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SA-03-137

April 29, 2005

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Subject: Meadowbank Gold Mine DEIS – Health Canada Technical Review

Dear Ms Briscoe and Mr Moggy,

Thank you for your letter of January 17, 2005, advising Health Canada (HC) of the submission of the draft environmental impact statement (DEIS) for the Meadowbank Gold Project.

The following are Health Canada's technical comments with respect to the adequacy of the DEIS for the Meadowbank Project, concerning health issues.

Air Quality Impact Assessment

Overall comment

The air quality impact assessment provided by the proponent and its consultant was clearly written, transparent, and easy to follow. Health Canada would like to acknowledge and thank the proponent for taking into consideration Keeping Clean Areas Clean and Continuous Improvement, and for providing attention and detail to mitigation of significant effects over all phases of the project as well as to the monitoring program.

Section-specific comments

With respect to Section 2.2 (p.2-1), Atmospheric and fugitive dispersion modelling was completed for the worst-case senario which was identified as when the Vault pit is scheduled to be in operation, which includes the hauling of ore from this site to the processing plant over a distance of ~7km. However, according to the Development Sequence illustrated in Figures 4-9 to 4-16 of Part 1 of the Meadowbank Gold Project Draft Environmental Impact Statement, it appears as though, between years two and five, both the Portage and Vault pits will be mined at the same time. Furthermore, between the years six and nine, it appears as though all three pit locations (Vault, Goose Ilsand, and Portage) will be in simultaneous operation. In addition, according to

Table A.1 in Appendix A (p.A-3), there may be a fourth mine site (the Borrow pit) but no further details were given.

The possibility of several pits being operated at once then calls into question the very basis for the temporal and spatial boundaries selected for the modelling processes for the worst-case (or normal operating) scenario. Solely modelling the pollutants anticipated to arise from the operation of the Vault pit only represents a portion of the Meadowbank gold mine project as there may also be up to three other mine sites in operation at the same time. While it is illustrated in Table 6.1 (Summary of Dispersion Modelling Results) that the majority of excessive PM_{10} and $PM_{2.5}$ emissions would be stemming from mobile sources (which will likely be a lesser component for the Goose Island and Portage sites, which are closer to the processing plant), the contributions of the other mine sites to these pollutants should be modelled in conjunction with the Vault pit as they are only ~7km apart, and are occurring within the same time frame. The same holds true for the other pollutants.

Section 3, Table 3.1 (p.3-2)
The "Desirable" TSP level of 60 □g/m^3 is an annual air quality objective (not 24 hr).

The World Health Organization has recommended a 1-hour average daily maximum NO_2 guidance concentration not exceeding 200 □g/m^3. Health Canada is currently in the process of examining the latest scientific evidence regarding health risks associated with exposure to NO_2, and may recommend a decrease in the acceptable1-hr NAAQO to 200 □g/m^3 as well. Timing of these recommendations are not yet clear.

Section 5.1.1 (p.5-1) and Section 6.1.2 (p. 6-2)
To supply the power for the facility, the air quality impact assessment states that there will be three diesel generators in operation, with a fourth on stand-by duty "to handle the peak demand during the winter season" (Air Quality & Noise Management, Section 3-2). Given the average monthly air temperature statistics for Baker Lake over a 57 year period (Table 5.6, p.5-8), the 'winter season' in Nunavut generally occurs from November through April. From Table 5.2 (p.5-3), which provides model input parameters for three diesel generators, it appears as though modelling did not take into consideration that one extra diesel generator may be operating for a significant portion of the year in order to meet the 15.5 MW operating capacity of the power plant.

Section 5.1.1, Table 5.3 (p.5-4)
Please superscript the exponents in the second column of this table.

Section 5.1.2 (p.5-4)
The fourth sentence of the first paragraph on this page states that a "conveyor will then convey the crushed material to a live uncovered coarse ore stockpile." However, Figure 4-18 (Process Flowsheet) of Part 1 of the Meadowbank Gold Project Draft Environmental Impact Statement shows that the crushed ore will be covered. Are these addressing the same stockpile? Similarly, please define "live uncovered".

Section 6.1.5 (p.6-4)
Since mobile sources are identified as being responsible for high particulate concentrations, please provide further detail on the use of fuel efficient machinery with emission controls and proper maintenance of these vehicles/machines, in addition to using dust suppressants.

Section 6.2.2 (p.6-6)
Please superscript the exponents in the sixth column of this table (second row).

Section 6.3 (p.6-7)
While it is recognized that the cumulative effect of all dust sources (fugitive as well as gaseous and fine PM emissions from the power plant and from mobile sources) cannot be simultaneously modelled, there should be a more detailed qualitative discussion as to their combined effect.

Given the modelling results, the PM_{10} and $PM_{2.5}$ plant and mobile source emissions may exceed the ambient air quality objectives. The PM from fugitive sources such as tailings, waste disposal areas and the ore stockpile may then add to the frequency and intensity of these exceedences.

Air Quality & Noise Management for the Meadowbank Gold Mine

Section 3.4 (p.3-4)
The stated objective of the air quality monitoring plan is to "collect sufficient data to determine the environmental effect of project activites on air quality" and will specifically address PM_{10}. While Health Canada is in agreement that PM_{10} should be monitored, it also suggests that more than one sampler be deployed. In order to obtain a representative picture of the concentration of suspended particulate matter in the air surrounding the project site, multiple samplers need to be set up (spatial and temporal).

Drinking Water Quality Assessment

The following comments pertain to water quality concerns from a health perspective. Page numbers refer to the DEIS part 1 report. Mine and camp fresh water are to be pumped from Third Portage lake. Therefore protection of this resource is the main concern from a drinking water perspective. The document, however is largely written from the perspective of environmental protection.

As an example on page XIV it is indicated that effluent will be discharged to Third Portage lake and that effluent quality is predicted to be well within MMER (Canadian Metal Mining Effluent Regulations) guideline concentrations for conventional parameters such as metals and cyanide. No reference is made to Health Canada's Guidelines for Canadian Drinking Water Quality or Nunavut's regulations for drinking water quality

Page XV it is indicated that at the end of mine life, it is conservatively estimated that cadmium, chromium and selenium may temporarily exceed CCME (2001) criteria in Third Portage Lake by nominal amounts (<2X) and copper by up to 4X.. There is no discussion of what this might mean for drinking water, ie., could levels exceed Health Canada's Guidelines or Nunavut's regulations for drinking water for these parameters prior to the end of project?

Page 91 "Total antimony, arsenic ....and nickel concentrations from project lakes are all below laboratory detection limits and well below CCME (2001) water quality guidelines for the protection of aquatic life". Since Third Portage Lake is also being used as a source for potable drinking water, it would be advisable to make comparison to Health Canada's Guidelines for Canadian Drinking Water Quality or Nunavut's regulations for drinking water quality.

Page 92. Instead of including only the average values in Table 4-13, it would be preferable if a range of values was also included for each parameter.

Page. 93. The report would be more complete if all the groundwater baseline data collected from the 4 monitoring wells were included in the report (in table format) rather than just a summary of the findings.

Pages 187-188 Mine Waste Rock Management Plan (Portage rock storage facility, Vault rock storage facility and the Tailings storage facilty). It is beyond HC's expertise to comment directly on the technical/engineering details of this section. However, if the measures indicated do not accomplish what is predicted there could be potential impacts on (drinking) water quality. For

example, if temperatures are warmer than predicted and permanent freezing of the tailings and the talik below Second Portage arm does not occur, this could increase the potential for acid rock drainage (ARD) and impact water quality.

Pgs 189-190 Water Management Plan. The details of the plan provided in this section are lacking. Depending on the specifics of the plan, how well the company follows what it sets out and is able to take corrective measures if unexpected problems occur, will determine to a large extent the impact on (drinking) water quality. Please see comments below with respect to information on monitoring and spill contingency. Also, it would be helpful if the location of water treatment facility was indicated on one of the figures (Figure 2.5) included in this volume.

Page 189: Reference to Health Canada's Guidelines for Canadian Drinking Water Quality or Nunavut's regulations for drinking water quality should be made in the section dealing with minimum standards that were incorporated into water management planning activities.

Pg 196-197 Monitoring and follow up. There is nothing on monitoring with respect to drinking water criteria (everything is based on aquatic life criteria). Information on the frequency of monitoring as well as the location of monitoring sites aimed specifically at the protection of drinking water source would be beneficial, ie., will monitoring occur near the fresh water intake on Third Portage lake?

Figure 4.43 (Permafrost & Hydrology Monitoring stations)
The text indicates that there are 4 groundwater sites, however, figure 4.43 only appears to have only 3. The text on page 85 with regards to hydrology seems to suggest that groundwater would flow from the tailings site/attenuation pond flows towards the south-east. This would imply that the fresh water intake in Third Portage lake would not be under the influence of groundwater flow from the tailings site and attenuation pond. Can the existing groundwater monitoring sites confirm this scenario?

Table E.1 in appendix E. How were the maximum predicted water quality concentrations calculated (information on model was not provided)? Again reference is made to Canadian Water Quality Guidelines for Aquatic life and MMER. but no reference is made to Health Canada's Guidelines or Nunavut's regulations for drinking water.

Tables E.3 - E..5 in appendix E. Reference should be made to Health Canada's Guidelines for Drinking Water Quality or Nunavut's regulations for drinking water regulations. In some of the tables, values are missing for Antimony (0.006 mg/L), arsenic (proposed values of 0.005 or 0.010 mg/L), boron (5 mg/L), barium (1 mg/L), selenium (0.01 mg/L) and uranium (0.02 mg/L).

Noise Impact Assessment

With respect to the Noise Impact Assessment p. 2-3, clause 2.2 125, dBA linear peak pressure from blasting at nearest residence either seems too high or does not make sense. Normally peak pressures are measured as C-weighted quantities.

The proponent is commended for providing a great deal of quantitative information about the noise levels from the various noise sources to be used for construction and operation and for predicting noise levels. In addition, the proponent is commended for having a monitoring program. However, one full day of monitoring per year does not seem sufficient to obtain a representative value. At least 2 days seems more reasonable given experience from other environmental assessments.

The number of on site people exposed to the various levels should be clarified. For example, a 24 hour Leq of 75 dBA , as appears at North Camp would normally be considered an unacceptable environment in a residential area and some mitigation would be required. It needs to be clarified whether this noise is continuous day and night and whether the workers will be residing in this environment. Ordinarily some mitigation would be required.

The amount of attenuation from outdoors to indoors should be estimated if the proponent is attempting to suggest that this will be sufficient to mitigate evening and night time impacts. An attenuation of about 25 dB would be needed to avoid a definite noise impact indoors and outdoor communication is totally unsatisfactory at a constant ambient of 75 dBA.

It is not clear what predicted levels will be after the mitigation commitments provided by the proponents in Tables A.1 to A.3.

Duration and frequency of exposure of the workers is important to know. The locations of the workers' living/sleeping areas relative to noise levels from the pit and the plant and the road needs to be shown.

The Alberta Energy Utilities Board guide indicates that occasional residents (seasonal hunting sites) should be assessed. The potential for locally significant impacts should be addressed with regard to occasional residents. For example, the maximum noise levels at the camping area may be in the 55 dBA range. The camping area should be specifically addressed in the noise impact assessment for completeness.

The occupational noise limits should be stated and the applicable legislation should be referenced; the AEUB Guide 38 says nothing about occupational noise limits.

It should be noted that the EPA reference provided by the proponent is the Irish EPA, not the US EPA.

Although the proponent uses a number of recent references to discuss the health effects of noise, the community noise reaction table is 35 years old and although it is still widely used as the basis for many guidelines and assessments throughout the world, it is not the basis of the current ISO standard for impact assessment. That standard is CAN/CSA- ISO 1996-1:05 (ISO 1996-1:2003)

The only impact on humans due to noise possible appears to be for workers or people in the camping area. More information is needed on these impacts, especially occupational noise exposure during day and night needs to be provided.

Country Foods Issues

This section pertains to human health issues related to project-related contamination of foods harvested in the study area.

A comprehensive assessment of country food issues was not identified in the draft environmental impact assessment for the Meadowbank Gold Project. At least a screening level risk assessment (SLRA) of the potential contamination of country foods gathered from the area of this project is required.

It is indicated in this draft EIS that limited hunting, trapping and fishing occurs in the area of the proposed Meadowbank Gold Project. Nevertheless, the following is required in regard to the risk assessment of potential country food contamination from the perspective of human health issues:

- Identify country foods (e.g. edible vegetation such as berries, the tissues (e.g. meat and liver tissues) of fish and wild game[1], etc.) gathered from the project area and consumed by local residents or by persons hunting or fishing in this area on an occasional basis;
- Identify potential contaminants taking into consideration all project activities[2];
- Identify contaminants of potential concern (COPCs) based on the feasibility of pathways of potential contaminants into country foods harvested from the project area;
- Justify that no further risk assessment or monitoring is required based on the results of a screening level risk assessment (SLRA);
- Or, based on the results of the SLRA, conduct further periodic monitoring of the levels of COPCs in country foods under study and/or undertake more in-depth site specific risk assessment(s) (SSRAs)[3] if required.

Detailed risk assessment information concerning food issues will be provided in Volume 3, Chapter 8 of the Health Canada publication entitled "Canadian Handbook on Health Impact Assessments". It is anticipated that Volume 3 of this document will be published in the summer of 2005. The information presented in this chapter of the handbook would undoubtedly be of assistance in providing the risk assessment information requested in the EIS for the Meadowbank Gold Project.

With respect to the Conformity Report of April 2005, in the sections 4.3.1 Vegetation Contaminant Loading, 4.13.2 Wildlife Contaminant Loading, and 4.13.3 Bird Contaminant Loading, modeling is proposed in regard to estimating levels of contaminants in vegetation, wildlife and birds. The focus of the comments presented in these sections appears to be the health of the vegetation, wildlife and birds. In this regard, at least a screening level risk assessment is required from the perspective of human health. It is necessary to provide information on country foods consumed in the project area as well as information on levels of contaminants of potential concern in these foods. This information can then be used to determine the impact on human health from the intake of contaminants, such as metals, from the consumption of these foods by local residents or occasional hunters and fishermen.

In the section 4.21.2.5 Wildlife Bioaccumulation, metals are identified as the only contaminants possible from the mine. It is agreed that mercury would be of concern in regard to bioaccumulation issues.

In the Environmental Impact Statement, page 135, Item #7, Section 4.21.2.1, "Project Components", rewatering and flooding is discussed in regard to affected portions of Third Portage Lake as well as Vault and Phaser Lakes. Therefore, consideration is required in regard to the potential of mercury (methylmercury) contamination of fish caught in the project area, which can occur as a result of flooding and altering water channels.

It is noted that background data for this project is available on mercury and other metal levels found in fish. In the Baseline Aquatic Report (January 2005), information is provided on levels of

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[1] It is indicated in the draft EIS (page XV) that wildlife may be exposed to contaminant loading from eating contaminated vegetation. It is necessary to identify the specific contaminants as well as the tissue(s) of the wildlife where the contaminant is found after ingestion of the vegetation.

[2] For example, metals are mentioned in the EIS. Specific metal contaminants must be identified. In this regard, it has been determined in the EIS that cadmium, chromium, copper and selenium may exceed water quality guidelines in Third Portage Lake. These metals should be considered as potential contaminants in country foods. In addition, mercury (methylmercury) contamination of fish may be of concern due to watershed changes proposed for this project. Lastly, it is indicated that arsenic (from arsenopyrite) is not a potential contaminant in this area. Arsenic is typically found in soils in the area of gold mine projects.

[3] Background data consisting of contaminant levels found in country foods before the project proceeds would be necessary for conducting a SSRA. This background data could then be used to determine the impact of the project on food contamination and the resulting potential impact on human health after operation of the project commences.

metals, including mercury, measured in the muscle of fish species harvested from lakes in the project area and from reference lakes. Therefore, this background data can be used to compare with mercury level estimates in fish based on a screening level risk assessment.

Socio-economic Impact Assessment

Health Canada is satisfied with the socio-economic impact assessment of January 2005. It is a reasonable approach acknowledging both the positives and potential negative impacts in terms of economic, social, and community factors. However, seeing as this project does have the potential to adversely affect individuals and local communities, HC would like to emphasize the need to fully implement all the mitigation and management measures as outlined in the Socioeconomic & Archaeology Management document (Jan. 2005).

Should you have any questions, please feel free to contact me via e-mail at carolyn_dunn@hc-sc.gc.ca, or by phone at (613) 948-2875.

Sincerely,

Carolyn Dunn
Environmental Assessment Officer

c.c. : Atis Lasis (HC)
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