

**Independent Environmental Monitoring Agency
Environmental Workshop (Air Quality)
Yellowknife, NWT
November 17, 2010 (1:00-5:00pm)
Summary of Discussion**

Revised: December 21, 2010

PARTICIPANTS

Agency Directors:

Bill Ross
Tony Pearce
Kim Poole
Audrey Enge
Tim Byers
Jaida Ohokannoak

Agency Staff:

Kevin O'Reilly
Monica Krieger

BHP Billiton (BHPB):

Jamie Steele

Rescan Environmental Services:

Dan Jarratt

Environment Canada (EC):

Anne Wilson
Dave Fox

Indian and Northern Affairs Canada (INAC):

Lionel Marcinkoski
Jason Brennan

Government of the Northwest Territories

(GNWT):
Aileen Stevens
Patrick Clancy

Akaiicho Treaty 8 - Łutsël K'e Dene First Nation

(LKDFN):
Irene Catholique
Joseph Catholique

Akaiicho Treaty 8 - Yellowknives Dene First

Nation (YKDFN):
Randy Freeman

North Slave Métis Alliance (NSMA):

Robert Mercredi

Tłıchų Government (TG):

Harry Apples
Marvin Apples

Interpreter:

Margaret Mackenzie (Tłıchų)

An opening prayer was given by Harry Apples.

OPENING REMARKS

Chairperson Bill Ross welcomed everyone to the workshop and gave an overview of the agenda. He mentioned that there had been some improvements in BHPB's air quality monitoring program and that this workshop was an opportunity to review those and to provide further feedback. The presentations are included as handouts in participants' folders, and are also available on the Agency website.

**PRESENTATION ON EKATI AIR QUALITY MONITORING PROGRAM AND RESULTS
Jamie Steele (BHPB) and Dan Jarratt (Rescan Environmental Services)**

Jamie Steele was introduced as the BHP Billiton Environmental Advisor (Compliance) and the person responsible for the Air Quality Monitoring Program (AQMP) at Ekati. Jamie gave an overview of the AQMP initiated in 1998, as well as some key results and findings. The AQMP includes six key components:

- Dustfall Monitoring (initiated in 2006)

- High Volume Air Samplers (HVAS or High Volume Air Samplers)
- Continuous Air Monitoring (CAM)
- Snow Core Sampling (every three years, last was in 2008)
- Lichen Sampling (every three years, last was in 2008)
- Greenhouse Gas (GHG) Reporting

Jamie also discussed the CALPUFF air quality dispersion modelling completed in 2006, and how the predictions compared to 2008 AQMP findings. *(Note: CALPUFF is an advanced computer program that predicts where and how far pollutants will disperse in the atmosphere, based on weather patterns and landscape features in the area.)*

Dave suggested that dustfall monitoring should be more closely linked with lichen sampling to derive a threshold for impacts, which does not currently exist. Kim explained that lichens are receptor species because they collect and hold contaminants. He also pointed out that the farthest dustfall stations from the mine are at 1 km, but lichen samples have been taken out to 16-18 km and show effects at that range. The CALPUFF model might be used to indicate where further sampling sites should be located to measure the full effects of dust.

Aileen stated the background sites are at 21.5 km and 36 km from site and accessible only by helicopter. She suggested that monitoring staff could be making more visual or qualitative observations of the impacts of dust on vegetation (e.g. robustness or density), rather than just tracking trends in concentrations over time. This could help develop impact criteria and inform associated studies.

Data sheets should also indicate where the helicopter landing is made at these remote sites, as dust disturbed by the helicopter landing may help explain some outlier data. BHPB responded by saying this would be added to the data sheets for future sampling. Better linkages between the dustfall and lichen sampling should also be considered. Dustfall sampling may also be correlated with dust suppression efforts.

Lionel asked whether additional dustfall monitoring is planned for the Long Lake Containment Facility (LLCF), as this is one of the first areas for progressive reclamation. Kevin agreed there will be greater potential for dust once Cell B starts to dry out. BHPB could evaluate the success of revegetation and rock covers in preventing additional dust by using more downwind sites and comparing data before and after revegetation. Another site on the west side of Cell B might be helpful. Jamie said there has been no internal discussion about adding sites.

Tim questioned whether dust from the airstrip could be affecting water quality in Kodiak Lake. He suggested there should be a dustfall monitoring station near the middle of Kodiak Lake, anchored to the bottom, to catch the predominant easterly winds blowing off the airstrip (all the other stations are situated for northwesterly winds). Dave agreed there should be an additional station in areas of highest wind (according to the wind rose on Slide 6 and Slide 34 of the presentation). Anne asked if any of the snow core sites were on lake ice (Kodiak or others). Dan replied they are all at locations on land.

Jamie indicated that BHPB would carry out the same dustfall sampling for 2011 with better field data sheets, and also try to land helicopters farther away during remote site sample collection.

Jamie described some improvements to HVAS sampling methodology, including a "clean" regimen for the laboratory and having assigned people to prepare samples instead of using students or whichever staff member has time. He noted BHPB has had difficulty operating the HVAS in winter because snow builds up in the motors and screens. Aileen suggested they contact John McKay (ENR staff) for further information on winter sampling as he maintains and operates several units year-round. BHPB is also investigating another sampling device called a "partisol".

Jamie stated that BHPB would be putting out a contract for the CAM building operation that should better integrate weather data and provide better oversight.

Dave raised concerns about the snow sampling methodology as the snow cores are allowed to thaw before analysis takes place. This may result in the degradation of nitrates and sulphates in the samples, giving incorrect data and conclusions. Jamie said that frozen samples were attempted in 2008 but did not work out as planned so the methodology will be reviewed. Aileen asked whether there had been any attempts to collaborate with Diavik as the same concerns had been raised for its snow sampling. She also suggested contacting CAPMoN people for advice and protocols. *[Note: The Canadian Air and Precipitation Monitoring Network (CAPMoN), operated by Environment Canada, is a series of monitoring sites across the country. The network is designed to study regional patterns and trends of atmospheric pollutants such as acid rain, smog, particulate matter and mercury. The research is known for its high-quality data with extensive quality control/quality assurance protocols. There is one CAPMoN site in the NWT at Snare Rapids.]*

Irene asked why the snow core and lichen sampling is only conducted every three years. Dan replied that the purpose is to track long-term trends, and every three years is sufficient for this (i.e. sampling every year would not provide any additional information).

Dave suggested that the company needs better reporting of any exceedances of air quality standards with explanations. Dan indicated this will happen in the revised 2008 AQMP report and future reports.

Jamie summarized Ekati annual greenhouse gas emissions, and noted that BHPB continues to reduce its fuel consumption wherever possible. This included implementing an onsite shuttle service, which eliminated about half of the light vehicle fleet.

PRESENTATION OF AGENCY REVIEW OF EKATI AIR QUALITY MONITORING PROGRAM Jaida Ohokannoak (Agency)

Jaida gave an overview of the independent review of the 2008 AQMP by SENES Consultants, which was commissioned by the Agency. The review found that there was a general lack of explanation on sampling and monitoring methods (i.e. methodology used for data collection); there were some problems with sample analysis and how the results are presented and interpreted; and BHPB needs to include a brief description of the quality assurance/quality control (QA/QC) measures for each of the monitoring programs in its report.

The Agency is pleased with the progress and improvements that have been made to the AQMP at Ekati, and several issues raised by SENES have been resolved in further technical discussions with BHPB. The company has made a number of commitments including attempting winter sampling with HVAS for 2010-11, reviewing snow core and dustfall sampling methodology, and issuing a revised report or addendum. Some of the remaining issues include:

- The two background sites for dustfall monitoring, AQ-49 and AQ-54 (also used for snow and lichen sampling), are located downwind of the mine site and therefore may not be appropriate to represent background conditions.
- BHPB should compare results between programs within the AQMP, such as the snow sampling (winter deposition) and dustfall sampling (summer deposition). The company should also investigate linkages between the AQMP and other monitoring programs. For example, the link between ambient air quality, dust deposition on lichen and vegetation, and its potential effects on wildlife (particularly caribou). As well, the linkage between air quality, contaminants in the water column, and potential impacts to fish and aquatic life.

The Agency emphasized that BHPB should consult with Aboriginal communities about changes to the AQMP, and with Diavik because impacts of dust extend beyond mineral claims. The company should also re-run the CALPUFF model, and get the new incinerator operational with proper training for staff.

Harry said he has been to Diavik and viewed the dust monitoring stations there. He noted there are very strong winds on the barrenlands this time of year (at freeze-up), and with no trees or other obstacles in its way dust will travel even further than 15 km. Harry added that even near Yellowknife you can see how far

dust travels. He has been to places many kilometres inland from Highway 3, and you can see a thin film of dust on trees and vegetation.

Bill said the Agency first heard concerns about the impacts of dust on caribou from community members over 10 years ago. These concerns led to the development of lichen studies, and are a good example of how Traditional Knowledge can inform environmental monitoring programs.

OVERVIEW OF INCINERATION EFFECTS AND BEST PRACTICE GUIDELINES

Anne Wilson and Dave Fox (Environment Canada)

Dave gave an overview of incinerators typically used in the north to deal with waste, and the issue of dioxins and furans. *(Note: Dioxins and furans are toxic chemical compounds that are released into the atmosphere mainly through the burning of waste. They are extremely persistent in the environment and build up in sediments and vegetation. They also bioaccumulate, becoming even more concentrated further up the food chain.)* EC has produced a Technical Document for Batch Waste Incineration in order to fill a knowledge gap, since the Canada-wide Standards (CWS) for dioxins and furans focused more on larger, municipal-type projects.

Small remote camps in the NWT typically use single chamber incinerators, which do not reach high enough temperatures to burn off toxic emissions such as dioxins and furans. EC is encouraging the use of dual chamber incinerators, but these are expensive. However, single chamber incinerators with an afterburner within the stack are a “second-best” alternative for smaller camps.

Anne presented the results of sediment sampling near the Ekati mine in April 2008. Ekati has used a single-chamber incinerator with an afterburner since production began in 1998, located on the shore of Kodiak Lake. Samples were taken from Kodiak Lake as well as Counts Lake, a reference site located 15 km from the mine. Results showed that total dioxins and furans were several times higher in Kodiak Lake than in Counts Lake.

Audrey asked why there are lower levels of dioxins and furans in the lower layers of Kodiak Lake sediment. Anne replied these are older layers, deposited before the incinerator was in use. Deposition rates in the north are very slow, and in the past there was less long-range transport of contaminants globally. Since the top layer of sediment represents the last 10 years, we are essentially seeing pre- and post-development of Ekati.

Irene questioned whether BHPB knew about dioxins and furans when they first started the project. Jamie answered that dioxins and furans were not as big an issue at the time of the original environmental assessment. Dave agreed there was little awareness of the incineration issue in the early 1990s. EC has only focused attention on it since 2005, and is trying to catch up on improvements. He said that BHPB was proactive in buying the new incinerator in 2006, but although it cost approximately \$3 million it is still not operational. Dave also mentioned that Diavik purchased a similar new incinerator, which is not yet operational either.

Dave noted that EC can provide advice to companies on preferred types of technology. EC is trying to get operators to move away from units with emission controls towards complete combustion units, and manufacturers are now supposed to meet CWS for concentrations in the stack. EC now also attempts to get incineration conditions added to land use permits and water licences (e.g. requirement for an incineration management plan), but they have had more success in Nunavut than in the NWT. Anne and Dave stressed the most important aspects of incineration are proper waste management, proper equipment, and proper operation of the equipment.

GENERAL DISCUSSION

Joseph noted that elders say lichens do not grow every spring, so there is a concern for contaminants collecting on lichen and staying there. Community people cannot travel through the mine site anymore

because of security, but the animals still do. What are they eating and inhaling? He added that the barrenlands are a beautiful place that shouldn't be wasted. It is important to protect these areas for future generations.

Robert asked whether rodents around the mine site or fish in Kodiak Lake have been sampled for dioxins and furans. Anne replied that this is the logical next step, but would need to be done on a species that does not move around very much (e.g. slimy sculpins). Kim agreed that sculpins would be the best test subjects. He mentioned that voles were tested in the early 1990s, but the small size and lifespan of rodents make them less desirable test subjects than sculpins or birds (although birds also migrate as far as South America so could be picking up contaminants at many different places). Tim wondered whether there is any way to separate out the types of dioxins and furans from incineration from those carried by long-range transport. Anne replied that this might be possible, but the fact that there are significantly higher levels of dioxins and furans in the Kodiak Lake samples than in the control lake that is farther away is in itself proof that incineration is the main source.

Irene was concerned that even more contaminants are now showing up on the land. She said that Łutsël K'e is surrounded by camps and mines, all of which have single chamber incinerators, and is worried about the effects on the water and fish of Great Slave Lake. Anne said that there was no open burning at the dump in Łutsël K'e this year which is a good thing. Aileen stated that the GNWT has strongly discouraged open burning at community landfills since 1993.

Monica asked Jamie to explain to participants why the new incinerator is still not operational. Jamie replied there have been numerous issues and complications since 2006. A scrubber was added to the original incinerator and there were problems in getting it to work properly. The liquids it produces are also highly acidic and it is not clear how to dispose of this waste. The modifications that were made to the unit were not approved by the manufacturer so there are issues around how to get it changed back and by whom, and there were problems with the building and ventilation. Dave recommended that BHPB should simply eliminate the scrubber on the unit. Harry asked whether the new incinerator would be inspected before it becomes operational. Dave replied that EC recommends stack testing before a unit is commissioned to make sure it works properly, but there are no regulations that require it.

CLOSING REMARKS

Bill thanked everyone for attending the workshop and felt it was very valuable. He particularly thanked BHPB for attending and participating in the workshop this year. It clearly shows that bringing people together on an annual basis to discuss monitoring programs and results is very valuable.

A closing prayer was given by Harry Apples.

RECOMMENDATIONS FROM THE WORKSHOP

1) BHPB should consider additional dustfall monitoring sites around Cell B of the LLCF (to evaluate the effectiveness of dust control measures), and around the middle of Kodiak Lake (to evaluate the potential effects on water quality from airstrip dust).

2) BHPB should get the new incinerator commissioned and operational.

3) BHPB should compare results between programs within the AQMP, such as the snow sampling (winter deposition) and dustfall sampling (summer deposition). The company should also investigate linkages between the AQMP and other monitoring programs for aquatics and wildlife. For example:

- Link between ambient air quality, dust deposition on lichens and other vegetation, and potential effects on wildlife (particularly caribou).
- Link between air quality, contaminants in water bodies, and potential impacts to fish and aquatic life. In particular, since dioxins and furans as a result of incineration are present in lake sediments, the next logical step would be sampling fish species such as sculpins for the presence of these compounds.