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Assessment and Abandoned Mines Branch
Energy, Mines and Resources
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March 31, 2010

Attention: Patricia Randell, Project Manager

Re: Environmental Data Gap Review, Mt. Nansen Reclamation Project

We compiled a report identifying the existing baseline environmental conditions for the Mt. Nansen mine site. That report includes information on the general physiography, geology and soils, terrain hazards, climate, air quality and noise, vegetation, wildlife, water resources, and aquatic organisms and habitat. It was a desk-top exercise identifying existing literature and data available within a local and regional study area. This letter report identifies gaps in information that are pertinent to environmental baseline data required for a YESAB Executive Committee project proposal submission.

A detailed project description is not yet available for this project and we understand that several reclamation options are being considered. We therefore generalize the information requirements based on our experience in other reclamation projects in Yukon, our knowledge of the Mt. Nansen ecosystems, impact assessment, and experience with other YESAB Executive Committee submissions.

The Mt. Nansen area has been relatively well studied with a variety of information available at the regional scale. While there is region-wide data, site-specific information exists only for a few environmental variables. As noted above, this is a preliminary overview because 1) reclamation options have not been finalized and environmental issues scoped, and 2) some of the information that we reviewed included ongoing work where final reports are not available.

KEY DATA GAPS/DATA ISSUES

The key data gaps that we identified in our review of the baseline environmental data include:

1. **Hydrogeology** — Work is in progress and available information is in draft form;
2. **Cover material quantity and quality** — Required for reclamation cover and re-vegetation planning;
3. **Vegetation/habitat classification and mapping** — Baseline characteristics of adjacent undisturbed habitats and vegetation characteristics to establish re-vegetation objectives;

4. **Local wildlife use** — Determine desirable habitat conditions and use by local wildlife species.
5. **Climate** — AAMB should continue with on-site climate data collection to enhance the on-site climate characterization;
6. **Hydrology** — AAMB should continue the hydrology program started in 2009.

We describe key information gaps by 1st order headings of the draft document. Key issues are summarized in Table 1.

Table 1. Potential Valued Environmental Component (VEC) Data Summary.

Potential VEC	General sampling period	Notes
Geology and Soils	NA	General characterization of regional area. No characterization of on-site cover material (reclamation potential of waste piles/overburden).
Climate	2000–2006 (old station)	Intermittent on-site data, issues with physical location of old monitoring station (some data may not be directly comparable).
	2007–2009 (new station)	Climate change section may require more insight from a climatologist /engineer to determine potential threat to thawing of tailing pond dam (as example)
Vegetation	2006	Generalized description of Project Area. Mapped vegetation/ELC units required for habitat assessment and reclamation.
Wildlife	NA	There have never been a Project Area-specific wildlife inventory. Site-specific uses have not been identified. There is generally good information available regionally. There is little Traditional Knowledge of wildlife trends, abundance and distribution in the area.
Water Resources	1999–2009	Water Quality information ongoing. Existing data and study design sufficient.
	2009	Water Quantity (hydrology) program started. Data insufficient for full characterization of surface water flows, but monitoring is in place if program continues through 2010.
	NA	Groundwater Flow and Permafrost not sufficiently characterized on site.
Aquatic Organisms and Habitat	1979–2008	Intermittent, yet through assessment of fish and fish habitat in all watercourses in the Project Area. Stream sediment analyzed for heavy metals in sufficient detail. Benthic invertebrates characterized. No data gaps identified.

1.0 INTRODUCTION

General information available on background of the project.

2.0 PROJECT SCOPE/STUDY AREA

The scope of the project is relatively undefined until further input from the AAMB. The environmental baseline should include a general description of the reclamation options to better frame the scope of baseline environmental information that we are summarizing.

Spatial boundaries are well defined and require no further information. Temporal boundaries include all available information up to preparation of the baseline report. We note below where duration of data collection is not sufficient for determination of natural variation.

3.0 GENERAL PHYSIOGRAPHY

Section is complete with detail sufficient for YESAB project proposal submission.

4.0 GEOLOGY AND SOILS

Detailed surficial geology is not available for the Local Study Area. For this project, it may be relevant to provide a description of the waste materials on site that are available as reclamation cover material.

However, there is no site-specific information on quality of the material as a growth medium, and no information on soils. This information is particularly relevant to reclamation activities. Therefore, key missing items include:

- Quantities and qualities of material available for cover (reclamation);
- Overburden storage is unknown (if it was separated from waste rock). This information may be better addressed in the project description (not in the environmental baseline portion).

There are no details on permafrost, although we presume that information may be included in the AECOM hydrogeology final report(s). AAMB should consult with AECOM to determine the data that are available to characterize permafrost on site.

5.0 TERRAIN HAZARDS

Terrain hazards at the site appear to be limited to permafrost and colluvial processes and rock fall in the Brown-McDade pit. Seismic activity at the site is summarized by 1:100, 1:475 and 1:1,000 year return.

Section is complete with detail sufficient for a YESAB project proposal submission.

6.0 CLIMATE

Climate data are available from regional stations, but there are limited and inconsistent on-site data. We feel that updated summaries of on-site climate data will be sufficient once this project is ready for submission.

There are no data to provide tangible evidence of climate change in the Local Study Area and that section will only describe general predicted patterns.

While long term climate data is not available for the RSA an assessment of climatic trends could be undertaken for the Carmacks area using historical climate data from Environment Canada.

7.0 AIR QUALITY AND NOISE

Air circulation patterns in and around the Local Study Area were assessed through an examination of long-term dust dispersion in EDI's Terrestrial Effects study. That study illustrated distance and direction of airborne heavy metal contamination. This section is complete with sufficient detail for a YESAB project proposal submission. Further data from an on-site climate monitoring station that includes wind speed and direction may provide further detailed information.

There are no quantitative data on noise levels within the Local Study Area. However, noise should not be considered a concern with this project. Reclamation activities will probably involve fewer disturbances than the original operation (*e.g.*, limited if any blasting), the site is remote from communities, and wildlife may have adapted to previous disturbances in the area. Therefore, this section is considered complete with sufficient detail for a YESAB project proposal submission.

Air quality was not considered in the Human Health Risk Assessment because it was not considered a significant pathway for chemicals of concern (SENES 2009).

8.0 VEGETATION

Detailed information of on-site vegetation is important for reclamation planning and species selection for re-vegetation of disturbed sites. There are general descriptions of land and forest cover types in the Local and Regional study areas, but those areas have not been mapped or quantified within the study areas. Mapping of general cover types in the region will enhance reclamation and re-vegetation planning to create an area that will “blend” into the surrounding environment and replace terrestrial habitats that were lost to mining surface disturbance.

Habitat types within the Project and adjacent areas (*e.g.*, within a 1 km buffer) should be classified and mapped, and a detailed inventory of over and understory species should be collected to document plant communities to the species level prior to project proposal submission.

A list of rare and conservation concern plants potentially occurring in the Local and Regional Study areas was developed for this baseline report. Rare and conservation concern plants should not be a concern if reclamation options and activities are contained within previously disturbed areas.

9.0 WILDLIFE

There is limited site-specific information on wildlife use of the Local Study Area, but there is relatively good information on wildlife within the Regional Study Area. Several studies were initiated with the re-introduction of wood bison in the region, and as baseline studies for other regional mines. Although there is generally a suitable amount of information available to describe regional wildlife distribution and abundance, there is little data that are useful specifically as a baseline for long-term monitoring purposes.

Some of the site-specific information that is missing includes information on the following species that may be considered valued species:

- Porcupine is an important wildlife species to the Little Salmon Carmacks First Nation. They have been observed within the Project and Regional study areas, but no abundance, distribution, or seasonal use pattern data exist. It would be relevant to a YESAB project submission to determine the seasonal use pattern of the Local Study Area by porcupine.
- Mule and white-tailed deer distribution and abundance is unknown. Their range is expanding in Yukon, so abundance may be increasing. As abundance increases they may become a more important harvest species. It would be relevant to a YESAB project submission to determine the seasonal use pattern of the Local Study Area by both deer species, and the potential for the reclaimed site to provide habitat.
- Wolverine is an aggressive yet shy species that avoids contact with humans, so they seldom coexist in areas with human activity. They were assessed as a species of “Special Concern” by COSEWIC. There is currently no abundance and distribution data of wolverine within the Regional Study Area. Consequently, they may be a species worth investigating through some focused seasonal survey work. It would be relevant to a YESAB project submission to determine the seasonal use pattern of the Local Study Area by wolverine.

The YESAB 2007 guidelines, and as a matter of good practice, suggest that baseline data on wildlife use be collected as a linkage to long-term monitoring objectives. YESAB (2007) suggests that long-term monitoring objectives be established prior to the implementation of the baseline data collection program. The Little Salmon Carmacks First Nation (LSCFN), Yukon Environment, and Environment Canada should be consulted prior to implementing further baseline data collection to determine interest in and value of specific wildlife in relation to the Mt. Nansen reclamation project. YESAB suggests that the requirement of an integrated baseline and long-term monitoring program be discussed prior to the development of the project proposal (YESAB 2007, Section 2.2). Consultation with regulators and the LSCFN to determine specific wildlife values and objectives for long term monitoring at Mt. Nansen was not a component of this project. Regardless, for this project, those objectives could relate to an assessment of the resumption of wildlife use of the reclaimed site (presuming that there was reduced wildlife use of the site as a result of previous mining activity). As noted above, that specific information is not available.

The YESAB guidelines suggest that baseline surveys be conducted for at least two years to determine the range of natural variability for wildlife baseline conditions (YESAB 2007). There has not been consistent or any *monitoring* of wildlife activity *per se* in the Local or Regional Study Areas. It will be useful to determine the localized use of the Local Study Area by resident and migrant wildlife species to determine current use of the site and immediately adjoining habitats. This information will aid in reclamation planning to either enhance habitat features, compensate for lost habitat features resulting from the original disturbance, or to avoid creating barriers to movement of wildlife through the reclaimed site. This will require seasonal wildlife use surveys be conducted to determine patterns of wildlife use of the Local Study Area.

10.0 WATER RESOURCES

Depending on what closure options may be considered, data may be insufficient to determine the proportional contribution of surface water and ground water within the project site.

The Project Area's watersheds, watercourses, and drainages are well described and characterized. However, water quantity in Pony, Back, Dome and Victoria Creeks is limited to 2009 discharge data. YESAB requests that changes to surface water flows with respect to the project under review be outlined. Until a closure option is chosen and designed, these alterations cannot be characterized. Some potential alterations include:

- The project will likely affect some surface and groundwater flows on site. Mine remediation and closure will include re-location and/or strengthening of the tailings pond area. Changes to this area could affect the amount of water flowing below and through the area and into Dome Creek. If it is determined that the tailings are to be relocated, and the Dome Creek valley reclaimed, the diversion channel would be removed and the original Dome Creek channel restored.
- If it is decided that the tailings are to be moved to the pit area and kept saturated (Alternative 4Ai) a diversion will be created on Pony Creek to move water into the pit area. This potential scenario involves at least two road crossings (culverts, bridges or fords), and more information will be required in this section regarding changes made the Pony Creek channel.
- It is unlikely that flows in Back and Victoria creek will be affected by this project.

Another full year of hydrology data collection is warranted and AAMB should continue with the current hydrology program. Environment Canada Screenings require two complete years of data.

Water Quality is well understood with over three years of consistent data collected at upstream and downstream sites in the four creeks. The water quality monitoring sites overlap spatially with the water quantity monitoring sites. No further information on current water quality parameters will be required for the YESAB project proposal.

The hydrogeology of the site is currently under re-evaluation by AECOM. We understand that analysis and reporting is in progress. A basic summary of hydrogeology can be compiled at this time; however, it may be that additional information should be incorporated at a later date based on current study findings. Also, like hydrology, no predictions can be made on project alterations to hydrogeology until a closure option is chosen and designed. We suggest that a hydrogeology data gap analysis be conducted *after* the completion of current hydrogeology work.

11.0 AQUATIC ECOSYSTEMS AND RESOURCES

The information for fish and aquatic habitat is sufficient for a YESAB project submission. Poor quality habitat and barriers at the mouths of Pony and Dome creeks prevent fish from using these streams which flow through the mine site. As such, fisheries concerns are limited to water quality concerns affecting downstream areas. Several fish species have been documented in Victoria Creek and grayling have been documented in Back Creek. Water quality has generally shown improvement since mine closure and with completion of interim reclamation activities.

Additional sediment sampling may be required to determine what changes have occurred in sediment metal concentrations since 2005. However, sediment will be influenced by upstream (placer) activities beyond the control of AAMB.

Benthic invertebrate data are generally of good quality and sufficient for a YESAB project proposal submission.

We can discuss any further information gaps following your review of the draft environmental baseline report. Please contact us at your earliest convenience.

Sincerely,

EDI ENVIRONMENTAL DYNAMICS INC.

Via e-mail

Michael Setterington, R.P.Bio

Senior Biologist

Literature Cited

SENES Consultants Ltd. DRAFT. Human Health and Ecological Risk Assessment for the Mt. Nansen Mine Site. Prepared for Yukon Government, Assessment and Abandoned Mine Sites. October 2009. 288 pp (PDF review copy).

YESAB 2007 (DRAFT v2007-03). Integration and implementation of wildlife baseline and monitoring programs in Yukon: A proponent's guide. Prepared March 2007.