ²⁹ http://www2.gnb.ca/content/gnb/en/services/services_renderer.200949.html.html
- ³⁰ EIA Appendix H- reclamation and bonding
- ³¹ EIA Appendix H, page 138, summary of bonding requirements
- ³² Cowan. W.R, W.O. Mackasey and John Robertson. The Policy Framework In Canada For Mine Closure And Management Of Long-Term Liabilities: A Guidance Document. NAOMI. 2011. <http://www.abandoned-mines.org/wp/wp-content/uploads/2015/06/PolicyFrameworkMinClosure2010.pdf>. Pages 14-16
- ³³ Dr. Norbert R. Morgenstern (Chair), CM, AOE, FRSC, FCAE, Ph.D., P.Eng.; Mr. Steven G. Vick, M.Sc., P.E.; and, Dr. Dirk Van Zyl, Ph.D., P.E., P.Eng. Report on Mount Polley Tailings Storage Facility Breach, Independent Expert Engineering Investigation and Review Panel, Province of British Columbia, January 30, 2015
- ³⁴ A 2005 study of failures in enforcement of Fisheries Act provisions can be found at MiningWatch, Protecting Fish Protecting Mines http://miningwatch.ca/sites/default/files/Protecting_Fish_0.pdf. This study includes references to an important and detailed report from the Dept. of Fisheries and Oceans about compensation measures for loss of fish habitat.
- ³⁵ Torrell (2000). quoted in Macey, Gregg P. and Jonathan Z. Cannon, *Reclaiming the Land* (Springer 2007), page 10.
- ³⁶ Excellent resources on this issue can be found in: International Institute for Indigenous Resource Management. Taking Control: Opportunities for and Impediments to the Use of Socio-Cultural Controls for Long-Term Stewardship of U.S. Department of Energy Legacy Waste Sites. November 22-23, 2004. Final Report: Summary of Roundtable Findings and

Recommendations; in Burger, Joanna. *Incorporating ecology and ecological risk into long-term stewardship on contaminated sites*. Remediation Journal, Volume 13, Issue 1, pages 107-119 Winter 2002.

<http://onlinelibrary.wiley.com/doi/10.1002/rem.10058/abstract>. And in GAO, 2005. Hardrock mining: BLM Needs to Better Manage Financial Assurances to Guarantee Coverage of Reclamation Costs. Report to the Ranking Minority Member. GAO-05-377, June 2005. www.gao.gov/cgi-bin/getrpt?GAO-05-377

³⁷ http://www.thestar.com/news/canada/2013/05/25/snclavalin_looking_to_clean_up_its_reputation.html

³⁸ Appendices to Comprehensive Study Review, page 212.

³⁹ Ibid, page 213.

⁴⁰ Affolder, Natasha, Katy Allen and Sascha Paruk. Independent Environmental Oversight: A Report for the Giant Mine Remediation Environmental Assessment, February 2011.

http://www.reviewboard.ca/upload/project_document/EA0809001_Independent_Environmental_Oversight_Report_1328898833.PDF

⁴¹ http://www.reviewboard.ca/upload/project_document/EA0809-001_Independent_Environmental_Oversight_Report_1328898833.PDF, page 10.

Review of CSR for the Sisson Project (Tungsten and Molybdenum Mine) - New Brunswick, CEAR #11-03-63169

Re: Proposed water management plans for the project during operation and closure

Roy Parker, MES

CCNB's questions regarding adequacy of CSR

1. **Review of Effects of Project on the Environment** - For your area(s) of review, please comment on whether the CSR properly captures the potential effects of the project on the environment and if not, what potential effects have not been addressed?
 - a. Tailings Disposal (CSR Section 4.2) – The CSR examined alternative methods for tailings disposal including the location of the TSF, the method of disposal and the type of dam construction. **It appears that economic factors put forward by the proponent were a key factor in determining the outcome.** The least expensive way to proceed was always supported. None of the concerns that I raised in my review of the EIA report for the project were addressed in CEAA's review and decisions.
 - b. Water Quality (CSR Section 5.3) – **This section of the CSR seems to have received a thorough examination by all of the reviewers and the CSR reflects that.** Many questions were raised about effluent quality and the concentrations of contaminants in the receiving waters. The NB EIA Approval sets out many conditions that directly address this issue. There will be an adaptive management approach used throughout the life time of the project when conditions arise that were not predicted by the EIA modeling and analyses. All liquid effluent discharges and seepages are subject to the limits set out in the *Metal Mining Effluent Regulations* and any discharges exceeding those limits could be considered a violation of the federal Fisheries Act and subject to prosecution and penalties.
 - c. In the receiving waters, concentrations of aluminum and fluoride are already close to or exceed the levels for the protection of freshwater aquatic life established by the CCME (*Canadian Water Quality Guidelines for the Protection of Aquatic Life, Freshwater*). The predictions are that mine discharges will cause the concentrations of these contaminants in the receiving waters to increase further. As well, concentrations of cadmium, chromium, copper, selenium and arsenic could all exceed *Canadian Water Quality Guidelines for the Protection of Aquatic Life* at some locations during some seasons once the project begins to discharge treated waste water. In Appendix G, the proponent argues that the CCME guidelines are conservative, that less stringent guidelines exist in other jurisdiction, that the exceedances are intermittent and localized and therefore the environmental effects are therefore not likely to be significant. **I think that this conclusion is naive and short sighted.** However, the CSR accepts these arguments (CSR Section 5.3.3) and concurs with the proponent's conclusions. The CSR does qualify their statement by saying that: "The Province of New Brunswick advised that it would establish regulated water quality objectives for the Project that adhere to the process and criteria set out in the *Canadian Water Quality Guidelines for the Protection of Aquatic Life (Freshwater)*. The proponent would monitor water quality through all phases of the Project, and implement adaptive management measures as

required.” This commitment by NB does provide some measure of assurance that the water quality in the receiving waters will be the subject of serious scrutiny and protection. If problems are detected, measures will be taken to correct the issue, hopefully before irreparable damage results.

2. **Review of Proposed Mitigation Measures** - Are they correct? Will they achieve the predicted result? Are there mitigation measures missing? Etc.
 - a. The storage of tailings under water in the TSF is the best available mitigation technology for materials that have the potential to form acid rock drainage. It does however result in a TSP with a larger footprint and higher dams to contain the tailings in a submerged manner. The proponent states that they will treat all waste water (pit water, process effluent, TSP seepage, site drainage, contaminated groundwater and TSP overflow) to meet the limits of the *Metal Mining Effluent Regulations*. First of all, that is a no brainer because federal law dictates that they have to do that. They provide a lot of conceptual plans about how that water will all be collected but provide almost no information about how they will treat the waste water to achieve the prescribed limits. There is reference to a “ferric co-precipitation process” on Page 29 of the CSR and a reference to a “ferric sulphate treatment” on page 34 of the CSR. In the EIA, there was one reference to using ferric sulphate treatment (Volume 1, Page 7-85). **There is no explanation as to why this treatment method was chosen, what contaminants it is targeting to remove or the efficacy of the method to remove those contaminants. So in response to your questions, I am not able to answer them because no detailed information about waste water treatment is provided.** I can only assume that specific information regarding waste water treatment will be provided as part of the project detailed design phase.
3. **Review of CEAA’s Analysis and Conclusions** - Are you in agreement with CEAA’s conclusion(s)? Why or why not?
 - a. As I stated in section 1c of my review; I do not agree with the CSR’s conclusions regarding possible impacts on the project on receiving water quality and the impact that contaminants from the mine operation might have on the aquatic life in those streams. They seem to accept the proponent’s arguments that the effects will be localized, seasonal and not significant. The Canadian Water Quality Guidelines are meant to protect all life stages of aquatic life against adverse effects of the contaminants. I don’t think that we should be prepared to accept localized and seasonal effects of the mine discharges on the aquatic life in the receiving water streams.
4. **Review of Proposed Follow-Up Programs** - Are they correct? Will they be effective? Are there programs missing? Etc.
 - a. Follow up monitoring, under the EIA process, is intended to verify the predictions of the EIA. **Much more specific detail on the proposed follow-up monitoring programs would be required to determine if they will be robust enough in spatial and temporal terms to detect changes in the aquatic environment as a result of discharges from the mine.** Those details may be provided later in the development stages of the project but we don’t have them available to us at this time.
 - b. There are no statements in the CSR about what happens if the predictions were wrong and the discharges from the mine caused the disappearance of a fish species from parts of the receiving water for whatever reason. There is some discussion of compensation for the physical loss of fish habitat due to the mine’s footprint but nothing about compensation/mitigation for impacts on the fish populations due to discharges to the receiving waters.

- c. Appendix G of the CSR provides a comprehensive list of environmental components to be monitored in the aquatic environment (Fish and Fish Habitat Section) and I can't suggest anything that they have missed. The CSR notes the environmental effects monitoring requirements of the *MMER* and that regulated program is specific about monitoring parameters, components to be monitored, frequency of sampling, sampling locations, sample sizes, quality assurance measures and reporting requirements.
 - d. There are follow up monitoring requirements in the approval issued by the Province of New Brunswick (Conditions 8 and 22) to verify the EIA predictions.
- 5. **Baseline Monitoring** – Was the baseline data collected of sufficient quality and quantity to detect future changes?
 - a. This is a difficult question to answer. First of all, I am only qualified to comment on the baseline surveys related to water quality, fish populations and fish habitat quality. The NB EIA Approval addresses this issue to some extent by requiring additional baseline data on water supplies (Condition 17), traditional country food (Condition 18), Wood Turtle populations (Condition 19) and a whole list of environmental matrices including water, soil, air and aquatic life (Condition 20). So the Province of New Brunswick obviously feels that these areas are lacking in sufficient information and want the baseline data sets to be expanded. I believe that the initial baseline data was collected in 2013. I am not aware if any of that monitoring has continued since the initial study. One would hope that the 2013 baseline data collection program would be continued to improve understanding of temporal variation in the parameters being measured. An understanding of the natural variability of a parameter will improve one's ability to detect a change related to discharges from the mining operation.
- 6. **CCNB's questions regarding some overarching issues:**
 - a. Reliance on the mitigation measures being implemented and effective – I think that you are right about this. The CSR seems to accept that the company will do everything necessary to mitigate any environmental problems and that the methods employed by the company will be effective.
 - b. Adaptive management – future problems will be detected by monitoring and be addressed once identified – This is definitely the case and that is the usual situation with new mining projects. The proponents examine all the facets of their proposed operations and predict the outcomes. But once things actually get underway, actual operating conditions can have quite different and unexpected results. Hopefully, issues will be identified quickly through monitoring and operational changes can be made before any serious environmental damage occurs.
 - c. Reliance on the EIA conditions of the Province of NB - I agree with your point. Fortunately, the NB EIA Approval was very thorough and set out a lot of conditions that addressed my concerns and many of the concerns of the other reviewers.

CSR's Response to My Original Comments and Questions raised during review of the EIA Report

- 7. **Tailings Storage Facility** - While not a failing of the project, the TSF's large size requires that it be very diligently planned, constructed, operated, and maintained. The NB EIA Approval addresses my concerns from pre-construction geotechnical testing (Condition 23 & 24), the design of the dams (Condition 12), the TSF Failure Modelling (Condition 26), Operation, Maintenance and Surveillance (OMS) Manual (Condition 30, j) and the creation of the Independent Tailings Review

Board (Condition 39). I think that this is as good as one can expect and the NB government has put the requirements in place to minimize the risk of a tailings dam failure.

8. **Seepage from the Tailings Dam** - A condition for allowing the project to proceed should be the requirement of a *detailed* plan to deal with such an emergency. The NB EIA Approval addresses my concerns with the requirement to develop an approved Emergency Preparedness and Response Program prior the start of construction (Condition 29, e, iv, v & vi)
9. **Dam Failure** - The EIA report does not provide a description of the spillway on the TSF or describe the design criteria for that spillway. *As in #1.*
10. **Water Management** - It is not clear from the EIA report whether all of the water management components (WMP, pumps, pipes, and spillways) are designed to deal with these types of extreme rainfall events. *Same response as for # 8*
11. **Dam Inspections** - Annual or at a minimum biannual inspections should be carried out to ensure the integrity of the dams surrounding the TSF. The NB EIA Approval addresses this concern with the requirement to establish the Independent Tailings Review Board (Condition 39).
12. **Flooded Open Pit Water Treatment** - While the proponent commits to treating overflow water from the flooded open pit “for as long as is necessary” (EIAR page 3-143), it is my experience that what is necessary is required for a much longer period of time than typically anticipated. Also, will the \$50 million proposed to be set aside be sufficient funding to pay for “as long as is necessary”? The NB EIA Approval addresses my concern with the requirement to develop an approved Financial Security Plan and review it every 5 years (Condition 16). This security, held by the government would be above and beyond the \$50 million proposed by the proponent for reclamation and post operational water treatment.
13. **Reclamation of Tailings Storage Facility embankments** - It is not clear from reviewing the EIA report that the proponent has calculated the soil requirements for re-vegetation and have determined that they will have enough material available when the reclamation begins. The NB EIA Approval does not directly address this concern but with the requirements to develop a Reclamation Plan in consultation with regulators and First Nations and the requirement to update the Reclamation Plan every 5 years (Condition 35), this concern should be addressed.
14. **Operational Waste Water Treatment –**
 - a. Some detail should be provided about the type and efficacy of the proposed waste water treatment processes that will be employed. *Not specifically addressed by the CSR or the NB EIA Approval.*
 - b. There is a reference to batch treatment of the water in the open pit with ferric sulphate. What is the purpose of this procedure? *Not specifically addressed by the CSR or the NB EIA Approval.*
 - c. Most water treatment plants create precipitate containing the contaminants, generally referred as sludge. What plans are there for sludge disposal? *Not specifically addressed by the CSR or the NB EIA Approval.*
15. **Follow-Up Monitoring –**
 - a. In Section 9.4.3.1.5 Fish Tissue Analysis, fluoride is not listed among the parameters to be measured. As fluoride is known to accumulate in bones, the fish tissue analysis for fluoride should include fish bones. *Not specifically addressed by the CSR or the NB EIA Approval.*
 - b. Similarly, in Section 9.4.3.2.1 Surface Water, fluoride is not listed. *Not specifically addressed by the CSR or the NB EIA Approval.*
 - c. **Acid Rock Drainage** – Does the CSR discuss this at all? *Not specifically addressed by the CSR or the NB EIA Approval.*

16. **Operational Interruptions** - Should an interruption in production occur, how will that affect the water management plan, the operation of the TSF and the treatment of the waste water? The NB EIA Approval addresses this concern with the requirement to develop an approved Emergency Preparedness and Response Program prior the start of construction (Condition 29, e: v & vi).

Roy Parker

April 27, 2016

5 May 2016

Mr. Scott Kidd
c/o Conservation Council of NB

RE: Comments on Sisson Project Comprehensive Study Report, CEAA April 2016

Dear Scott:

Please find enclosed my comments on the Canadian Environmental Assessment Agency (CEAA), Comprehensive Study Report (CSR) for the Sisson Brook Tungsten and Molybdenum Mine (New Brunswick). I understand the CSR is CEAA's conclusions and recommendations regarding the implementation of mitigation measures and whether the project is likely to cause significant adverse environmental effects.

Other than extensive comments on issues with First Nation's engagement, this document is rather lean on content. It is essentially a checkbox exercise. They appear to have gone through their fixed list of questions and if (1) all the necessary boxes were present and (2) either the proponent or the Province's (NB) Conditions of Environmental Impact Assessment Approval suggested something would be done, then the box has been checked and the conclusion drawn: "...the Agency concludes that the Project is not likely to cause significant adverse environmental effects taking into account the implementation of mitigation measures described in this Comprehensive Study Report." There is no actual assessment of the processes proposed or any indication of the conditions to operate. Furthermore, the only environmental protection offered by the CSR is the statement: "If the Project proceeds, a follow-up program would be required to verify the accuracy of the environmental assessment and to determine the effectiveness of the proposed mitigation measures." If the proponent has failed and the environment has been impacted, then what was the point of the EIA and this CSR in particular?

Most significantly, there are the references to monitoring, adaptive management, and mitigation actions, but there is nothing about the significance of failing or the consequences of failure to meet notions of mitigation or addressing the different scales of failure, e.g., everyday operations to extreme failures. The Province will issue "Permissions to Operate" related to the various activities and the "exceedance targets" will be set, but where is the guarantee that targets are correct and where are the consequences of failing. Where are the assurances that the consequences of failures will be imposed and effective. Nobody needs a lesson in the ubiquity of non-compliance of mining operations including (1) meaningless financial penalties (\$2,000 seems to be a normal high in New Brunswick) or (2) the long political and/or court battles with a destroyed environment, no consequences, and tax payer on the hook (also common in NB and some mines that are >10 years in non-compliance without action).

I realize the CEAA and the Provincial EIA processes are being followed, but so far I find very little government effort to understand the environmental impacts, their probability of occurrence, the financial costs necessary to overcome an impact when it occurs, and how the proponent will actually be penalized for a failure. The government can claim that permits are required and penalties exacted by current laws, but no successful business person would enter into deal where the consequences of failures weren't dictated clearly in the contract.

Disappointedly,

R. Allen Curry
Science Director, CRI
Professor of Biology, Forestry and Environmental Management
University of New Brunswick

cc: Dr. Michael van den Huevel, CRI Director

Review of CSR for the Sisson Project (Tungsten and Molybdenum Mine) - New Brunswick, CEAR #11-03-63169

Re: CSR Section 5.2 - Atmospheric Environment

Inka Milewski

CSR Effects of Project on the Environment

The CSR concluded that atmospheric effects of the Project include air quality, greenhouse gas emissions, noise, odour, vibration, and the visual environment. CCNB concurs with this assessment.

CSR Proposed Mitigation Measures

The CSR's recommendations for mitigating the impacts of air emissions include dust suppression for roads, seeding and re-vegetation of topsoil and overburden storage piles as soon as possible after disturbance, a scrubber on the ammonium paratungstate plant (APT) and dust collection systems for the crusher and ore processing plant and the APT plant. The CSR mitigation measures also include monitoring during construction and operations to verify impact predictions and adaptive management. The CSR proposes that the monitoring plan, adaptive management consideration, and contingency plans required by the Province of New Brunswick (DELG 2015: Condition 30) will be adequate in mitigating the atmospheric effects of the Project.

In its review of the EIA report for the Project, CCNB recommended the dust suppression plan include a plan for fresh water usage to confirm that the current design of the freshwater supply system is adequate to meet the Project's dust suppression plan. The New Brunswick Department of Environment and Local Government (DELG) is requiring the proponent to conduct a *Water Supply Source Assessment* (WSSA) for all groundwater supply wells to be developed as part of the project (DELG 2015: Condition 14). The proponent must follow DELG's March 2014 *Water Supply Source Assessment Guidelines* and a WSSA Initial Application must be submitted to the DELG for review and approval before any groundwater supply wells are drilled.

CCNB also recommended that the use of recycled water for dust suppression be prohibited given the reagents used in the processing and APT plants and the geological conditions (metal leaching/acid rock drainage) in the area. The CSR and the New Brunswick Conditions of Approval give no direction regarding the use of recycled water for dust suppression. Again, we reiterate that the Project proponent must be required to provide a mass balance model that examines whether the current design of the freshwater supply system will be adequate to meet the Project's dust suppression plan. The use of recycled water must not be part of the design.

Dust from unpaved roads has been identified as the largest source of fugitive dust emissions from the Project. An estimated 851 mt will be released from the construction phase of the Project and an estimated 1,397 mt released annually from the operation phase of the project (EIAR pages 3-94 to 3-98 and pages 3-127 to 3-134).

Few quantitative studies have been done to assess the effectiveness of different road dust suppressants on unpaved roads. Where studies have been done, they have shown that water, as proposed in the Sisson Project, is the least effective in reducing dust (Rushing et al. 2006). The effectiveness of water is dictated by a wide range of technical and operational performance factors (e.g., water consumption rate, spray configuration, equipment function and operation (Gambetese and James 2001). Gambetese and James (2001) found that dust suppression using truck-mounted water spray systems had an efficiency range of 5-74% with an average effectiveness of 50%.

Sanders et al. (1997) examined the effectiveness of three chemical-based suppressants (lignin derivatives and chloride based compounds) and found they reduced fugitive dust from unpaved roadways by 50-70%. The effectiveness of acrylic polymer emulsions and petroleum-based suppressants, which act more as sealants, on unpaved roads were found to range between 33% and 100% one week after application, but, efficiency dropped, depending on the suppressant, to 0% to 95% eight to twelve months after application (Gillies et al. 1999). For obvious environmental reasons, chemical or petroleum-based suppressants are not desirable for this Project.

While the mitigation measures identified in the EIA and recommended in the CSR will likely result in some reduction of fugitive dust releases, an evaluation of the efficacy of these mitigation measures has not been provided. The Project's mitigation plans for road dust suppression would need to have an annual 70% efficiency performance in order to reduce the estimated 1,397 metric tonnes (mt) of road dust released from the Project to levels equal to the release of total particulate matter from the largest industrial source (Irving Oil Refinery: 420 mt) in New Brunswick (NPRI 2016). At the more likely efficiency performance of 50%, the Project will release an estimated 700 mt of dust from roads, significantly more than emitted from New Brunswick's largest industry operation.

Fugitive dust suppression from roads will be a major challenge for the Project and, to date, no effective plan other than watering has been proposed. The Project proponent must provide a more comprehensive evaluation of the efficacy of the Project's dust suppression plan, in particular the plan to reduce road dust.

CSR Follow-up Measures

The CSR outlined follow-up measures to verify the accuracy of the air quality assessment and determine the effectiveness of the proposed mitigation measures.

CCNB, in their review of the Project's impacts on air quality as set out in the Project's EIA report, stated that the accuracy of the project's emission estimates, in particular particulate matter (PM) and arsenic, and the reproducibility of air paratungstate plant are not supported by the available data or calculations. The CSR addresses some but not all of the deficiencies identified by CCNB (**Table 1**). With respect to particulate matter (PM), the CSR has recommended additional baseline air quality sampling, air quality modeling, analysis on the potential for contaminant transport from overburden stockpiles and other sources and further details and modelling on the operation and emissions from the ammonium paratungstate plant (**Table 1**). The CSR has also recommended on-going air quality monitoring in response to CCNB and other intervener concerns over the lack of air quality monitoring during the construction and operation phase of the project.

The CSR does not address CCNB's concern that some discrepancies and inconsistencies in the meteorological data used in the air dispersion model could result in inaccurate predictions. Accurate characterization of wind patterns is central to producing valid and reasonable estimates of contaminant

dispersion and deposition. Wind erosion is the most important factor influencing dust emissions and deposition which, in turn, have important environmental consequences (Csavina et al. 2012).

Meteorological discrepancies must be addressed prior to baseline air quality testing. The discrepancy and uncertainty of wind patterns reported by Rescan (2008) and the Project EIA report, and the rationale for locating the meteorological station below the maximum sources of dust emission must be examined and explained.

At a minimum, the proponent should be required to compare modeling results using wind data from multiple sources and from site-based meteorological wind located above, not below, the maximum sources of dust. The proponent should be required to re-measure, over an appropriate period of time, site meteorological data at project sites appropriate to individual project emission sources. These measures are required before recompiling model dispersion and deposition patterns of mine emissions.

Table 1. CCNB Comments from review of EIA report and CSR Follow-up Measures for the Project

<i>CCNB Comments</i>	<i>Follow-up Measures Recommended by the Agency</i>
<ul style="list-style-type: none"> discrepancies and inconsistencies in the meteorological data used in the air dispersion model the improper location of the meteorological station at the proposed project site the spatial domain for the air quality model is too small 	
<ul style="list-style-type: none"> a lack of data on background ambient air concentrations for PM₁₀ 	<p>Establish baseline to verify ambient concentration predictions (e.g. PM, PM2.5, PM10, H2S, SO2 and NH3).</p> <p>Provide updated results of additional air quality modeling (i.e. that would be conducted in support of the provincial permitted process), should these results differ from those presented in the proponent's EIA report. Revisit the Human Health Risk Assessment with any updated concentrations to more accurately predict human health risks from inhalation exposure</p>
<ul style="list-style-type: none"> missing and inaccurate emission estimates for some project sources 	<p>Conduct additional analysis on the potential for contaminant transport from overburden stockpiles, including but not limited to, windblown material transport, drainage and seepage to drainage ditches and sewers, and manage stockpiles accordingly to plan to reduce and eliminate off-site transport and risk.</p>
<ul style="list-style-type: none"> higher average arsenic concentration in all pathways (except topsoil) than the arsenic value used in the dispersion and deposition model 	
<ul style="list-style-type: none"> missing geo-referenced data required to validate the concentration and spatial 	

distribution of trace metals at the project site	
<ul style="list-style-type: none"> emission estimates from the ammonium paratungstate plant are not supported by available data or calculations 	Provide additional modelling and further detail on the operation and emissions from the ammonium paratungstate plant
<ul style="list-style-type: none"> no environmental monitoring for future air quality is proposed for the project. 	Monitor air quality, including air contaminant emissions (e.g. PM, PM2.5, PM10, H2S, SO2, NH3, and potentially others) and ambient PM concentrations. Implement adaptive management measures if significance criteria are exceeded.

The CSR also fails to address CCNB's concerns that the analysis, characterization and reporting of trace metal emissions, in particular arsenic, from the construction and operational phases of the Project are incomplete and the likelihood that trace metal and metalloid emissions are underestimated (**Table 1**). Transport of metal and metalloids by atmospheric particulates (dust) is an important pathway by which contaminants can be redistributed in the environment and mining activity is reported to account for 60% of all atmospheric arsenic (Csavina et al 2012).

Concentrations of arsenic were found to be significantly higher in all potential Project pathways/sources, with the exception of baseline surface soils, than the value used in the EIA report to model arsenic emissions (41 mg/kg) (**Table 2**). Average trace metal values in waste rock and mid-grade ore used to determine trace metal emissions to air are not representative of trace elements in the high-grade ore that will be processed in the APT plant.

Furthermore, arsenic from overburden removal during the construction phase will be a significant source of arsenic emissions to the atmosphere and have not been included in air quality modelling. During the construction phase of the project, an estimated 28 million cubic meters (74.5 million mt@specific gravity 2.66 [Rambøll Arup. 2011]) of overburden will be removed, transported, stored and subject to wind erosion until mitigation measures are put in place. The source of the overburden will be the pit area, the tailing storage facility (TSF) embankment foundations, and the on-site quarry.

The CSR's follow-up recommendations include additional baseline sampling to verify ambient air concentration predictions and additional analysis on the potential for contaminant transport from overburden stockpiles. This analysis must include an updated analysis of arsenic in all Project pathways, in particular the ore, and a re-analysis of air quality dispersion and deposition modeling based on the updated arsenic analyses.

Table 2. Arsenic concentrations in various project pathways

Statistical Value	Baseline Surface Soil ^a ppm (mg/kg)	Overburden ^b ppm (mg/kg)	Sub-soil ^c ppm (mg/kg)	Pit Walls ^d ppm (mg/kg)	Waste-Rock/ Mid-grade Ore ^e ppm (mg/kg)	Ore ^f ppm (mg/kg)
Mean	10.7	143.3	66.4	83.5	64.8	41
Number of	51	300	667	58	184	— ^g

Samples						
Min - Max Values	1 - 103	6.8 - 10200	10 - 1470	0.9 - 2490	<0.1 - 2917	- ^g
No. of samples below limit of detection	1	0	0	8	4	- ^g
Notes: ^a Data Source: Baseline Metal in Soil Technical Report Table 3.1, page 17 and Appendix B -ProUCL Outputs for Samples from Key and Soil Sites. Baseline soil samples restricted to the top 30 cm of soil. ^b Data Source: MRARD Report, Appendix G Overburden Results, G1:Overburden trace element data ^c Data Source: 2008 Geodex Mineral Report No. 476311 ^d Data Source: ML/ARD Report, Appendix D Pit Wall Results, D2: Trace element analysis ^e Data Source: ML/ARD report, Appendix B:Barren rock Static Test Results, B2: Trace element analysis results ^f Data Source: Sisson Project EIA Report, Table 3.4.31, page 3-134. Value used to estimate project trace metal emissions ^g Data not provided						

CSR Analysis and Conclusions

The CSR report states that "the adverse residual effects of the Project on the atmospheric environment would be: medium in magnitude, occur locally (with the exception of greenhouse gases), and occur continuously or on a regular basis over the life of the Project, which is close to 30 years"(CSR: page 25). The Canadian Environmental Assessment Agency (CEAA) believes that "impacts of emissions would be reversible over the long-term. Taking into account applicable mitigation, the Agency is of the view that the Project is not likely to result in significant adverse environmental effects on the atmospheric environment" (CSR: page 25).

The CSR's conclusion that the Project is not likely to result in significant adverse effects on the atmospheric environment is premature given the significant deficiencies and uncertainties in emissions and air quality model predictions. The reliance on adaptive management for mitigation is overly optimistic given the acknowledged difficulties in implementing adaptive management and the fact that there are so few practical, on-the-ground, examples of successful adaptive management (Foran et al. 2015, Westgate et al. 2013, Canter and Atkinson 2010, Medema et al 2008, Stankey et al. 2003). Furthermore, neither the CSR nor the New Brunswick government's Conditions of Approval outline the management mechanism necessary to integrate the knowledge gained in monitoring into better management decisions, actions or policies.

Conclusion and Recommendations

Despite decades of technological improvements in mining emissions abatement and mitigation technology, mining operations remain one of the most significant sources of atmospheric dust (Csavina et al. 2012).

Prior to any permits being issued for the Project, the proponent must be required to:

- re-measure meteorological data at sites appropriate to individual project emission sources and re-model the emission results based on this data;
- provide a mass balance model that examines whether the current design of the freshwater supply system will be adequate to meet the Project's dust suppression plan: the use of recycled water must not be part of the design;
- provide a comprehensive evaluation of the efficacy of the Project's dust suppression plan, in particular the plan to reduce road dust; and
- provide an updated analysis of arsenic in all Project pathways, in particular the ore, and a re-analysis of air quality modeling based on the updated arsenic analyses.

References

Canter, L. and S. F. Atkinson. 2010. Adaptive management with integrated decision making: an emerging tool for cumulative effects management. *Impact Assessment and Project Appraisal*, 28:4, 287-297.

Csavina J, Field J., Taylor M.P., Gao S., et al. 2012. A review on the importance of metals and metalloids in atmospheric dust and aerosol from mining operations. *Science of the Total Environment* 433:58-73.

Foran CM, Baker KM, Grosso N, and I. Linkov. 2015. An enhanced adaptive management approach for remediation of legacy mercury in the South River. *PLoS ONE* 10(2): e0117140. doi:10.1371/journal.pone.0117140

Gambatese, J.A., and D. E. James. 2001 Dust suppression using truck-mounted water spray system. *Journal of Construction Engineering and Management* 127(1): 53-59.

Gillies, J.A., Watson, J.G., Rogers, C.F., DuBois, D., Chow, J.C., Langston, R., and J. Sweet. 1999. Long-term efficiencies of dust suppressants to reduce PM₁₀ emissions from unpaved roads. *Journal of the Air & Waste Management Association* 49(1):3-16.

Medema, W., McIntosh, B.S., and P.J. Jeffery. 2008. From premise to practice: a critical assessment of integrated water resources management and adaptive management approaches in the water sector *Ecology and Society* 13(2): 29 URL: <http://www.ecologyandsociety.org/vol13/iss2/art29>

New Brunswick Department of Environment and Local Government (NB DELG). 2015. Conditions of Environmental Impact Assessment Approval for the Sisson Mine Project.

National Pollutant Release Inventory 2014 (Environment Canada 2016).

Rambøll Arup. 2011. Geotechnical properties for Glacial deposits. Appendix GDR 00.1-001-C . Copenhagen, Denmark. <http://www.femern.com/material-folder/documents/2011-publications/appendix-gdr-00.1-001-c>

Rescan (2008) Sisson Brook Project Registration. NB EIA Registration Document prepared for Geodex Minerals by Rescan Environmental. Vancouver, B.C. 167 p. + Appendices.

Rushing, J.F., Harrison, A., Tingle, J.S., Mason, Q., and T. Caffrey. 2006. Evaluation of dust palliatives for unpaved roads in arid climates. *Journal of Performance of Constructed Facilities* 20(3):281-286.

Sanders, T.G., Addo, J.Q., Ariniello, A., and W. F. Heiden. 1997. Relative effectiveness of road dust suppressants. *Journal of Transportation Engineering* 123(5): 393-397.

Stankey, G.H., Bormann, B.T., Ryan, C., Shindler, B., Sturtevant, V., Clark, R.N., and C. Philpot. 2003. Adaptive management and the Northwest Forest Plan - Rhetoric and reality. *Journal of Forestry* 101:40-46.

Westgate, M.J., Likens,, G.E., and D.B. Lindenmeyer. 2013. Adaptive management of biological systems: A review. *Biological Conservation* 2013 158:128-139.

Review of CSR for the Sisson Project (Tungsten and Molybdenum Mine) - New Brunswick, CEAR #11-03-63169

Re: CSR Section 5.8 – Human Health

Inka Milewski

CSR Effects of the Project on Human Health

The CSR concluded that potential health impacts from the Project could occur as a result of inhaling and directly or indirectly ingesting contaminants released from various Project activities. The CSR concluded that the Project could potentially increase contaminant concentrations in air, soil, plants, and wild game and that seepage and treated mine water could affect water quality in the receiving environment. CCNB concurs with this assessment.

The CSR, Province of New Brunswick and the proponent did not address the potential biophysical, social and economic determinants of health of permanent residents living within the Project's entire Local Area Assessment (LAA). This decision was based on the assumption that predicted air quality and water assessment modeling results were accurate. The Project proponent predicted that deposition of ore dust within the LAA would be negligible and that arsenic levels in Napadogan Brook would be unlikely to result in health effects since potential exposures to the water would be intermittent (CSR: page 66). These predictions are premature given that the CSR has recommended extensive additional analysis and baseline modeling of air, dust, and water in the pre-construction phase of the Project.

The CSR, the Province of New Brunswick and the proponent also did not address the potential health risks for on-site workers. The **Canadian Handbook on Health Impact Assessment**, a Report of the Federal/Provincial/Territorial Committee on Environmental and Occupational Health, makes the following case for worker health to be part of the health risk assessments of development projects:

"In the past, workers have unintentionally played the role of the "mining canary," with their negative health outcomes serving as a warning for the rest of society. It behooves us to give prominent consideration to these individuals, who not only are responsible for societal productivity, but are most at risk by virtue of the dose response relationship that is fundamental to toxicology." (Health Canada (2004): Volume 3., Chapter 7, page 7-1)

The Project EIAR indicated that up to 300 workers would be on-site during the Operation phase of the Project, generally split between two 12-hour shifts per day (EIAR 2013; Sec 3.4, page 3-138). At any one time, there would be approximately 150 workers on site who would be working primarily in an area between the quarry and the mine pit. Four Human Health Risk Assessment (HHRA) receptors (HHRA 21, 23, 25 and 43) were identified in this area (EIAR 2013; Sec 7.7; page 7-119). This area was identified by depositional modelling to be the area of highest ground level concentration of NO₂, total PM, PM₁₀ and PM_{2.5} (EIAR 2013, Section 7.1, figures 7.1.2 to 7.1.8) and the health risk from inhaling PM in this area exceeded the benchmark/Concentration Ratio (CR=1.0) by seven times. The Project-related risk (CR = 6.81) accounted for almost all of the risk.

Numerous studies have statistically linked occupational, as well as ambient, exposure to dust (PM10, PM2.5 and coarse particles) and arsenic with a wide range of cancer and non-cancer health impacts (e.g., asthma, cardiovascular and lung diseases, mitochondrial and lung fibroblast damage) (Casale et al. 2014, Surdu et al 2013, Ciarrocca et al. 2012, Hou et al. 2010, Alley et al. 2009).

Health risk values (CRs, Health Quotients, and Lifetime or Incremental Cancer) were not reported for any individual HHRA receptor locations directly at the Project site. No explanation was provided for this omission. This information would be useful to New Brunswick's occupational health and safety agency in ensuring that the correct and highest occupational health standards are imposed on the Project to protect the health and well-being of workers.

CSR Proposed Mitigation Measures

The CSR recommends the Project follows the mitigation measures outlined in the NB Government's Conditions of Approval for the atmospheric environment, water resources, and fish and fish habitat to reduce people's exposure to metals and other contaminants in all phases of the Project. These measures include additional baseline sampling, modeling, monitoring of air, water, vegetation and fish and adaptive management.

In response to previous CCNB and other intervener concerns regarding non-cancer health risks from arsenic exposure, the CSR has recommended the Project evaluate, pre-construction, the non-cancer effects of arsenic in the risk calculations and provide the results to Health Canada for review.

The CSR has also recommended that, during all phases of the Project, "signs be posted in areas where edible vegetation is expected to be collected warning people to either avoid collecting vegetation in the vicinity of roads or to wash vegetation prior to consumption. If it is determined that country foods have been compromised as a result of the Project, post signs warning people to temporarily avoid collecting vegetation in applicable areas until the issue has been resolved" (CSR: page136).

As a mitigation measure, washing edible plants will address only surface dust, not metal contaminants that have been absorbed through roots from the soil or directly through plant leaves and fruit (Li et al. 2016, De Temmerman et al. 2015, Filipović-Trajković et al. 2012, Pandey et al. 2012, Nouri et al. 2009). Signs along country roads in the Project area must indicate that consumption of all edible vegetation be avoided. Pending the results of the CSR's recommended update of additional air quality and dust monitoring, a public communication strategy must be developed by the Province of New Brunswick and the Project proponent, in collaboration with First Nations, to alert the public that collecting edible vegetation in larger portions of the LAA is prohibited.

CSR Proposed Follow-Up Programs

The CSR has recommended that, pre-construction, the Project undertake additional soil sampling and surveys, with input from First Nations, of traditional country foods within the LAA. The CSR recommends that, pre-construction, the results of the traditional and country food monitoring program be used to verify the revised predictions of additional aerial dust deposition modelling. The CSR is also recommending a suite of monitoring to be done during all or some phases of the Project. These include monitor potential effects of dust fall at two to three traditional use sites identified by First Nations for harvesting of country foods (pre- construction and again within five years of the start of operations), monitoring country and traditional food for metal including arsenic, chromium, manganese and thallium

(pre-construction and operations) and monitor surface water quality in McBean and Napadogan Brooks (pre-construction and operations).

CCNB, in their previous review of the EIA report's treatment of the Project's impacts on human health, stated that there were serious deficiencies in the methods and data used to estimate the project-related human health risks that compromise the validity and precision of the results generated from the HHRA (Table 1). The CSR addresses some but not all of the deficiencies identified by CCNB.

Table 1. CCNB Comments and CRS Follow-up Measures for the Project

<i>CCNB Comments</i>	<i>Follow-up Measures Recommended by the Agency</i>
<ul style="list-style-type: none"> the HHRA modeling domain is too small and does not cover the entire project Local Area Assessment (LAA); 	
<ul style="list-style-type: none"> emissions of particulate matter and metals during the construction phase of the project and the potential seepage of metals from overburden piles during the construction phase have been excluded from the assessment; 	(from the CSR recommended follow-up on Air quality) Pre-construction, provide updated results of additional air quality modeling and revisit the Human Health Risk Assessment with any updated concentrations of contaminants to more accurately predict human health risks from inhalation exposure.
<ul style="list-style-type: none"> the Project + Baseline assessment of maximum acute and chronic human health risks from inhaling PM₁₀ emissions are incomplete and inaccurate; 	Establish baseline air quality for PM, PM _{2.5} , PM ₁₀ , H ₂ S, SO ₂ and NH ₃ , and potentially other emissions to verify predictions in the Human Health and Ecological Risk Assessment.
<ul style="list-style-type: none"> particulate emission estimates during the operational phases of the project are significantly underestimated; 	(from the CSR recommended follow-up on Air quality) Pre-construction, provide updated results of additional air quality modeling and revisit the Human Health Risk Assessment with any updated concentrations of contaminants to more accurately predict human health risks from inhalation exposure.
<ul style="list-style-type: none"> arsenic emission estimates during operational phases of the project are significantly underestimated; 	(from the CSR recommended follow-up on Air quality) Pre-construction, provide updated results of additional air quality modeling and revisit the Human Health Risk Assessment with any updated concentrations of contaminants to more accurately predict human health risks from inhalation exposure.
<ul style="list-style-type: none"> sulphur dioxide (and other) emission estimates from the Project's ammonium paratungstate (APT) facility are significantly underestimated; 	(from the CSR recommended follow-up on Air quality) Provide additional modelling and further detail on the operation and emissions from the ammonium paratungstate plant
<ul style="list-style-type: none"> characterization of health risks for on-site workers 	

are not reported or discussed; and	
<ul style="list-style-type: none"> public and occupational health follow-up or monitoring will not be done. 	
<ul style="list-style-type: none"> no evaluation of the non-cancer health risk of arsenic exposure 	<ul style="list-style-type: none"> Undertake an evaluation of the non-carcinogenic effects of carcinogens such as arsenic in the risk calculations for a different receptor (i.e. toddler), and provide to Health Canada for review (pre-construction).+
<ul style="list-style-type: none"> no sensitivity analysis to identify how variations in the model inputs influence the outputs of the model 	

CCNB, in their review, stated that portions of the LAA were not covered by the Public Health and Safety assessment because the receptors defined for the HHRA covered a smaller (20 by 20 km) spatial area (EIAR 2013; Sec. 8, page 8-448) than the area used to gather baseline information (25 by 25 km) (EIAR 2013; Sec. 7.1, page 7-5). As a result, HHRA receptor locations in the community of Napadogan and other locations at the edges of the LAA where people from Williamsburg, Currieburg, Boyds Corner, Stanley, and Fredericksburg may spend recreational time were not covered by the HHRA. No explanation is provided in the EIAR for the decision to use the smaller domain area. The spatial area of the HHRA must be expanded to cover, at the very least, the entire LAA (25 by 25 km).

The Province of New Brunswick is requiring that the proponent, with input from First Nations, undertake soil sampling and collect additional baseline information for country foods within the local assessment area, including small mammals, as a condition of their EIA approval (NB DELG2015: Condition 18). This new baseline soil and country food data, as well as data on updated concentrations of contaminants and baseline air quality modelling, must be used to revise the Project HHRA predictions for the entire LAA.

As mentioned earlier, neither the CSR, the Province of New Brunswick or the Project proponent have addressed the potential health risks for on-site workers and no public and occupational health follow-up or monitoring has been recommended. Human health risks from the Project have been too narrowly defined as cancer and non-cancer health risks despite the fact that, worldwide, health agencies view health as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (World Health Organization 1948).

The information in the EIA on the health status (EIAR 2013; Sec. 8, pages 8-443 to 8-448) and the socio-economic setting (EIAR 2013; Sec. 6, pages 6-43 to 6-49) of the Project have no statistical relevance in evaluating the potential health or socio-economic changes that may occur as a result of the Project's activities for residents who live, work or spend leisure time around and within the LAA. The health information provided in the EIAR is not (and statistically cannot be) linked to any future monitoring or health assessment of the Project's impacts.

While the practice of including determinants of health beyond disease risks in environmental impact assessments has been realized in some countries, Canada has not considered or given adequate treatment to these considerations in project assessments (McCallum et al. 2015, Nobel and Branson 2005).

Health Canada, the Province of New Brunswick, and First Nations, in collaboration with the Project proponent, need to develop a protocol for monitoring the broader health status of persons living, working, or spending leisure time within the Project LAA and linking this information to environmental monitoring data.

Risk assessments rely on at least 50 different assumptions regarding exposure, dose-responses, ingestion rates, bioavailability and toxicological reference values (TRV). Statistical sensitivity analyses are usually preformed to understand how risk estimates are dependent on variability and uncertainty in the factors contributing to risk. For example, the sensitivity analysis performed for the Sudbury Area Risk Assessment (SARA) study (2008) assessed how variations in soil concentration, bioavailability, and consumption rates influenced the outcomes of health human risk assessments. The sensitivity analysis revealed that by altering soil ingestion rate, soil to dust ratio, food consumption rate, bioavailability of lead in soil and dust and the TRV, soil risk management levels varied substantially (-41% to +2200%) (SARA 2008; Vol II, Chapter 5, pages 5-40 to 5-41).

Given the significant uncertainties in the Project's estimate of dust and arsenic emissions and impacts on vegetation, wildlife and water, the Project should be required to conduct a sensitivity analysis to identify how variations in the model inputs influence the outputs of the model.

CSR Analysis and Conclusions

The CSR concluded that dust deposition from the Project could potentially increase contaminant concentrations in soil, plants, and wild game and that seepage and treated mine water could affect water quality in the receiving environment. The CSR also concluded that potential health risks from these effects were limited to the public and Maliseet and Mi'gmaq First Nations using the Project area for hunting, fishing, trapping, and recreational activities.

The CSR concluded, however, that, "taking into account applicable mitigation, the Agency is of the view that the Project is not likely to result in significant adverse environmental effects on human health" (CSR: page 73).

The CSR's conclusion that the Project is not likely to result in significant adverse health effects is premature given the significant deficiencies and uncertainties in emissions, dust, and air quality modeling results and subsequent uncertain health risk predictions. The overall regulatory reliance on monitoring for mitigation is overly optimistic given the acknowledged lack of meaningful measures for evaluating health outcomes in environmental impact assessments (McCallum et al. 2015, Lui et al. 2012, Noble and Bronson 2005). As for the use of adaptive management, neither the CSR nor the New Brunswick government's Conditions of Approval have outlined the management mechanisms necessary to integrate the knowledge gained in monitoring into better management decisions, actions or policies.

Conclusion and Recommendations

Given the duration and scale of the Sisson Project, it is simply not credible to suggest that metals and metalloids released from the Project will not have a significant effect on soil, vegetation, wildlife, and water quality and, consequently, human health. These predictions are premature and must be revisited once the results of additional analysis and baseline modeling of air, dust, vegetation, wildlife and water in the pre-construction phase of the Project have been completed and the HHRA predictions updated.

Prior to any permits being issued for the Project, the proponent must:

- expand the spatial area of the HHRA to cover, at the very least, the entire LAA (25 by 25 km);
- ensure that the results of aerial dust deposition on vegetation are incorporated into a re-analysis and updating of baseline air and water quality modeling and other assessments of Project impacts;
- conduct a sensitivity analysis to identify how variations in the model inputs influence the outputs of the health risk model;
- in collaboration with Health Canada, the Province of New Brunswick and First Nations, develop a protocol for monitoring the broader health status of persons living, working, or spending leisure time within the Project LAA and link this information to environmental monitoring data; and
- assess the health risks for on-site workers based on updated air quality modeling.

If the Project is permitted, the proponent must:

- ensure signs are posted along country roads in the Project area to indicate that consumption of all edible vegetation be avoided; and
- pending the results of the CSR's recommended update of air quality and dust monitoring develop a public communication strategy, in collaboration with the Province of New Brunswick and First Nations, to alert the public that collecting edible vegetation in larger portions of the LAA is prohibited.

References

Alley, D. F., Gordon, N. R., Langley-Turnbaugh, S., Wise Sr, J. P., Van Epps, G. and A. Jalbert. 2009. The effect of PM10 on human lung fibroblasts. *Toxicology and Industrial Health* 25(2): 111–120.

Noble, B.F., and J.E. Bronson. 2005. Integrating human health into environmental impact assessment: case studies of Canada's northern mining resource sector. *Arctic* 58(4):395-405.

Casale, T., Rosati, M.V., Ciarrocca, M., Samperi, I., et al. 2014 Assessment of liver function in two groups of outdoor workers exposed to arsenic. *International Archives of Occupational and Environmental Health* 87:745–752.

McCallum, L.C., Ollson, C.A., and I.L Stefanovic. 2015. Advancing the practice of health impact assessment in Canada: Obstacles and opportunities. *Environmental Impact Assessment Review* 55: 98-109.

Ciarrocca, M., Tomei, F., Caciari, T., Cetica, C., et al. 2012. Exposure to arsenic in urban and rural areas and effects on thyroid hormones. *Inhalation Toxicology*, 24(9): 589-598.

De Temmerman, L., Waegeneers, N., Ruttens, A., and K. Vandermeiren. 2015. Accumulation of atmospheric deposition of As, Cd and Pb by bush bean plants. *Environmental Pollution* 199:83-88.

Filipović-Trajković, R., Ilić, Z.S., Šunić, L., S. Andjelković. 2012. The potential of different plant species for heavy metals accumulation and distribution. *Journal of Food, Agriculture & Environment* 10 (1): 959-964.

Health Canada. 2004. *Canadian Handbook on Health Impact Assessment. Volume 3: The Multidisciplinary Team*. A Report of the Federal/Provincial/Territorial Committee on Environmental and Occupational Health. Cat. H46-2/04-362E ISBN 0-662-38010-X.

Hou, L., Zhu, Z., Zhang, X., Nordio, F., et al. 2010. Airborne particulate matter and mitochondrial damage: a cross-sectional study. *Environmental Health* 9:48. <http://www.ehjournal.net/content/9/1/48>

Li, N., Wang, J., and W. Song. 2016. Arsenic uptake and translocation in plants. *Plant and Cell Physiology* 57(1): 4–13.

Liu, H., Bartonova, A., Pascal, M., Smolders, R., Skjetne, E., and M. Dusinska. 2012. Approaches to integrated monitoring for environmental health impact assessment. *Environmental Health* 11:88.

Nouri, J., Khorasani, N., Lorestani, B., Karami, M., Hassani, A.H., and N. Yousefi. 2009. Accumulation of heavy metals in soil and uptake by plant species with phytoremediation potential. *Environment and Earth Science* 59:315–323.

Pandey, R., Shubhashish, K., and J. Pandey. 2012. Dietary intake of pollutant aerosols via vegetables influenced by atmospheric deposition and wastewater irrigation. *Ecotoxicology and Environmental Safety* 76:200–208.

Sudbury Area Risk Assessment (SARA) Group. 2005. Sudbury Area Risk Assessment. Volume II, Chapter 5, p. 5-40 to 5-41.

Surdu, S., Fitzgerald, E.F., Bloom, M.S., Boscoe, F.P., et al 2013. Occupational exposure to arsenic and risk of nonmelanoma skin cancer in a multinational European study. *International Journal of Cancer* 133:2182–2191.

World Health Organization (WHO). 1948. Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19 June – 22 July 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100) and entered into force on 7 April 1948. http://whqlibdoc.who.int/hist/official_records/constitution.pdf

4. Conclusion

The CEA Agency describes environmental assessment as:

“[A] process to predict environmental effects of proposed initiatives before they are carried out.

An environmental assessment:

- *identifies* potential adverse environmental effects;
- proposes measures to mitigate adverse environmental effects;
- *predicts* whether there will be significant adverse environmental effects, after mitigation measures are implemented; and
- includes a follow-up program to verify the accuracy of the environmental assessment and the effectiveness of the mitigation measures.” *(emphasis added)*

As CCNB made clear during its earlier review of the EIA Report for the Project, the Proponent had not provided enough information (e.g., missing baseline studies) to properly identify the Project’s effects. Important information regarding mitigation measures, such as the design of the water treatment plant, was also missing. As such, the CEA Agency’s first and second described purposes of an EA had not been met for the Project. The third purpose could not be met at the EIA Report stage because without complete (or reasonably complete) information on the Project’s impacts and mitigation measures it was impossible for the proponent to accurately predict the significance of the Project’s adverse environmental effects. As we also discuss, good EA practice does not allow adaptive management to be used in place of good baseline data.

CCNB’s review of the CSR for the Project has shown that little has changed since the EIA Report stage. Vital information regarding baseline environmental conditions, impacts of the Project, and mitigation measures continues to be missing. Without this information, CCNB does not understand how the CEA Agency could consider the CSR ready to be written or reach its conclusion that the Project is, except for impacts on First Nation’s peoples, not likely to cause significant adverse environmental effects.

We agree with the CSR’s conclusion that the Project will have significant adverse environmental effects on Maliseet First Nations. However, it is CCNB’s position that “negotiations to accommodate” are not adequate mitigation of these effects. The CSR should not have been concluded until the outcome of these negotiations was known.

CCNB’s has also shown that the CSR’s review of the described “Need for” the Project is also flawed. Simply put, the need for the Project cannot be met and as such the Project should not be allowed to proceed.

For all of the above reasons, it is the position of CCNB that the conclusions of the CSR cannot be supported. Instead the CEA Agency should have 1) concluded that there is no need for the Project and that it is likely to cause significant adverse environmental effects, and 2) recommended that the Project not be allowed to proceed.

5. About CCNB and its Participation in the Review of the EA for the Sisson Project

Since 1969, the Conservation Council of New Brunswick has worked for the protection of the environment in New Brunswick, Canada, and globally. Today, CCNB works to conserve our natural resources, air, land and water through education, networking, publishing, and collaboration with all sectors of civil society. We feel the proposed Project will impact local and regional air, soil, water quality, and wildlife habitats. Given CCNB's mandate and purposes, we are greatly concerned about these potential impacts. We are interested in this environmental assessment because we believe the process, if done properly, will help further sustainability in New Brunswick, which will in turn assist CCNB in fulfilling its mandate.

The Conservation Council of New Brunswick is a membership-based charitable organization that has been at the forefront of environmental action in New Brunswick. Its work is carried out by a small staff and volunteers under the direction of a Board of Directors drawn from all regions of the province. Over the years, the organization's work has led to the clean-up of the St. John River, the wholesale removal of leaking underground gasoline storage tanks, the environmental regulation of drinking water supplies and salmon aquaculture, the legal protection of salt marshes and action on environmental clean-ups, acid rain, climate change, energy efficiency, and sustainable resource management such as forestry and mining. In 1991, the Conservation Council of New Brunswick was appointed to the Global 500 Honour Roll by the United Nations Environmental Programme.

Appendix A – Excerpt from CCNB October 2013 report on Project EIA report, re: Benefit to Canadians

3.2 EIA Report Section 1.3.6 Benefits to Canadians

With respect to the issue of the benefits to Canadians, the Final Terms of Reference (TOR) for the Sisson Project required to proponent to do as follows (at TOR p. 26):

2.2.2.10 Benefits to Canadians

The Proponent should describe how Canadians benefit from the project planning and information gathering process undertaken by the Proponent as part of the environmental assessment. Factors to be considered may include the following.

- Maximized environmental benefits: Describe the environmental benefits created as a result of the project going through the EA process.
- Contribution of the EA to support sustainable development: Describe how the EA process for the Project contributed to the concept of sustainable development for a healthy environment and economy.
- Public Participation: Describe how public participation in the EA influenced the Project design and the environmental effects analysis.
- Technological innovations: Identify any new technologies that were developed to address environmental effects that could be used for other projects.
- Increases in scientific knowledge: Describe any new scientific information collected through the EA that could benefit the assessment of other projects.
- Community and social benefits: Describe any changes in Project design that resulted in indirect benefits to communities and/or social benefits (e.g., enhanced access to wilderness areas for recreation).

The EIA report's treatment of this requirement is superficial at best. This EIA section, one page in length, is cursory and references only general and generic benefits. For example, no specific or concrete examples of modifications, input from Aboriginal peoples, local communities or stakeholders are given. No specifics about any meaningful contributions to scientific knowledge are given. If more detail is provided elsewhere in the EIA report about how the proponent's project planning has benefited Canadians, such as EIA sections discussing consultation for example, then this should be made clear in Sec. 1.3.6. Concrete examples of how the preparation of an EIA report can modify a project can be found in the Comprehensive Study Report for the Kitsault Mine Project, e.g., "The NLG and Aboriginal groups identified that the current decline of the moose population in the Nass Area could potentially be affected by the Project. Because moose are of high value ecologically, culturally and economically, the proponent, with input from the NLG and Aboriginal groups, developed mitigation measures to address the potential effects on moose along the Nass FSR." (CEAA 2013 at p. 105)

Appendix B – Excerpt from CCNB October 2013 report on Project EIA report, re: main problems of EIA Report

1.4 Five significant shortcomings of the EIA report

CCNB Action's reviewers identified many ways the EIA report needs to be improved. However, after CCNB Action's own review, after reading our experts' reports and discussing the EIA report with them, and hearing from the public, CCNB Action has identified five overarching "themes" about the inadequacy of the EIA report. (Many of these same concerns were raised during the federal review panel's hearing for the EIA report for the New Prosperity Mine in B.C., an HDI (the partner of Northcliff Resources in the Sisson Project) project (see **Appendix F** of this report)).

1.4.1 The EIA report is fundamentally incomplete

There are many examples of how the Sisson Project EIA report is incomplete and as such needs to be revised before any further consideration of approving the project can take place. Some of the most glaring and vital are discussed below.

1.4.1.1 Acid Base Accounting for many potential sources of metal leaching and acid rock drainage were not complete at the time the EIA report was written

Metal leaching and acid rock drainage are two of the biggest and most obvious environmental effects of a metal mine. The assessment of these effects is fundamental to understanding the impacts of the Sisson Project. As such, they should have been top of mind when it came to completing the EIA report. Clearly they were not as the SRK 2013 ML/ARD Potential Characterization Report was not completed until August 2013, while the EIA report was submitted to the Agency on July 31, 2013. How any work or information from the ML/ARD report could have been included in the EIA report is unclear.

Further to this point, even the acid base accounting work in the ML/ARD report is incomplete. For example:

- **SRK ML/ARD Sec. 3.5:** "Additional overburden sampling is planned as part of geotechnical investigations in early fall 2013 and acid-base accounting analyses will be performed at that time."
- **SRK ML/ARD Sec. 4.5:** "Additional geotechnical investigations are planned for the fall of 2013 and ARD characterization is expected to occur at that time."

"Additional work will be required to understand the mobility of arsenic from overburden. These studies are planned for the fall of 2013. "

Regarding ML/ARD, the Terms of Reference for the EIA Report required that:

The discussion of ML/ARD should demonstrate that Northcliff has the necessary understanding, site capacity, technical capability and intent to identify, avoid, mitigate and/or manage ML/ARD in a manner which protects the environment through the life of the mine and after closure of the mine.

Given the proponent's cavalier treatment of the issue of ML/ARD in the EIA report, it is clear Northcliff has done none of this.

1.4.1.2 Details and statements regarding seepage from the tailings storage facility are either lacking or unsupportable

At pages 7-79 and 7-80, the EIA report states:

7.6.2.2.1.3 TSF Embankment Drainage and Seepage Collection

Steady-state seepage analyses were completed using the finite element computer program SEEP/W to estimate the amount of seepage through the TSF embankments. It was assumed that a portion the embankment drainage and seepage will be captured by the embankment seepage collection system or intercepted and collected by groundwater pump-back wells downstream of the TSF. A small fraction of the total seepage was assumed to bypass the seepage collection systems and be lost to the environment downstream of the TSF.

Nowhere in the EIA report or supporting studies are the results of these analyses or actual rates of seepage provided. What is a "small fraction" is not quantified. Evidence that this information is not shared with the public or decision-makers can be seen in EIA report Figure 3.4.9 (at page 3-124) "Schematic of Mine Operational Water Balance". The legend figure states the source of the figure is Samuel Engineering 2013. However, closer inspection shows the figure was supplied on March 27 to the proponent by Knight Piesold. While similar, Samuel Engineering did not use this figure. Rather, this figure comes from the reference Knight Piesold 2013b. (Sisson Project – Feasibility Study Monthly Operational Water Balance. Prepared for Northcliff Resources Ltd. dated March 27, 2013.) This Feasibility Study was not placed on the CEAR website for this project.

Dr. Chambers (CSP2) 1-2 highlights the need for this information:

It is noted in the Knight Piesold Baseline Hydrogeology Report that:

- "● Till: Surficial geology mapping has identified basal and ablation tills up to about 10 m in the project area. The till is comprised of varying composition of sand, silt, gravel and clay. The ablation till may be more permeable than the basal till.
- Shallow, weathered bedrock: The presence of this zone in the upper 10 m to 20 m of rock is based on regional mapping as well as drilling in the project area."

With up to 10 m of till, potentially on top of fractured bedrock that could be an additional 20 m in depth, the likelihood of seepage under the starter (and fully constructed) tailings dam seems probable in some locations.

1.4.1.3 Hydrometeorology data is missing or seemingly ignored

- **Baseline Hydrometeorology Report Sec. 6.0:** A reasonable amount of hydrological and meteorological data has been collected at the project site. However, periods of limited or missing data exist within the records. The most notable of these is the lack of winter precipitation data at the Sisson climate station, as well as limited May freshet runoff data and

winter discharge data. It is therefore suggested that ongoing data collection be continued and that the estimated values in this report be reviewed and updated once additional data become available.

- **Baseline Studies: KP hydrogeology Sec. 4:** The rate of groundwater recharge was estimated as about 8 % of the MAP (1350 mm) based on a watershed model for the project that was calibrated to regional streamflows at Narrows Mountain Brook (KP 2012e). The regional stream flow data currently provides the best approximation of the long-term distribution and volume of flow at the site. As additional precipitation and streamflow measurements (especially low flow measurements) are collected on site, the modelling work may be revised to use site data for calibration. Short warming periods in the winter result in a component of the winter snowmelt and therefore winter low flows may reflect both surface runoff and groundwater discharge.

This flow condition observed during this packer test indicates that the higher take is likely not indicative of the bulk permeability of the test interval. Given the uncertainty with the high take tests, the following was recommended:

- Identify the packer tests as high take without assigning an actual hydraulic conductivity value, until there is greater certainty regarding the validity of the testing.
- If required, carry out additional and more than one type of hydraulic testing (e.g. constant head, falling head, lugon) to better constrain whether the high take results are indicative of the site conditions or were influenced by the testing tool or method.
- Recognize the implications of potentially high hydraulic conductivity values within the deposit area on engineering and environmental studies until additional testing is completed to gain a better understanding of the hydraulic conductivity values.

From the above quote, it appears as though the proponent chose to ignore results it didn't like and wait for better data. There is no evidence that further testing was done to determine the mine site's hydraulic conductivity values and as such it is unclear how the proponent reached conclusions regarding the rate of groundwater flow for the project.

1.4.1.3 Understanding the toxicity of water released to Sisson Brook

In the EIA report, the water quality at a node for Sisson Brook is not discussed (at page 7-92) despite it being the receiving waters for the water from the TSF and later, open pit. Instead, the closest water quality node that is discussed is at Napadogan Brook 5 (NAP 5), which is below the confluence of Sisson and Napadogan Brook. At NAP 5, the toxicity of Sisson Brook is diluted by Napadogan Brook, thereby not providing the public and decision-makers of what is the final water quality of Sisson Brook. This information is key if we are to understand the impacts of the project on water quality and fish and fish habitat.

The failure to discuss a water quality node at Sisson Brook provides another example of the poor quality of the background work done for the EIA report. The Predictive Water Quality study treats NAP 5 as an effluent discharge point. For example (at Predictive Water Quality Study page 5):

Beginning in Year 8, 6,000,000 m³/yr of excess water from the TSF is pumped to a water treatment plant (WTP) and discharged post-treatment to Napadogan Brook at the confluence with Sisson Brook. The WTP discharge rate is generally proportional to the baseline hydrograph

of at the point of discharge. The discharge is further reduced during low flow months in late summer and mid-winter.

Everywhere else in the EIA report it is made clear that water will be discharged to Sisson Brook. Why the Predictive Water Quality Study used a different discharge is unclear. This lack of consistency results in vital information being lost to the EIA report.

Finally, the proponent's assertions that it will do future work to address gaps in data and analyses are not in keeping with the Agency's own guidelines regarding the completion of an EIA report:

"A commitment to implementing adaptive management measures does not eliminate the need for sufficient information regarding the environmental effects of the project, the significance of those effects and the appropriate mitigation measures required to eliminate, reduce or control those effects. Where additional information collection or studies are needed over the life-cycle of the project, such studies in themselves should not be considered "mitigation measures"." (CEA Agency's 2009 Operational Policy Statement, *Adaptive Management Measures under the Canadian Environmental Assessment Act* at page 4, emphasis added)

The spirit of the 2009 OAP is that EIAs are not complete until all necessary baseline data is collected. Without this, the effects of a project cannot be fully assessed.

Recommendation:

- That the CEA Agency require the proponent to revise the EIA report to address all the concerns identified by CCNB experts and in this report.

1.4.2 No economic cost-benefit analysis

Common sense tells us that large open pit mining operations that dig up acid generating and metal leaching rock, emit contaminated dust, destroy the headwaters of clean and ecologically important rivers, fragment terrestrial landscapes, and have massive tailings ponds and dams, cause harm to the environment. These negative environmental effects also impact communities located near these mines. If these impacts and harm are significant, then these projects should not be approved by the public and environmental assessment decision-makers. However, sometimes they are when it is believed the economic benefits of a mine outweigh or justify the damage it causes to the environment and communities. Implicit in these decisions though is that the economic benefits of a mine are large enough to outweigh its environmental and social costs.

As has been detailed by Dr. Moir (see Section 2.9 below), without a cost-benefit analysis we don't have an accurate picture of the economic benefits, if any, of the Sisson Project. As Dr. Moir notes, the use of an economic impact model, like the one used by the proponent, for a different project showed that the project created a positive economic benefit, while using a true cost-benefit analysis showed this same project generated a negative economic loss to the community. Therefore, without an economic cost-benefit analysis for the Sisson Project, the public and decision-makers cannot make an informed decision about whether the economic benefits of the project justify the damage it will cause to the environment. Making this determination becomes even more difficult when the true closure costs of the Sisson Project are not known.

Recommendations:

- In consultation with Dr. Moir, have the proponent prepare an economic cost-benefit analysis for the Sisson Project for inclusion in a revised EIA report.
- Have the proponent provide a fully costed estimate of the long term closure costs of the Sisson Project for inclusion in a revised EIA report.

1.4.3 No assessment of the failure of the tailings dam

As will be detailed more fully below, and as much as the proponent would like this fact to go away, tailings dams fail! The failure of the Sisson tailings dam could release millions of tonnes of tailings and millions of cubic metres of supernatant water into the ecologically valuable Nashwaak watershed. While understated, the EIA Report does recognize the harm such a failure would cause. “At Sisson, a failure of the TSF embankment and resultant tailings or process water release could significantly affect downstream watercourses and habitats that have substantial ecological and societal value ...” (EIAR page 3-25, emphasis added). Despite a tailings dam failure posing the project’s biggest acute threat to the environment, the proponent chose not to assess its impacts.

8.17.2.1.1 Loss of Containment from Tailings Storage Facility (TSF)

“With the application of these standards and rigorous construction methods to ensure the structural integrity of the TSF embankments and components, the implementation of adaptive management measures as necessary over the life of the mine, and the legislated regulatory oversight, the possibility of a structural failure of a TSF embankment is so unlikely that it cannot reasonably be considered a credible accident or malfunction, and is thus not considered further in this EIA Report.” (EIAR page 8-698, emphasis added)

In his review of the EIA report for the Sisson Project (see Section 2.5 below), Dr. Chambers, who has 20 years of experience as an advisor on the environmental effects of mining projects both nationally and internationally, clearly explains why the above thinking is flawed.

This is the first time I have seen this glaringly overconfident statement made in an EIS/EIA.

In the 10 years since the ICOLD 2001⁸ report the failure rate of tailings dams has remained at roughly one failure every 8 months (i.e. three failures every two years).⁹ These dam failures are not limited to old technology or to countries with scant regulation. Previous research pointed out that most tailings dam failures occur at operating mines, and that 39% of the tailings dam failures worldwide occur in the United States, significantly more than in any other country.¹⁰

Tailings dam failure is a low probability event, but also an event with high consequences. These consequences have never been ignored in any other EIS/EIA I have reviewed. To in essence

⁸ Tailings Dams, Risk of Dangerous Occurrences, Lessons Learnt from Practical Experiences, Bulletin 121, International Commission on Large Dams, 2001.

⁹ Data from <http://www.wise-uranium.org/mdaf.html> “Chronology of major tailings dam failures” as of March 22, 2011.

¹⁰ Reported tailings dam failures, A review of the European incidents in the worldwide context, M. Rico, G. Benito, A.R. Salgueiro, A. Díez-Herrero, H.G. Pereira, Journal of Hazardous Materials 152 (2008) p. 848.

assert that ‘my engineering’ could not possibly fail, in light of existing statistics, is arrogantly assuming that it is always the other guy (or gal) that will make a mistake – but not me. This is exactly the attitude that leads to accidents – as has been proven many times in the aviation world. (emphasis added)

Recommendation:

- Have the proponent complete a detailed environmental effects analysis of the failure of the tailings dam for the Sisson Project for inclusion in a revised EIA report. The assessment would include a modeling of the most likely worst case disaster scenario for such a failure describing, for example, the toxicity of the tailings and supernatant water, how much tailings and supernatant water would escape from the tailings storage facility, how far and to what depth the tailings and supernatant water would travel downstream, and what damage this would cause to communities in the watershed and the environment, including Atlantic salmon habitat, and for how long.

1.4.4 The closure plan is missing significant details

Several CCNB Action reviewers discussed the serious deficiencies of the proponent’s closure plan. Mines with acid rock drainage and metal leaching leave long term environmental liabilities that must be managed. Without an understanding of the long term future environmental, social, and economic costs of the Sisson Project, we cannot make a fair determination of whether the project is sustainable, i.e., does it meet the needs of today without damaging the opportunities of future generations. Several of the key deficiencies of the closure plan are discussed below.

1.4.4.1 There is no accurate description of how much contaminated water will have to be managed after closure

The EIA report first states “the TSF will have approximately 2 million m³/year of surplus water starting at about Year 8” (EIAR page 3-123). It then reports, “Approximately 6 million m³/year of TSF pond water will be pumped to the WTP during Operation starting in Year 8 under average conditions” (EIAR page 7-80). Finally, the SRK (2013) Metal Leaching and Acid Rock Drainage Potential Characterization then describes in Appendix I (conceptual water treatment plant design) that the TSF, and after closure, the open pit will have an annual discharge of 1,280 m³/hr (or 11 million m³/year). This wide variation in water that will have to be treated after closure is never explained.

1.4.4.2 There is no accurate description for how long contaminated water will have to be managed after closure

The EIA report provides no details about how long post-closure that water will need to be treated, only that it will be treated for “as long as necessary” (EIAR page 143). Is this 1 year, 10 years, 100 years, or more? This is not an idle question, for as Mr. Parker points out (Section 2.10 below), we already have closed mines in New Brunswick whose waste water requires long-term treatment. The lack of detail in the EIA report obviously does not assist in decision-making about the project.

1.4.4.3 Significant details about the conceptual water treatment plant are missing

The water treatment plant (WTP) is the key component of the closure plan for the mine, yet it is not described in any detail in the actual EIA report. Without the WTP, the environmental effects of the

project post-closure on the aquatic environment will not be mitigated, in turn increasing their significance. Given the limitations of the conceptual design for the WTP, at present there is *no water treatment plant* for the Sisson Project. As the SRK 2013 report states:

In the event that water treatment for sodium or fluoride is required ... then the water treatment process proposed here will not be adequate. (SRK 2013 Appendix I, emphasis added)

The EIA report shows (at page 7-98) that post-closure, fluoride levels in water from the mine will be 2 to 3 times the CCME FAL guidelines (for the protection of aquatic life). The proponent can have no expectation that this continual exceedence, amongst others, will be permitted in the future. As a result, there is no actual plan for a WTP in the EIA report and a new conceptual WTP needs to be designed. The consequence of this is that any of the proponent's environmental effects analysis that relied on the existence of the flawed conceptual WTP must be redone, and if not redone, then without the mitigation of a WTP, the adverse environmental effects of the project on the aquatic environment must be considered to be significant.

1.4.4.4 The Terms of Reference regarding closure have not been met

At a minimum, the discussion of alternative means of carrying out the Project shall include a consideration of the following: ...

- alternative options for reclamation and closure. (TOR at page 22-23)

In response to this requirement, the EIA report (at page 3-77) states, "Northcliff has considered various options to achieve decommissioning, reclamation and closure of the Project site at the end of mine life." No details of these other options are provided. Clearly this is not enough information for the public and decision-makers to weigh these alternatives. It is also not in keeping with Environment Canada's 2011 *Guidelines for the Assessment of Alternatives of Mine Waste Disposal*:¹¹

The alternatives assessment should objectively and rigorously consider all available options for mine waste disposal. It should assess all aspects of each mine waste disposal alternative throughout the project life cycle (i.e., from construction through operation, closure and ultimately long-term monitoring and maintenance). (at page 7)

Recommendations:

- Any plan for the decommissioning and closure of the project should be completed at the mine-proposal stage, and certainly prior to permitting, to a sufficient degree to reasonably determine water treatment costs, i.e., how much water and what is in the water, reclamation costs, and assess the short and long term social, health, and economic impacts from the mine (including post-closure).
- Prior to permitting the proponent should identify what long term and permanent water quality treatment may be necessary at the mine site. This includes but not be limited to discharges from the pit (including from pit walls that will not be submerged and pit discharges to groundwater).
- Permanent treatment should be avoided. The closure plan should more fully evaluate this and identify alternatives to perpetual treatment.

¹¹ Available at: <http://www.ec.gc.ca/Publications/default.asp?lang=En&xml=5ECBCE8B-7E50-49E3-B7AD-8C21A575E873>.

1.4.5 Costs of closure are not explained

Regarding this issue, Dr. Chambers writes

If there is surplus pit water that will require treatment it is reasonable to anticipate that this treatment will be required in perpetuity - forever. That presents clear long-term liabilities and costs to the Crown, Province, and public. These liabilities and costs should be fully evaluated and discussed ... (Section 2.5 below).

Similar concerns are raised by Dr. Curry (Section 2.4), Dr. Moir (Section 2.9), Mr. Parker (Section 2.10), and Mr. Hart (Section 3.0 Sustainability).

The proponent provides no details about how it arrived at a figure of \$50 million to cover the costs of decommissioning, reclamation, and closure of the project. In addition, all of the above reviewers believe this amount to be very inadequate for a project of this size. The average operational costs of water treatment for mines are estimated to be \$1.54 per m³.¹² Accepting the proponent's figure of the project having 6 million m³ of surplus water/year, one arrives at roughly \$9 million/year being required to treat this water. The proposed \$50 million would be depleted in less than 6 years, without including reclamation costs such as for revegetating the site.

Recommendation:

- Have the proponent provide a fully costed estimate of the long term closure costs of the Sisson Project for inclusion in a revised EIA report.

¹² Zinck, J. and W. Griffith. 2013. Review of Mine Drainage Treatment and Sludge Management Operations. MEND Project: 603054. Report: CANMET-MMSL 10-058(CR).

Appendix C – Excerpt from CCNB October 2013 report on Project EIA report, re: Experts' findings

1.3 Summaries of experts' main concerns about the EIA report

1.3.1 Summary of the reviewers' main comments about the EIA report: Atmospheric Environment

- Not enough data/information has been collected to say accurately what is the trace metal content of the ore, pit walls, waste rock, overburden, etc. Without this information, the types and amounts of air contaminants released by the project cannot be determined.
- Using the limited trace metal data that is provided in background studies for the EIA report, the reviewers calculate there is more arsenic in the project's ore than what is reported (EIA report = 41 mg/kg of arsenic; Reviewers = 64.8 mg/kg of arsenic).
- The use of 41 mg/kg of arsenic (vs. 64.8 mg/kg) in modeling for predicted air quality results in the under-estimation of the release of this contaminant. Also, the EIA report only uses arsenic concentrations from the ore in its modeling. This is the lowest concentration of arsenic for any of the potential pathways of air contaminants, other than soil. For example, the EIA report provides the mean arsenic concentration in the overburden as 143.3 mg/kg, which was not used in the report's calculation of trace metal air emissions. Arsenic concentrations are significantly higher in all emission pathways than the value used to estimate arsenic releases from the project.
- The drill core assays used to calculate trace metal content were not taken from random locations or locations that are representative of the entire mine site.
- Wind data provided in the EIA report does not reflect prevailing conditions and it was not collected from the highest point of the mine where tailings beaches will be located.
- Emissions of particulate matter (dust) from the site are under-estimated.
- The EIA report does not provide information on how much hydrogen sulfide and other pollutants the ammonium paratungstate (APT) plant will emit. Based on the reviewers' investigation of the predicted releases from an ATP plant in New York, it is clear the Sisson Project ATP plant will be a significant source of air pollutants.
- The Sisson Project will not contribute to the Canadian Council of Minister of the Environment's nationally-supported goal of "keeping clean areas clean".
- No environmental monitoring for future air quality is proposed for the project despite evidence that mines can release annually 5 to 30 times more dust than predicted in an EIA report.

1.3.2 Summary of the reviewer's main comments about the EIA report: Public Health

- The main concerns raised about the EIA report's section on the Atmospheric Environment are also applicable to the Public Health section. Additional concerns follow below.
- The most serious deficiency is that the EIA report did not evaluate the non-cancer health risk of the most common route of exposure to arsenic - ingestion of soil, water and food and dermal contact with soil. The human health risk assessment (HHRA) has incorrectly assumed that the health risks related to ingesting or inhaling arsenic are cancer-related only and that there are no toxicological reference values for non-cancer health effects via the oral or dermal route for adults or toddlers. As a result, the baseline (and project-related) human health risk assessment via ingestion of soil, water and food and dermal contact with soil has not been assessed for arsenic.

- The HHRA modeling domain is too small and does not cover the entire project Local Assessment Area (LAA). As a result, HHRA receptor locations in the community of Napadogan, and other locations at the edges of the LAA where people from Williamsburg, Currieburg, Boyds Corner, Fredericksburg and Stanley may spend recreation time, are not covered by the HHRA.
- Emissions of particulate matter and metals during the construction phase of the project and the potential seepage of metals from overburden piles during the construction phase have been excluded from the assessment.
- The Project + Baseline assessment of maximum acute and chronic human health risks from inhaling PM₁₀ emissions are incomplete and inaccurate.
- Particulate emission estimates during the operational phases of the project are significantly underestimated.
- Arsenic emission estimates during operational phases of the project are significantly underestimated.
- Sulphur dioxide (and other) emission estimates from the Project's ammonium paratungstate (APT) facility are significantly underestimated.
- Characterization of health risks for on-site workers are not reported or discussed.
- A sensitivity analysis of the HHRA results has not been done.
- Public and occupational health follow-up or monitoring will not be done.

1.3.3 Summary of the reviewer's main comments about the EIA report: Water Resources

- In spite of the fact that the analyses could benefit from some potential methodological improvements and specifications mentioned above, the assessments provided appear to be technically and scientifically sound. Some (probably small) risks associated with local, perhaps short term, changes in the hydrological budget and water routing for wetlands and aquatic life are scarcely treated.

1.3.4 Summary of the reviewer's main comments about the EIA report: Water Resources

- The EIA report is incomplete in many critical areas. For example, the EIA report was written before the all-important Metal Leaching/Acid Rock Drainage Potential Report (ML/ARD Report) was completed. The EIA report was submitted to the CEA Agency on July 31, 2013, while the ML/ARD was not completed until August 2013.
- This mine will need a water treatment plant (WTP) and this plant is the core of the mine's water management plan. However, the WTP is poorly described and the plans for it are not in the actual EIA report.
- The WTP was designed to deal with arsenic and antimony only, not the other many chemicals that will be in the tailings pond.
- Details for all water management at the mine site are not provided. For example, water management ponds are to collect and pump back any seepage or other surface water to the tailings pond. How will this be managed (e.g., secure pumping when required, overflow conditions) is not made clear in the EIA report.
- There are no plans to put a liner in the tailings pond to prevent seepage. Tailings pond seepage is a major source of acid rock drainage.
- Models used by the proponent do not model natural variability. The proponent uses averages where it has some information, yet the proponent knows and discusses variability in several places. Confidence limits are best estimated to be +/- 100% of the average.

- The EIA report speaks to potential outcomes, but gives no probability values of such as would be expected in an objective report on such an operation. Where risk is presented, it is consolidated into just a few categories. These risks are also the proponent's "judgment"; probabilities (%) need to be presented.
- There is no adequate proposal of environmental funding to deal with the water issues for such massive landscape features of the open pit and TSF post-operations. \$50M may clean up the site (no details are provided for how this figure was arrived at), but it will never come close to handling the volumes of water in perpetuity.
- A breach of the tailings dam is not assessed in the EIA report. Although the chances of such may be small, they are not insignificant, and the impacts of such a breach on downstream water quality could be catastrophic. This needs to be assessed.

1.3.5 Summary of the reviewer's main comments about the EIA report: Aquatic Environment

- The main concerns raised about the EIA report's section on Water Resources are also applicable to the Aquatic Environment section. Additional concerns follow below.
- Not enough basic field work was done and where done, not always interpreted properly.
- Atlantic salmon in the St. John River are soon to be an endangered species and the Nashwaak River is officially recognized as the critical river for their survival, yet there is no planning for the risk of loss if any/some/all of the water management plans fail.
- The toxicity of water releases from the tailings pond to Sisson Brook has not been addressed fully.
- The EIA report says that fish habitat loss will be compensated by the removal of the Lower Lake Dam. The proponent has been told repeatedly by locals and scientists that this is not needed and as such it should not be proposed as the most likely habitat compensation scenario.
- A breach of the tailings dam is not assessed in the EIA report. Although the chances of such may be small, they are not insignificant, and the impacts of such a breach on downstream water quality could be catastrophic. This needs to be assessed.

1.3.6 Summary of the Center for Science in Public Participation's (CSP2) main comments and recommendations on the EIA report and proposed mine plans

Note: CSP2 submitted their comments on the project directly to the Agency on October 7, 2013, and are reproduced in Section 2.5 below for convenience.

- Regarding design of the tailings storage facility (TSF), CSP2 recommends *"A more sound approach in terms of controlling seepage would be to remove the native soils for use in reclamation, and to compact the remaining material to a specified density."*
- CSP2 raises concerns about how the tailings dam response to earthquakes has been modeled. They recommend *"If pseudo-static modeling was used to test for seismic stability, then a numerical model should be used to test the dam under seismic loading."* Their reason for this recommendation is that "It is especially important that dynamic modeling be performed since the dam design has incorporated a modified centerline-type construction (which has an upstream-type component built on seismically unstable tailings). Today, few US regulatory agencies accept pseudostatic methods for seismic design of new dam projects."
- Regarding the issue of alternatives for the design of the tailings dam, CSP2 states, "The EIA does not explain whether the use of cycloned tailings for dam construction, which would probably require downstream-type construction, would provide better seismic stability than for the modified

centerline design chosen as the preferred alternative.” It subsequently recommends *“It would be appropriate to have a full explanation of why a modified-centerline rockfill dam is better than a downstream dam constructed of tailings.”*

- Like other reviewers, CSP2 discusses the incompleteness of the acid base accounting for the project: *“The overburden should be sampled for sulfur and carbonate to insure that no acid drainage will emanate from the overburden.”*
- The EIA report is not clear about how much surplus water will need to be treated. “The TSF will have approximately 2 million m³/year of surplus water starting at about Year 8.” (p.3-123) and; “Approximately 6 million m³/year of TSF pond water will be pumped to the WTP during Operation starting in Year 8 under average conditions.” (p. 7-80) This is a discrepancy of 4 million m³/year.”
- Like other reviewers, CSP2 discusses the cost of future water treatment. “... the volumes possible at Sisson Brook could require a financial surety in the \$100’s millions. ... By failing to declare, whether through lack of information or analysis, it must be assumed that a financial surety for water treatment in perpetuity needs to be established. However, the financial analysis of this outcome is also not addressed in the EIA. Because of the financial risk it places on the public, this is a major omission in the EIA.”
- CSP2 is particularly critical of the EIA report’s failure to assess the impacts of a tailings dam breach. “Tailings dam failure is a low probability event, but also an event with high consequences. These consequences have never been ignored in any other EIS/EIA I have reviewed. To in essence assert that ‘my engineering’ could not possibly fail, in light of existing statistics, is arrogantly assuming that it is always the other guy (or gal) that will make a mistake – but not me. This is exactly the attitude that leads to accidents...”
- Regarding the proponent’s plan for quarterly water quality monitoring, CSP2 states “Quarterly monitoring is not adequate to capture surface water variations. Weekly sampling is typical at most mines.”
- “The [Conceptual Decommissioning, Reclamation and Closure Plan] should be completed at the mine-proposal stage, and certainly prior to permitting, to a sufficient degree to reasonably determine water treatment costs, reclamation costs, and assess the short and long term social, health, and economic impacts from the mine (including post-closure).”
- The CSP2 review contains other recommendations, such as those dealing with groundwater monitoring, determining the cost of the closure bond, and steps for reclaiming the site.

1.3.7 Summary of the reviewer’s main comments about the EIA report: Terrestrial and Vegetated Environments

- Overall, sampling for wildlife other than birds is inadequate.
- From the bird surveys done, there are several Threatened Species in the project area whose protection needs to be addressed before the project proceeds: Common Nighthawk, Olive Sided Flycatcher, and Canada Warbler.
- The EIA report does not discuss the importance of insects to the ecosystem and makes no mention of rare butterfly species such as the early hairstreak, hoary elfin and hoary comma.
- How the project will affect the national recovery strategy for long eared bats (*Myotis* spp.) is not discussed in the EIA report.
- The impacts of habitat fragmentation are downplayed in the EIA report, especially when one considers the cumulative impacts of human activity in that area, the overall declining health of the Acadian forest type in New Brunswick, and the large vegetated area that the project is impacting.

- The project's impacts on lynx cannot be rated as "not significant" when no numbers are provided about how many lynx may die because of the project and the number of lynx in NB is not provided.
- The EIA report fails to acknowledge how the cumulative environmental effects of the project will contribute to deforestation and forest degradation at a time when the diversity of the Acadian forest should be restored.
- The EIA report fails to describe the potential effects of ecosystems and changes in the biota of terrestrial and freshwater ecosystems as a result of climate change in the future.
- The EIA report fails to develop a systematic approach to documenting how the project's environmental effects, such as to the atmospheric or aquatic environment, overlap with, and consequently impact on, candidate protected natural areas (PNAs). Many of the project's environmental effects will travel outside of the 1.5 km local assessment area chosen by the proponent to predict the impacts of the project on candidate PNAs.
- The EIA report does not assess the economic benefits of candidate PNAs as economic alternatives to the project, or the impact of PNAs as part of the environment's impact on the project.

1.3.8 Summary of the reviewer's main comments about the EIA report: Wetland Environment

- There is an over reliance on adhering strictly to the current provincial wetlands management policy which (as the proponent clearly states) does not regulate a large proportion of wetlands in the project development area, the local assessment area, and the regional assessment area. This leads to an underestimation of impacts due to a lack of requirements for compensation for this loss and an underestimation of the cumulative impacts, particularly when considered with future forestry activity which has the most impact on the unregulated wetlands (forested wetlands).
- The proponent does not go into detail about their proposed wetland compensation approach for mitigating the loss of wetlands functions of government regulated wetlands.
- The proponent relies heavily on future work to identify compensation measures. With a lack of detail it is impossible to comment on such things as watershed thresholds for wetland function loss and appropriate compensation to reflect the watersheds thresholds. This modeling should be undertaken.

1.3.9 Summary of the reviewer's main comments about the EIA report: Labour and Economy

- The EIA report is only dedicated to describing the economic benefits of mine, not its costs.
- The reviewer questions the use of an economic impact model (EIM) used to calculate the benefits of the project. Under EIMs, all expenditures by the project are a benefit. This includes the money spent to clean-up spills and floods of tailings.
- Even if one accepts the use of an EIM in the EIA report, the economic benefits of the mine have likely been over-estimated.
- A traditional cost-benefit analysis should have been used to improve our knowledge about the economic impacts of the mine.
- No details are provided about how the \$50 million in closure costs were estimated. The reviewer believes this amount to be a serious under-estimation.
- Based on the proponent's sensitivity analysis, the reviewer states that mineral price movements, especially in the price of APT, will have a significant effect on the viability of this project. He also notes that current prices for molybdenum are far below the proponent's assumed price of \$15/lb.

1.3.10 Summary of the reviewer's main comments about the EIA report: comparing the project to other mines

- From the parts of the EIA report the reviewer read, it is his view that overall the EIA report was very thorough and quite well done. He did raise some concerns about the project's plans for water management and the tailings storage facility (TSF). These follow below.
- A condition for allowing the project to proceed should be the requirement of a detailed plan to deal with emergencies such as a power failure, a pump(s) malfunction, and excessive precipitation.
- The EIA report does not provide a description of the spillway on the TSF or describe the design criteria for that spillway.
- It is not clear from the EIA report whether all of the water management components (WMP, pumps, pipes, and spillways) are designed to deal with these types of extreme rainfall events.
- Annual or at a minimum biannual inspections should be carried out to ensure the integrity of the dams surrounding the TSF versus the five year inspection period proposed by the proponent.
- It is not clear to the reviewer whether \$50 million is adequate to properly close the mine.
- The reviewer notes that very few mines commence operation and run uninterrupted for the predicted full operational life of the mine. Metal prices, technical problems and labour disputes can all result in temporary or premature closure of a mine. This issue is not discussed in the EIA. The reviewer asks that should an interruption in production occur, how will that affect the water management plan, the operation of the TSF and the treatment of the waste water?

1.3.11 Comments on the failure of the EIA Report to address Need for and Sustainability of the Project

- The business case for the mine is weak, therefore the proponent has failed to demonstrate a clear need for the project in its basic purpose – supplying tungsten.
- The EIA report does not explain how the project supports sustainable development today and meets the needs of future generations.
- The proponent's, Northcliff Resources, relationship with HDI is unclear, i.e., it seems as though HDI is the proponent. Other environmental assessments have raised serious concerns about the quality of the EIA reports for different HDI projects, such as the Prosperity Mine in BC.