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CS 02 005 NU

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Ms Stephanie Briscoe
Executive Director
Nunavut Impact Review Board
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Re: Doris North Gold Mine Project Final Environmental Impact Statement

Dear Ms. Traynor and Ms. Briscoe:

At your request, scientists from Health Canada have reviewed the "Final Environmental Impact Statement – Doris North Project" submitted by Miramar Hope Bay Ltd. (November 2003). The focus of these comments is on whether this FEIS conforms to the Nunavut Impact Review Board's Pre-hearing Decision of June 12, 2003, as well as the Environmental Assessment Guidelines for this project (October 2002), with respect to human health concerns.

Air Quality Assessment

The FEIS fails to explicitly examine the effects of the change in air quality on human health, including occupational health and safety. Therefore, the FEIS does not conform to guideline 4.21.2.2. It is not sufficient to acknowledge the possibility of health effects due to air emissions, as is done in the FEIS p. 5-10. More information is needed on the linkages between air quality, the environment, and human health, as required by the guidelines. Furthermore, the information in supporting document B3 is inadequate because the "modelling results have been presented excluding the 4.6 ha area enclosing the camp site and ore processing facilities" (B3, p. 30). This is unacceptable, as this 4.6 ha area is where mine workers will be exposed to emissions. Modelling results for the mine site must be presented in order to examine the potential health effects of the project's air emissions.

The mitigation measures described for air quality effects (specifically, to address the exceedance in the PM_{10}) are also insufficient, as is the monitoring plan described. An explanation is needed for reducing monitoring for 24-hour average values of total suspended particulate (TSP) from every three days to every six days during the operation of the mine, particularly given PM_{10} levels are expected to pose a human health risk.

MHBL comment:

The accepted practice for assessing air quality effects associated with mining developments is to exclude the predictions within the active mining areas; recent assessments completed in the North have excluded the predicted concentrations within their mineral leases. In contrast, the modelling completed for Doris North only excluded predictions within a 4.6 ha area that enclosed the camp site and ore processing activities (the processing area). This approach is more restrictive that the approaches used on other mining applications in the North. However, to respond to the concerns raised by Health Canada, we provide data below that presents both the predictions outside the 4.6 ha processing area, as well as the maximum predictions within the processing area.

Compound	Maximum Predictions		Guidelines or Criteria	
	Outside Processing Area	Within Processing Area	Environmental	Occupational
1-hour SO_2 [µg/m³]	304.3	150.3	450	—
8-hour SO_2 [µg/m³]	104.2	44.7	—	5,239
24-hour SO_2 [µg/m³]	56.0	23.6	150	—
annual SO_2 [µg/m³]	6.6	4.0	30	—
1-hour NO_2 [µg/m³]	334.7	235.1	400	—
8-hour NO_2 [µg/m³]	209.1	175.2	—	5,643
24-hour NO_2 [µg/m³]	159.4	152.8	200	—
annual NO_2 [µg/m³]	73.4	76.6	100[(a)]	—
24-hour TSP [µg/m³]	89.3	73.6	120	—
annual TSP [µg/m³]	12.7	24.6	60	—
8-hour PM_{10} [µg/m³]	103.1	87.8	—	10,000
24-hour PM_{10} [µg/m³]	85.9	72.5	50	—
annual PM_{10} [µg/m³]	8.2	13.3	60	—
8-hour $PM_{2.5}$ [µg/m³]	92.2	82.0	—	3,000
98th percentile 24-hour $PM_{2.5}$ [µg/m³]	26.5	21.6	30	—
annual $PM_{2.5}$ [µg/m³]	6.4	8.6	15	—

(a) The federal acceptable objective for annual NO_2 is 100 µg/m³, and is defined as providing adequate protection for personal comfort and well-being. The annual desirable object for NO_2 is 60 µg/m³.

With the exception of the annual NO_2 and 24-hour PM_{10} predictions, all predicted ground-level concentrations, both outside and inside the processing area, comply with the relevant guidelines and criteria. Since the air quality guidelines have been established to afford adequate protection to the environment and public health, no further health assessment was deemed necessary for SO_2, 1-hour and 24-hour NO_2, TSP, $PM_{2.5}$ and the annual PM_{10}.

With respect to the highest annual NO_2 predictions of 73.4 µg/m³ (outside the processing area) and 76.6 µg/m³ (inside the processing area), these values only exceed the federal desirable objective of 60 µg/m³. The maximum annual NO_2 concentrations are all below the federal acceptable objective of 100 µg/m³. For context, the federal acceptable objective is defined as being "*…intended to provide adequate protection against adverse effects on soil, water, vegetation, materials, animals, visibility, personal comfort and well-being.*" (Federal-Provincial Advisory Committee on Air Quality 1987). Therefore, by the federal government's definitions, no health effects would be associated with the annual NO_2 predictions, which were below the level defined as providing adequate protection against adverse effects to personal comfort and well-being.

The conservative dispersion modelling completed for the Doris North Project also identified areas in the immediate vicinity of project operations where the 24-hour PM_{10} levels were predicted to exceed the 50 µg/m³ criteria established in British Columbia. A value of 50 µg/m³ is also being considered as a potential Canada-Wide Standards for PM_{10}. It should be noted that 24-hour PM_{10} concentrations in excess of 50 µg/m³ are predicted to be very rare, occurring no more than 1% of the time, even within the ore processing areas. It is also important to remember that the processing area would be restricted to operating staff. Therefore, we believe that occupational health and safety regulations are the appropriate criteria to use within the processing areas. The recommended occupational health and safety limit for inhalable particles (i.e., PM_{10}) is 10 mg/m³, or 10,000 µg/m³ (ACGIH 2003). None of the predicted PM_{10} concentrations at the Doris North site come close to approaching the occupational health and safety limits of 10,000 µg/m³. Also, occupational health and safety issues for workers at the Doris North Project will be further addressed as during the project permitting process.

Although not considered to be applicable for evaluating the potential air quality effects within active mining and processing areas, the Federal-Provincial Working Group on Air Quality Objectives and Guidelines (hereafter referred to as the Working Group) (Health Canada 1999) have developed reference levels for PM_{10} and $PM_{2.5}$ based on a statistical relationship between PM_{10} and $PM_{2.5}$ exposures and potential health effects determined from epidemiological studies. Health Canada (1999) indicates that each µg/m³ increase in PM_{10} greater than the reference level could result in an increase of 0.014 deaths per million people per day. For $PM_{2.5}$, Health Canada (1999) indicates that each µg/m³ increase in $PM_{2.5}$ greater than the reference level could result in an increase of 0.026 deaths, 0.0118 hospital respiratory-related admissions and 0.010 cardiac related hospital admissions, all per million people per day.

This statistical relationship is based on epidemiological studies conducted in United States cities with populations far in excess of the expected project workforce and much higher PM_{10} and $PM_{2.5}$ concentrations than predicted at the Doris North Project. Therefore, it is uncertain whether the statistical relationships determined by Health Canada from these epidemiological studies are directly applicable to workers living at the Doris North camp. Since the request regarding potential health effects of PM_{10} has come directly from Health Canada, it seems reasonable to use this approach as a conservative evaluation of potential health outcomes.

The Working Group's report makes use of a parameter called SUM25 to associate potential mortality with ambient PM_{10} concentrations. This SUM25 value is calculated as the sum of the daily PM_{10} concentrations above 25 µg/m³, and has units of micrograms per cubic metre-days ([µg/m³]×days). The maximum SUM25 values for the 4.6 ha area enclosing the processing area was 103.26 (µg/m³)×days. In contrast, the maximum SUM25 value outside the this 4.6 ha area was predicted to be 208.68 (µg/m³)×days. By combining these SUM25 values with the statistical relationship presented in the Working Group's report, it is postulated that an order of magnitude approximation of possible health outcomes can be derived. The following mortality levels were calculated for the peak staffing levels of 234 people during operations, due to the predicted maximum PM_{10} levels within the Doris North site:

$$\text{mortality}_{\text{within processing area}} = 103.26 \times \frac{0.014}{10^6} \times 234 \text{ people} = 0.00 \text{ deaths/year}$$

$$\text{mortality}_{\text{outside processing area}} = 208.68 \times \frac{0.014}{10^6} \times 234 \text{ people} = 0.00 \text{ deaths/year}$$

The Working Group makes use of a SUM15 parameter to associate potential mortality and hospital admissions with ambient $PM_{2.5}$ concentrations. The SUM15 value is calculated as the sum of the

daily $PM_{2.5}$ concentrations above 15 µg/m³, and has units of micrograms per cubic metre-days ([µg/m³]×days). The maximum SUM15 values for the 4.6 ha area enclosing processing area was 88.62 (µg/m³)×days. In contrast, the maximum SUM15 value outside the this 4.6 ha area was predicted to be 301.96 (µg/m³)×days. By combining these SUM15 values with the statistical relationships presented in the Working Group's report, it is postulated that an order of magnitude approximation of possible health outcomes can be derived. The following mortality levels and hospital admissions were calculated for the peak staffing levels of 234 people during operations, due to the predicted maximum $PM_{2.5}$ levels within the Doris North site:

$$\text{mortality}_{\text{within processing area}} = 88.62 \times \frac{0.026}{10^6} \times 234 \text{ people} = 0.00 \text{ deaths/year}$$

$$\text{mortality}_{\text{outside processing area}} = 301.96 \times \frac{0.026}{10^6} \times 234 \text{ people} = 0.00 \text{ deaths/year}$$

$$\text{respiratory hospital admissions}_{\text{within processing area}} = 88.62 \times \frac{0.0118}{10^6} \times 234 \text{ people} = 0.00 \text{ deaths/year}$$

$$\text{respiratory hospital admissions}_{\text{outside processing area}} = 301.96 \times \frac{0.0118}{10^6} \times 234 \text{ people} = 0.00 \text{ deaths/year}$$

$$\text{cardiac hospital admissions}_{\text{within processing area}} = 103.26 \times \frac{0.014}{10^6} \times 234 \text{ people} = 0.00 \text{ deaths/year}$$

$$\text{cardiac hospital admissions}_{\text{outside processing area}} = 103.26 \times \frac{0.014}{10^6} \times 234 \text{ people} = 0.00 \text{ deaths/year}$$

Therefore, using this highly conservative Health Canada relationship, which is not considered applicable for evaluating effects in active mining and processing areas, no perceptible increases in health effects related to PM_{10} and $PM_{2.5}$ concentrations are expected for people living or working at the Doris North site. In addition, all of the predicted concentrations within and outside the processing area were below the respective guidelines established to protect human health and well-being.

With regard to mitigation plans, Miramar Hope Bay Limited (MHBL) has made significant commitments with respect to mitigating dust emissions, including PM_{10}, at the Doris North Project. Specifically, MHBL has committed to the following mitigation measures during construction, as highlighted in Section 6.1 of Supporting Document B3 to the FEIS:

- use of coarse rock in roads, airstrip, building pads and laydown areas to minimize dust.
- application of water or chemical suppression to roadways and construction areas to reduce dust from rock haulage, grading and bulldozing to a minimum.
- regular servicing of all mobile and stationary engines to maintain efficiency.

Since the limited number of 24-hour PM_{10} levels predicted to exceed 50 µg/m³ were all related to dust emitted from the surface haul routes, MBHL has committed to the following mitigation measures specifically targeting the particulate emissions from these surface haul routes:

- application of water or chemical suppressants to roadways to reduce dust from ore and waste rock haulage to a minimum.
- use of coarse rock in roads to minimize dust.

In addition, MHBL has also committed to implement the following dust and particulate (including PM_{10}) mitigation measures for other activities during the operating phases:

- use of a brine solution for dust suppression in the underground mine.

- installation of dust covers, sonic sprays, etc. to suppress dust generation from equipment in the crushing facility.
- installation of a dust scrubber on the smelting off-gas stream.
- submerged release of tailings deposition to avoid tailings dust emissions.
- installation of a waste oil burner unit equipped with a settling tank and filter system for particulate removal from the waste oil.
- regular servicing of all mobile and stationary engines to maintain efficiency.
- use of coarse rock in the airstrip, building pads and laydown areas to minimize dust.

This lengthy list of mitigation measures shows MHBL's commitment to minimize air quality effects, including PM_{10} levels, during the construction and operation of the Doris North Project.

The federally mandated National Air Pollution Surveillance (NAPS) monitoring program operates on a fixed schedule with samples being taken every sixth day. For TSP, this means that samples should be collected for a full 24-hour period every sixth day. As part of the MHBL commitment to collect as much data as possible in preparing the FEIS, this schedule was advanced for a short period to include an additional sample collected every third day. The increased sampling frequency was intended only to collect the maximum amount of data during a limited window of opportunity prior to submitting the FEIS.

This proposed monitoring program is appropriate in the measurement frequency. With the exception of 24-hour PM_{10}, all of the predicted concentrations, both inside and outside the ore processing areas, were below the respective guidelines established to protect human health and well-being. We have also demonstrated that no health effects are expected from the predicted PM_{10} or $PM_{2.5}$ levels at the Doris North Project, even using the highly conservative Health Canada relationships.

References

ACGIH (American Conference of Governmental Industrial Hygienists). 2003. TLVs and BEIs Based on the Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices. American Conference of Governmental Industrial Hygienists Inc. Cincinnati, Ohio.

Health Canada. 1999. Addendum to Science Assessment Document Particulate Matter ≤10µm and ≤2.5µm. A Report by the Federal-Provincial Working Group on Air Quality Objectives and Guidelines.

Federal-Provincial Advisory Committee on Air Quality. 1987. Review of National Ambient Air Quality Objectives for Nitrogen Dioxide – Desirable and Acceptable Levels.

Noise Assessment

The noise assessment does not conform to the guideline 4.21.1.4 and the pre-hearing decision item #4, p. 38, for the following reasons:

The FEIS does not provide the information needed to evaluate the conclusions that it presents with respect to noise. For example, surveys to confirm the current noise levels at the site and

validate the predicted noise levels expected to result from the project were not undertaken (FEIS supporting document B3 p. 80).

Also, the FEIS does not take into consideration the human health effects of noise, particularly on mine employees; by failing to seriously address infringement on pristine noise conditions in its cumulative assessment; and by only anecdotally discussing noise at night rather than proposing mitigation for the >40dBA noise levels at night. (FEIS p. 5-14)

MHBL comment:

The impact assessment for the Doris North Project meets Guideline 4.21.1.4 and the pre-hearing decision item #4, p. 38. We believe the noise assessment exceeds the requirements for projects of this nature. Section 4.21.1.4 of the Doris North Final EIS Guidelines states:

> *The Proponent shall assess the potential impacts of the processing and plant infrastructure, including:*
>
> - *noise from plant operations and transportation to and from the plant; …*

Item #4, p 38 of the pre-hearing decision document states:

> *Impact assessments must include any environmental effects likely to result from the project in combination with other projects or activities that have been, or will be, carried out. This element of the EIS must include a mitigation analysis that explains how the impacts could be avoided, minimized, cured, eliminated, or compensated.*
>
> *The FEIS must include:*
>
> *General Impact Assessment*
>
> - *A more complete analysis of impacts in each of the following areas: climate/global warming, noise, terrain, permafrost, hydrology/water quality, wastewater treatment, acid rock drainage and metal leaching, aquatic organisms and habitat, wildlife, bird life and habitat, vegetation, and accidents and malfunctions. …*

Since Nunavut does not currently have a noise assessment protocol or quantitative noise limits or guidelines, the FEIS looked to the Northwest Territories for guidance. The Northwest Territories has developed a draft environmental protocol which adopts the Alberta Energy and Utilities Board (AEUB) Noise Control Directive 99-8 (AEUB 1999a) and Guide 38 (AEUB 1999b). Therefore, Guide 38 was chosen as the basis for the methodology used for the noise assessment of the Doris North Project.

Guide 38 specifically recommends a receptor-based assessment method, focusing on impacts at residential properties (dwelling units) nearest a proposed development. Camps for the development are specifically excluded from assessment. Guide 38, Section 4.2, Table 2, states the following:

> *Dwelling Unit: Any permanently or seasonally occupied dwelling with the exception of an employee or worker residence, dormitory, or construction camp located within an industrial plant boundary. In the latter cases, occupational noise standards may be applicable.*

Since the nearest residents are 65 km from the site, strictly following the Guide 38 approach for dwellings was not considered valid. In areas distant from residential dwellings, Guide 38

recommends that projects meet a target noise level of 40 dBA at night and 50 dBA for daytime at a distance of 1.5 km from the site.

The FEIS guidelines do not call for surveys to confirm current noise levels at the site. The only sources of noise currently at the site would be naturally occurring activities, such as wind. Section 5.4 of Supporting Document B3 to the FEIS suggested that background noise levels at the project site are expected to range between 25 and 40 dBA. This statement was based on measurements made in an arctic landscape when there was little wind. Wind events can result in natural background levels higher than 40 dBA; a 35 km/h wind should result in ambient noise levels of about 55 dBA (van den Berg 2000).

Since there are no activities occurring at the site, there appeared to be no compelling need to complete on-site measurements to support the FEIS. As noted above, pristine background noise levels can readily exceed the 40 dBA night time target and 50 dBA daytime target (both to be applied at a distance from 1.5 km from the site) that were used in the noise assessment of the Doris North Project. Therefore, the criteria used in the noise assessment are likely more restrictive than if monitoring data were used to set assessment targets. Section 6.2 of Supporting Document B3 to the FEIS did recommend that follow-up noise surveys be performed prior to construction (to confirm current noise levels) as well as once the project has reached full capacity (to confirm noise predictions presented in the FEIS). The noise survey to confirm the FEIS predictions can not be undertaken until the Doris North Project is approved, constructed, and reaches its full operating capacity.

Possible human health effects related to noise fall into the following two categories:

- physical; and
- psychological.

Physical health effects refer to hearing damage due to very high noise levels. According to the World Health Organization (WHO), there is no identifiable risk of hearing damage in noise levels less than 75 dBA, based on a 40 hour work week (WHO 1980).

One of the key elements of the psychological health effects of noise is sleep interruption. The WHO indicates that an indoor noise level of 45 dBA is a desirable criterion to prevent sleep disturbance in the most sensitive individuals. However, this can vary depending on the nature of the noise, the sensitivity of the individual (WHO 1980) and the habituation of the noise exposure. That is to say many individuals will become accustomed to steady noise levels, to the point that they will no longer interrupt sleep. In addition, typical northern building construction methods will include heavily insulated buildings fitted with a minimum of double glazed windows. This level of construction would provide at least a 30 dBA reduction (Cowan 1994) of the exterior noise levels. Therefore, exterior noise levels less than 75 dBA would result in interior noise levels below the 45 dBA desirable criterion.

Specific noise mitigation for the mine employees was not discussed in the FEIS since this is an occupation health and safety issue. Occupational health and safety issues for workers at the Doris North Project will be addressed as part of the project permitting process.

References

AEUB (Alberta Energy and Utilities Board). 1999a. Interim Directive ID 99–08. Noise Control Directive. 4 pp.

AEUB. 1999b. Guide 38: Noise Control Directive – User Guide. 4th Edition.

Cowan, J.P. 1994. Handbook of Environmental Acoustics. Published by Van Nostrand Reinhold Company, 283pp.

Van den Berg, Frits. 2000. Measurements and Analysis of Natural Ambient Sound Levels and Weather Parameters. Presented at InterNoise 2000.

WHO. 1980. Environmental Health Criteria 12: Noise. Prepared by the World Health Organization, Geneva, 103pp.

Water Quality Assessment

The assessment of effects on water quality, and consequently, potential effects on human health, is inadequate and does not conform to guideline 4.21.2.3, and pre-hearing decision item #4, p. 38, for the following reasons:

The consideration of drinking water is inadequate as there is no discussion of sources of drinking water for on-site workers. Furthermore, assessment and management of discharge from Tail Lake should consider Health Canada's Canadian Drinking Water Quality Guidelines, not just guidelines for the protection of freshwater aquatic life.

With respect to surface and groundwater contamination the assessment of the long-term effects of geochemical effects is inadequate, and information on nutrient loading into the ambient environment is missing. While the conclusions suggest minimal effects, the assessment fails to consider local traditional food consumption and only addresses a limited number of chemicals - see comments below. Finally, the choice of copper as the parameter limiting the water volume to be released from Tail Lake (FEIS p. 5-24) seems problematic from a human health perspective; is copper the contaminant of most concern for potential human exposure?

MHBL comment:

In the human health risk assessment, the maximum concentration in Tail Lake of the operation or post-operation scenario was compared with Drinking Water Quality Guidelines for the Protection of Human Health. This was part of the chemical screening process in Appendix II, Section 3 of the Human Health and Ecological Risk Assessment - Supporting Document F2. It was assumed that people hunting in the area could be exposed to drinking water from Tail Lake. It should be noted that all drinking water for on-site workers will be drawn from Doris Lake (not Tail Lake), and be treated, as required, to meet drinking water quality guidelines.

Traditional food consumption was evaluated as part of the human health assessment. It was assumed that caribou would drink water from Tail Lake while in the vicinity of the Doris North Project. Conservative assumptions regarding uptake of metals from Tail Lake into caribou tissue were used to calculate caribou meat concentrations of the chemicals of concern. The "limited number of chemicals" evaluated in the human health assessment were selected following a chemical screening process, which is standard practice for human health risk assessments. In this screening process, chemicals that would not present a risk to human health were eliminated from further assessment because operations/post-operation concentrations were below conservative regulatory guidelines or background concentrations (see response to next question).

The choice of copper as the parameter that limited water volume discharged from Tail Lake was to provide adequate dilution of the decant to meet CCME water quality guidelines for the protection of aquatic life downstream of the falls on Doris Outflow. This would also provide protection for human health, as the guidelines for protection of aquatic life are generally more stringent than the guidelines for drinking water quality.

Human Health Risk Assessment

We appreciate the inclusion of the HHRA in supporting document F2. However, many more details are needed, and therefore, the FEIS does not conform to the guideline 4.21.4 and the requirements of the pre-hearing decision, p. 38.

Mercury is not included among the chemicals of concern assessed in wildlife. It is important to include mercury in this grouping at it is known to both be present in high levels in the local natural environment and known to cause human health effects. An assessment of any possible contribution of the project to mercury levels is required, as stated in the pre-hearing decision: "an examination of…the potential for contaminants such as mercury to biomagnify up the food chain".

Given the fact that "fifty-nine per cent of Inuit households rely on harvested resources" it is imperative to fully assess all the chemicals from the project that could cause human health risks from the consumption of country foods. Information should be provided and assessed for a whole suite of metals (including antimony, barium, boron, cadmium, chromium, copper, lead, mercury, selenium, silver, thallium, uranium and zinc).

Also, the assessment should examine the actual average consumption of country foods for the Kitikmeot. It is important to consider these local consumption patterns of traditional foods when determining the species to be assessed, the study area to be used in the assessment, and in the evaluation of risk. Furthermore, follow-up monitoring of all metals in fish and wildlife should be put in place to evaluate the accuracy of the HHRA and to manage any possible human health outcomes.

MHBL comment:

Please provide more specific information on the "many more details" that are required.

As mercury would not be used in the milling process, the tailings discharge from the Doris North Project would not contribute to any increased concentrations of mercury in Tail Lake and thus other lakes in the watershed. Mercury was not evaluated as a chemical of concern because it screened out of the chemical screening process. The chemical screening process is described in detail in the Human Health and Ecological Risk Assessment, Supporting Document F2. In summary, the first step of the chemical screening process is a comparison of the predicted concentrations in Tail Lake with the baseline concentrations. If predicted concentrations were not greater than baseline concentrations, as was the case for mercury, then the project is not expected to contribute to an incremental increase of the parameter and the chemical was not evaluated further in the assessment. The second step in the screening process was a comparison of predicted concentrations with applicable regulatory guidelines (e.g., Canadian Drinking Water Quality Guidelines for protection of human health). If predicted concentrations were less than regulatory guidelines, then the parameter was not evaluated further in the health assessment. The final step of the screening process was to determine if any of the chemicals are essential nutrients (e.g., calcium). This is standard practice in health assessments for EIS and risk assessments.

The chemicals that were selected for the risk assessment were chosen if all of the following conditions were true:

- predicted concentrations were greater than baseline concentrations;
- predicted concentrations were greater than applicable regulatory guidelines or no applicable guidelines were available; and,
- the metal is not considered an essential nutrient (that is, a metal that is important for growth and health).

Although it is likely that there is some general information available on the types and approximate frequency of country foods consumed by Kitikmeot, this type of information is not specific enough to serve the purposes of the health assessment, which requires consumption rates in grams per day (g/day). Therefore, the food consumption values for aboriginal people reported in the "Compendium of Canadian Human Exposure Factors for Risk Assessment" (Richardson 1997) and adopted by Health Canada (2003) were used in the health assessment. Specifically, the fish consumption rates are based on Inuit consumption values which would be representative of the Kitikmeot people. In addition, several layers of safety were applied throughout the risk assessment to prevent underestimation of exposure. For example, it was assumed that people spent 30 days per year in the vicinity of the Doris North Project and consumed fish from the area everyday for 30 days. This is conservative because during public consultation, Inuit residents indicated that they did not hunt, trap or fish in the area of the Doris North Project as frequently as their ancestors. It was also assumed that people ate caribou meat for 365 days per year from caribou that spent 365 days per year at Tail Lake.

Monitoring of wildlife meat is not feasible due to the number of samples required for statistical significance. In addition, game animals do not necessarily stay within a single project study area. Thus, tissue concentrations in caribou would be indicative of regional environmental concentrations, and not only effects of migrating through the Doris North Project area. Fish tissue will be collected and analysed as part of the Metal Mining Effects Regulations.

References

Richardson, G.M. 1997. Compendium of Canadian Human Exposure Factors for Risk Assessment. Ottawa: O'Connor Associates Environmental Inc.

Health Canada. 2003. Federal Contaminated Site Risk Assessment in Canada Part I: Guidance on Human Health Screening Level Risk Assessment (SLRA). Version 1.1. October 3, 2003.

Socio-Economic Analysis

The baseline study (support document E2) gives a thorough description of the socio-economic conditions in the Kitikmeot. We appreciate the level of detail provided about community health. As it pertains to health, we find that this baseline study complies with guideline 4.14. However, it is obvious that this study is adapted from the baseline study done for the Jericho Diamond EIS. Please ensure that this study is revised to be specific to the Doris North project.

Overall, we find that this Socio-economic Impact Assessment (supporting document E3) does not comply with the guidelines section 4.21.4 and the pre-hearing decision item #4, p. 38. This is for a number of reasons:

The SIA does not fulfill the requirement to "evaluate how the temporary or final closure of the mine would affect workers and communities", and to include "a discussion of the *boom and bust impacts of a short term project*, as well as the socio-economic implications of a longer term project". Given the very short life of this mine, the socio-economic impact assessment is inadequate; more details need to be given about the socio-economic effects of the mine closure, such as unemployment and changes in income levels.

Also, the SIA is inadequate with respect to methodology. The assessment does not provide sufficient information about how the conclusions were reached. Explanations and justifications are needed, for example, justification is needed for the statement on page 13 of E3: "The physical health of Kitikmeot residents as a group should not be impacted by the development of the Doris North project." Given the potential for impacts to the environment where Kitikmeot residents practice traditional activities, it is possible that impacts to physical health could occur.

Furthermore, information is required about how socio-economic mitigation measures will be implemented, and who will be responsible for the mitigation and monitoring.

Public Consultation
The FEIS does not conform to guideline 4.5, and the pre-hearing decision item #6 (p. 39), for the following reasons:

The FEIS does not provide enough information about the outcomes of public consultation and whether public concerns were addressed. If public concerns were addressed, the proponent must demonstrate how this was undertaken.

Also, the FEIS needs to provide more information on public involvement in project implementation, including details of a communications programme that demonstrates how the public will be involved throughout the life of the project.

Cumulative Effects Assessment
The Cumulative effects assessment is inadequate, and does not conform to guideline 4.22, and pre-hearing decision item #8, p. 41, for the following reasons:

The CEA does not include an appropriate consideration of interactions with other projects, especially exploration outside the Hope Bay belt, hunting camps, and shipping. Interactions with these other activities need to be considered with respect to effects on caribou and marine species, and on the traditional use of these species. Furthermore, the FEIS does not give any indication of the inclusion of traditional knowledge or IQ in the CEA.

Valued Components
The selection of VSECs does not conform to the requirements of the pre-hearing decision item #5, p. 39. Although we appreciate the selection of community health as a VSEC, the assessment is inadequate with respect to the cultural, social, emotional, and spiritual aspects of well-being. To be effective the VSECs should include a socio-cultural component, such as traditional way of life.

Study Areas
The basic study area definitions may not be suitable for assessment of all the factors. For instance, human health effects will likely in some respects be contained within the local study area (e.g., noise) and in other respects transcend even beyond the regional study area (e.g., caribou, air). Therefore, we suggest that the regional study area be redefined according to factors such as caribou habitat areas, and air sheds.

MHBL comment:
Air Regional Study Area: Section 4.4 of Supporting Document B3 of the FEIS states "Predicted concentrations at the edge of the RSA are very small (e.g., 6 µg/m³ for NO_2, 0.1 µg/m³ for SO_2)." Since concentrations at the Doris North Project are negligible at the extents of the RSA, there should be no human health effects related to airborne concentrations from the Doris North Project beyond the RSA. Therefore, the current definition of the RSA for air quality is appropriate.

Data and Monitoring Requirements
As referenced above under specific sections, there are number of monitoring programs that are not sufficient:

- Air quality assessment does not include campsite monitoring. The follow-up monitoring program of every six days may not be suitable given the PM_{10} exceedance.

Response: Please refer to the previous discussion on air monitoring discussed in the specific respose given above.

- Water quality and country foods assessment does not include mercury and other metals among the chemicals of concern. Follow-up monitoring is required.

Response: Water quality monitoring will include assessment of mercury as well as a suite of other metals. Follow-up monitoring relating to caribou and fish was discussed in the specific response given above.

- Data is needed on average noise generated by all the sources of noise.
- Socio-economic monitoring of community well-being should be built in both for positive and negative effects.

Please note that the responsibility for the health of the people of Nunavut lies primarily with the territorial government, and therefore, we trust that the appropriate authorities will be involved in addressing any related issues and concerns. Health Canada's comments are provided as required under section 12(3) of CEAA and in the spirit of taking into consideration the health and well-being of all Canadians.

Should you have any further questions, please feel free to contact me (tel: 416.954.0821 or email: Anjala_Puvananathan@hc-sc.gc.ca) or Carolyn Dunn (tel: 613.948.2875 or email: Carolyn_Dunn@hc-sc.gc.ca).

Yours sincerely,

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