

A PUBLIC WATCHDOG FOR ENVIRONMENTAL MANAGEMENT AT EKATI DIAMOND MINE™



**Independent**  
Environmental  
Monitoring Agency

*Technical Annual Report* 2007-08

# Agency Recommendations for 2007-08

## Recommendation

**Closure and Reclamation:** *The Department of Indian and Northern Affairs (DIAND) should increase the amount of resources available to potentially affected Aboriginal organizations to engage in regulatory and review processes, in particular the closure planning process for the Ekati Mine.*

**DIAND Response:** Indian and Northern Affairs Canada (INAC) recognizes that Aboriginal organizations have concerns about their capacity to participate in regulatory and review processes. INAC has no formal process to provide participant funding for these process, but will continue to consider individual proposals as funding becomes available. ■



## Agency Recommendation Themes 1997-2008

Recommendation Recipient	Frequency of Recommendations
BHPB	80
Government (GNWT, GN, Government of Canada)	13
Water Boards (NWT Water Board, MVLWB, WLWB)	8
Environmental Agreement signatories	3
Aboriginal Society Members and BHPB	3
Aboriginal Society Members	1
All Agency Society Members	1
Total 109	

## Recommendation

**Closure and Reclamation:** *BHP Billiton (BHPB) should improve its reclamation research plan to include an explicit description of the link between the research task and the related closure measure, how the research task will be carried out to deal with each of the remaining uncertainties, what data will be collected, how the results will be used to improve the Interim Closure and Reclamation Plan (ICRP) and when the results will be available to amend the ICRP. This recommendation should be targeted especially at the four key issues of concern—pits, Long Lake Containment Facility (LLCF) cover, water quality in the LLCF, and extra-fine processed kimberlite.*

**BHP Billiton Response:** The Agency provided this recommendation to BHPB early in 2008 when comments were sought as a part of the ICRP review process. This advice was considered together with requests and comments from community and regulatory members of the ICRP Working Group. Changes to the layout and content of the *Reclamation Research Plan* have been undertaken to address these and other concerns and will be included in the final draft due later this year. ■

## Recommendation

**Wildlife Effects Monitoring:** *BHP Billiton (BHPB) should, in collaboration with the Government of the Northwest Territories, Department of Environment and Natural Resources (GNWT-ENR), recommence wolverine DNA monitoring in 2009 for continuation every second year. All cells within the BHPB study area should be sampled (varying numbers of cells were not sampled in 2005 and 2006). The snow track surveys for wolverine should be discontinued in favour of the DNA monitoring.*

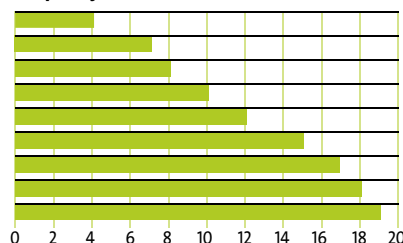
**BHP Billiton Response:** The wolverine DNA monitoring program carried out in 2005 and 2006 was a part of a sampling program operated and coordinated by ENR with four northern mining developments. BHPB is prepared to cooperate with ENR in the future should a similar monitoring program be set up. Future modifications to the Wildlife Effects Monitoring Program will be considered.

**GNWT Response:** It is the GNWT's intent to continue to move forward with a wolverine DNA monitoring program in the central barrens. The GNWT has had initial discussions with BHPB about participation in this program. ■

**Themes:**

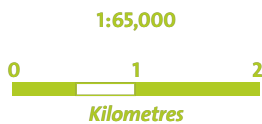
- Role of government in environmental management
- Regional monitoring and cumulative effects
- Wildlife monitoring
- Kodiak Lake monitoring
- Waste rock management, seepage and characterization
- Aquatic monitoring and fisheries
- Closure and reclamation
- Traditional Knowledge and Aboriginal involvement
- Environmental management, planning and reporting

**Frequency:**

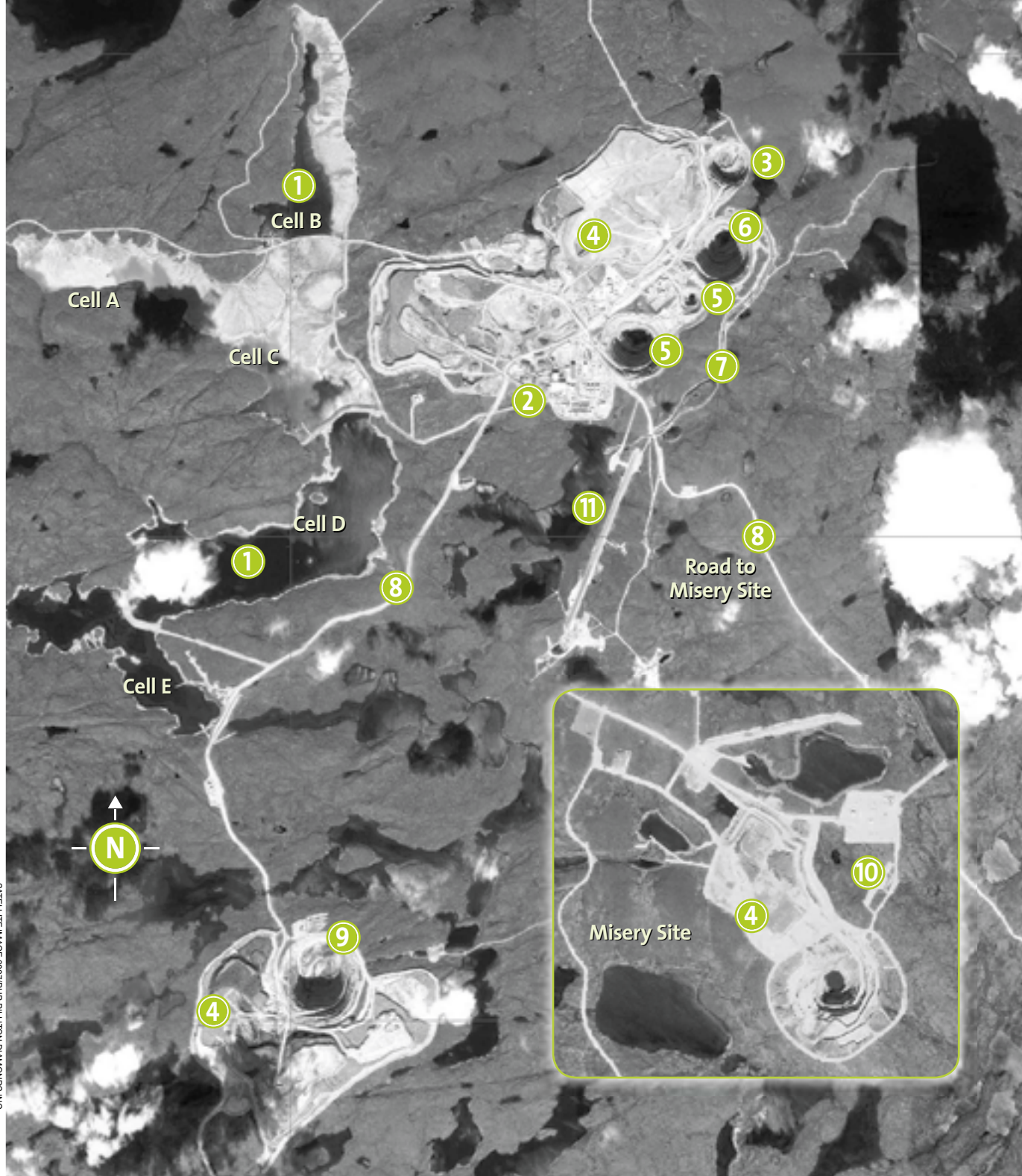


# Ekati Diamond Mine

- ① Long Lake Containment Facility (Cells A – E)
- ② Main Camp
- ③ Beartooth Pit
- ④ Waste Rock Piles
- ⑤ Koala and Koala North Pit
- ⑥ Panda Pit
- ⑦ Panda Diversion Channel
- ⑧ Haul Roads
- ⑨ Fox Pit
- ⑩ Misery Site
- ⑪ Airstrip



SATELLITE IMAGE 2007/BHP BILLITON DIAMONDS INC.





# Independent Environmental Monitoring Agency

## Director Biographies



### **Bill Ross** *Appointed April 1997*

*Appointed by BHP Billiton, Government of the Northwest Territories and Government of Canada (in consultation with the Aboriginal governments).*

Bill Ross has studied and participated in the professional practice of impact assessment for 35 years with a focus on *cumulative effects* assessment and follow up studies. He has served as a director of the Agency since its inception and as its Chair since 2003. His goal for the Agency is that, when the Ekati Mine closes, BHP Billiton will be recognized as having operated the best environmentally-managed mine in Canada's North.



### **Tim Byers** *Appointed May 2001*

*Appointed by Akaitcho Treaty 8 (Lutsel K'e First Nation and Yellowknives Dene First Nation).*

Tim Byers is an independent consultant living in Manitoba who has been working on projects in the Canadian arctic all his professional life, specializing in studies of arctic seabirds, fish and marine invertebrates. He has also assisted Aboriginal communities in documenting their indigenous environmental knowledge. Tim is keenly interested in seeing more Aboriginal youth become engaged in the environmental sciences, as well as Traditional Environmental Knowledge (TEK) being more frequently used in environmental monitoring and research.



### **Jaída Ohokannoak** *Appointed December 2003*

*Appointed by the Kitikmeot Inuit Association.*

Jaída Ohokannoak has served as the secretary-treasurer since 2004. She has resided in northern Canada for over 16 years, currently in Cambridge Bay, and has experience in environmental assessment, renewable resource management, research and monitoring studies. She believes that mining can be conducted in an environmentally responsible manner that will benefit both industry and local people without long-term impacts to the environment.



### **Sheryl Grieve** *Appointed October 2005*

*Appointed by the North Slave Métis Alliance.*

Sheryl Grieve is a Geographer and Environmental Scientist who specializes in culturally appropriate environmental assessment, using indigenous values in Benefit-Cost Analysis and Geographic Information Systems. Sheryl is a long-term northerner who currently manages the Environment, Lands and Resources Branch of the North Slave Métis Alliance.



### **Laura Johnston** *Appointed December 2006*

*Appointed by BHP Billiton, Government of the Northwest Territories and Government of Canada (in consultation with the Aboriginal governments).*

Laura Johnston recently retired from Environment Canada after 30 years of service. For the last 15 years she was the Manager of Environmental Protection Branch's Northern Division with responsibilities for overseeing the department's role in environmental assessment, environmental enforcement and environmental emergency prevention, preparedness and response for the NWT and Nunavut. Her expertise is in the fields of chemistry and geology with a focus on water related issues, especially groundwater quality.



### **Tony Pearce** *Appointed March 1997*

*Appointed by the Tlicho Government.*

Tony Pearce is a resource planner specializing in planning and policy development for First Nations in areas related to treaty negotiation and land use.



### **Kim Poole** *Appointed December 2006*

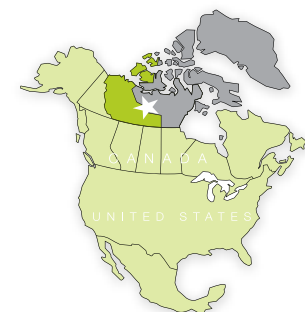
*Appointed by BHP Billiton, Government of the Northwest Territories and Government of Canada (in consultation with the Aboriginal governments).*

Kim Poole is a professional, independent wildlife biologist with over 25 years experience in the NWT, Nunavut and BC in the areas of wildlife research and assessment of impacts due to forestry, mining and tourism.

A PUBLIC WATCHDOG FOR ENVIRONMENTAL MANAGEMENT AT EKATI DIAMOND MINE™



# Independent Environmental Monitoring Agency



■ NORTHWEST TERRITORIES  
■ NUNAVUT

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*Technical Annual Report* 2007-08

## Message from the Chairperson

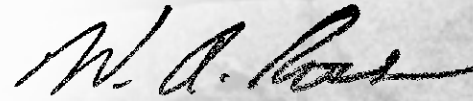
It is with pleasure that I present to you the technical version of the 2007-08 annual report of the Independent Environmental Monitoring Agency. The report summarises the Agency's activities and offers recommendations to BHP Billiton (BHPB) and to the governments of Canada and the Northwest Territories so that the good environmental performance observed at the mine can continue. The major focus of the Agency for this past year has, once again, been on closure and *reclamation* of Ekati. The draft Interim Closure and Reclamation Plan (ICRP) submitted by BHPB has been the subject of review by the ICRP Working Group on which we serve and to which we have contributed. This process is coming to an end and we are hopeful it will lead to a good closure plan, including a sound *reclamation* research plan, one that will deal effectively with the four key uncertainties of concern for developing the ICRP: pit lakes, Long Lake *tailings* cover, water quality in Long Lake *tailings* impoundment, and clay slurries (*extra-fine processed kimberlite*). As can be observed by one of our recommendations, we also think this process can be a useful tool to achieve capacity building in the communities. We have also summarized our recommendations since 1997 so the reader will have a sense of what our focus has been over the years.

The Agency has also been devoting efforts to the review of the Watershed Adaptive Management Plan, water quality issues associated with the Long

Lake Containment Facility (very well explained in the water quality model developed and circulated by BHPB), air quality matters (especially dust), the *cumulative effects* of Ekati and other human activities on caribou and, as illustrated by another recommendation, to the effective monitoring of wolverine.

We were able to resolve our disagreement with BHPB regarding use of funds allocated for the Agency's involvement in regulatory processes. One result of this resolution is a belief that we are more able to work effectively with BHPB even when we disagree on details. This outcome, we hope, will result in achieving our common goal of effective environmental management at Ekati.

Our efforts to maintain community input this past year have again been valuable, although we were not able to hold a board meeting in a community. Because we have found such meetings to be very useful, we have already scheduled one for the fall of 2008. We did hold an environmental workshop in conjunction with our annual general meeting and conveyed the results of that workshop to BHPB and to the governments. One key message was the importance of developing capacity for effective environmental management in the communities, which could be applied to Ekati. We also met with Aboriginal Society Members several times during the year, as is indicated in this report. Such meetings provide valuable information for the Agency and, we believe, allow us to help the communities. ■



William A. Ross, Chairperson  
March 31st, 2008



# Agency Activities and Assessing the Agency

## Highlights:

- **Five board meetings, the annual general meeting and an environmental workshop hosted by the Agency in Yellowknife;**
- **BHP Billiton (BHPB) agreed to improve its air quality monitoring following an independent review commissioned by the Agency;**
- **Continued participation in the Interim Closure and Reclamation Plan (ICRP) Working Group and frequent advice to BHPB on reclamation planning;**
- **Full complement of directors active throughout the year; and**
- **Mediation process led to the resolution of a funding issue.**

## Agency Activities

Over the course of 2007-08, Agency activities were carried out in accordance with the approved Agency work plan, which links director and staff activities to our mandate as described in the Environmental Agreement. Our work plan is also used for budgeting purposes and guides the direction and focus of the Agency, including the directors' review of technical documents and the funding available for publications and *consultation* events. As in previous years, board meetings were held in Yellowknife along with an annual general meeting and an environmental workshop to discuss environmental monitoring results at Ekati. The Agency funded participants from our Aboriginal Society Members to attend the annual general meeting and environmental workshop in Yellowknife.

The Agency visited the Ekati Mine site in May 2007 and toured various parts of the mining operation. Many of the photographs taken during the Agency visit to Ekati are found in the pages of

this annual report. Unfortunately, due to scheduling difficulties, the Agency was not able to have a board meeting hosted in one of the Aboriginal Society Member communities over the course of the 2007-08 year. We hope to visit Lutsel K'e later in 2008.

The Agency participated in reviews of key BHPB environmental reports and regulatory initiatives throughout the year. In large part due to our technical review of BHPB's Air Quality Monitoring Program (AQMP) design, a collaborative technical meeting was held in January 2008. At this meeting a productive discussion took place among various experts in the field including consultants, the company and governments, and we expect an improved AQMP to be implemented at Ekati over the next year. We also provided advice to BHPB on numerous topics throughout the year such as the Sable, Pigeon and Beartooth Water Licence renewal and the new Watershed Adaptive Management Plan (WAMP). We provided guidance to the Department

of Indian and Northern Affairs (DIAND) regulatory reviewer Neil McCrank on topics such as the role of environmental monitoring agencies and the need for adequate participant funding. Agency representatives also regularly attended meetings in Yellowknife on topics such as the future of the pits at closure and caribou management.

Our focus remains on ensuring the eventual closure and *reclamation* of Ekati is the best possible, from an environmental perspective, of any mining project in Canada's North. We have invested considerable time in participating in the Wek'èezhii Land and

Water Board (WLWB) led ICRP Working Group. Tony Pearce and Bill Ross represent the Agency in the ICRP Working Group meetings and all directors contribute to forming Agency submissions to the WLWB and BHPB. We have at times offered advice to BHPB directly in the interest of ensuring the process continues to move forward. For more information on *reclamation* at Ekati, please see the Closure and *Reclamation* section in this report.

In order to achieve improved coordination and communication between the Agency and the *Environmental Agreement* signatories (BHPB, the Government of



Agency director visiting Lutsel K'e

## AGENCY ACTIVITIES AND ASSESSING THE AGENCY

Northwest Territories (GNWT) and the Government of Canada), biannual meetings are held. At these meetings the Agency and the signatories provide an update on activities and the responses it has received from BHPB, as well as the Agency reporting on financial expenditures and future plans. The *Environmental Agreement* signatories are offered an opportunity to respond to formal Agency recommendations and other discussions take place. Additionally in 2007-08 a mediation process was conducted to resolve the issue of the interpretation and eligibility of the Agency to use its "Separate Fund" to participate in interventions and hearings. It was agreed that the Agency would be able to access the budgeted funds in the event that the WLWB provides an indication in writing that there will be a hearing on any given matter. For a copy of the mediation agreement please see our website.

### Agency Consultation and Communication

The key means of communication for the Agency are the production of plain language and technical annual reports, a website and library of Ekati related material, a brochure sent out to each household in our Society Member communities, an annual general meeting and in some years, environmental workshops. Our outgoing and incoming correspondence is summarized on the following page (Tables 1 and 2). The staff also respond to frequent requests from students and the public for information

on and photographs of Ekati.

Director *consultation* visits in the communities are also a key aspect of Agency communications. We attempt to send a director to any community that requests information about Ekati (see Table 3). During 2007-08, we again found that other resource development pressures in the NWT have led to

reduced opportunities for the Agency to meet with community members. We continue to hear comments from our Society Members, at the staff and leadership level, that they are comforted knowing the Agency is performing its role in monitoring activities and reviewing environmental reports produced annually by BHPB.

### Assessing the Agency

Over the past year we have generally received favourable reviews from our Society Members at the annual general meeting and on other occasions. We have also observed that Agency technical reviews are often detailed and comprehensive enough to receive compliments from the government

*Continued on page 7 ►*



*Agency 2007 annual general meeting in Yellowknife.*

## Agency Outgoing Correspondence

Over the 2007-08 period, we distributed 20 letters addressed to the following organizations and copied to all of our Society Members:

### Table 1. Agency Outgoing Correspondence

Over the 2007-08 period, we distributed 20 letters addressed to the following organizations and copied to all of our Society Members:

#### Volume of Agency Outgoing Correspondence

Recipient (copied to all Agency Society Members)	Number of pieces of correspondence sent
WLWB	11
BHPB	6
DIAND	1
<i>Environmental Agreement</i> signatories	1
Environmental Monitoring Advisory Board/ Snap Lake Environmental Monitoring Agency	1

#### Subject of Agency Correspondence

Subject	Number
Closure and <i>reclamation</i> planning	7
Water licence and environmental agreement administration	6
Aquatic effects and monitoring	2
Air quality monitoring	1
Wastewater and <i>processed kimberlite</i>	1
Wildlife	1
Waste rock	1
Aquatic and wildlife monitoring (jointly)	1

### Table 2. Agency Incoming Correspondence

131 pieces of correspondence were received from all parties and filed to the Agency public registry in 2007-08.

From	Number
BHPB	46
WLWB or its consultant	38
DIAND	16
Agency Aboriginal Society Member	8
GNWT	8
Department of Fisheries and Oceans	6
Environment Canada	6
DIAND and GNWT collaboratively	1
Other	2

Subject	Number
Closure and <i>reclamation</i> planning	38
Water licence and environmental agreement administration	36
Waste rock	16
Aquatic monitoring	13
Wildlife monitoring	11
Wastewater and <i>processed kimberlite</i>	6
Ekati inspections	4
Air quality monitoring	3
Exploration (diamond)	2
Hydrocarbon management	1
Other	1

## AGENCY ACTIVITIES AND ASSESSING THE AGENCY

Table 3. Agency Communication and Consultation Activities in 2007-08

Date and Location	Purpose	Main Issues
May 24, 2007 Yellowknife	<i>Environmental Agreement</i> Implementation Meeting	<ul style="list-style-type: none"> <li>discussion of communications responsibilities and draft recommendations for the 2006-07 annual report by the Agency (BHPB and governments agreed to respond in time for annual report publication)</li> <li>two matters in dispute discussed and it was agreed to send the second matter to mediation (allocation of expenses to the Separate Fund)</li> </ul>
May 28-29, 2007 Lutsel K'e	Director visit at the request of the Wildlife, Lands and Environment Committee	<ul style="list-style-type: none"> <li>general update on Agency activities</li> <li>provided update on ICRP review</li> <li>concern raised by community that fish should be part of the final pit lakes</li> </ul>
May 2007 Yellowknife	Agency director meeting with North Slave Métis Alliance (NSMA) staff	<ul style="list-style-type: none"> <li>discuss Ekati research application reviews and potential role of the Agency</li> </ul>
August 14-15, 2007 Wemindji, Quebec	Agency invitation to a Community Mining Conference by the Cree Nation of Wemindji	<ul style="list-style-type: none"> <li>overview presentation given on the Agency and its work</li> <li>questions from Quebec mining companies and local communities responded to by Agency representative</li> </ul>
September 4-5, 2007 Lutsel K'e	Director visit at the request of the Wildlife, Lands and Environment Committee	<ul style="list-style-type: none"> <li>general update on Agency activities</li> <li>provided presentation on the Agency's 2006-07 annual report and the ICRP review</li> </ul>
September 1 and 8, 2007 Yellowknife	Agency director meeting with NSMA staff	<ul style="list-style-type: none"> <li>update provided on Agency activities and annual report</li> </ul>
September 11 and 13, 2007 Yellowknife	Agency director meeting with NSMA members	<ul style="list-style-type: none"> <li>role of Agency in upcoming Sable, Pigeon and Beartooth (SPB) Water Licence renewal and ICRP</li> </ul>
September 22 and 28, 2007 Yellowknife	Agency director meeting with NSMA staff and Board of Directors	<ul style="list-style-type: none"> <li>Agency role and positions on ICRP Working Group and BHPB Annual Environmental Report</li> </ul>
November 13, 2007 Yellowknife	Environmental workshop	<ul style="list-style-type: none"> <li>Agency sponsored workshop to present results of the 2006 Ekati environmental monitoring programs</li> <li>usefulness of annual collaborative workshop was observed</li> <li>interest in Long Lake Containment Facility (LLCF) water quality predictions and Adaptive Management Plan</li> <li>persistent concerns around dust</li> <li>Agency transmitted concerns in a January 7, 2008 letter to BHPB and governments with a recommendation that BHPB meet with communities to discuss changes to the air quality monitoring program</li> </ul>
November 14, 2007 Yellowknife	Agency annual general meeting	<ul style="list-style-type: none"> <li>Agency director presented annual report and financial statements for 2006-07</li> <li>concerns were raised about preventing problems as seen with past mines and that some water quality parameters are approaching Canadian Council of Ministers of the Environment (CCME) limits</li> <li>some discussion by Aboriginal Society Members on the need to change the <i>Environmental Agreement</i> as part of the five-year review</li> <li>a motion was passed by all Society Members to encourage governments and industry to work together to help build capacity in Aboriginal communities to participate in regulatory processes and agreements</li> </ul>

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## AGENCY ACTIVITIES AND ASSESSING THE AGENCY

regulators. In addition there have been occasions when the institutional memory of the Agency has been helpful in reviewing Ekati research plans and regulatory reviews. On these occasions the Agency can fill the role of reminding others of the rationale for past decisions.

These are some of the key reasons the Agency was brought into existence and we are pleased to fulfill this role.

On the other hand we have noticed some diminished ability of the Agency to meet with as many community members as often as we would like or

to host a board meeting in a community other than Yellowknife. We also do not regularly receive as much feedback about the Agency performance as we would like. For a variety of reasons, we are considering a formal self-evaluation of the Agency performance that would

be reported on next year, as we did in 2000. The Agency remains committed to regular communication with our Society Members and welcomes constructive feedback linked to our ability to operate as determined by the Environmental Agreement. ■

Table 3. Agency Communications and Consultation Activities in 2007-08 (continued)

Date and Location	Purpose	Main Issue
November 14, 2007 Yellowknife	Agency special meeting with Aboriginal Society Members	• opportunity for Aboriginal Society Members to raise items of specific concern
December 13 and 17, 2007 Yellowknife	Agency director meeting with NSMA Environment Committee	• update on Agency activities and BHPB community meetings
December 18 and 22, 2007 Yellowknife	Agency director meeting with NSMA staff and leaders	• update on Agency and BHPB activities
January 20 and 25, 2008 Yellowknife	Agency director meeting with NSMA staff and leaders	• update on Agency and BHPB activities
January 25, 2008 Yellowknife	DIAND workshop to develop Aquatic Effect Monitoring Program (AEMP) guidelines (Agency director participated by phone)	• Agency position on collaborative reviews of AEMP results and methodology; need for link to Adaptive Management Plans; handling of data outliers; incorporation of Traditional Knowledge (TK)
February 6, 2008 Yellowknife	<i>Environmental Agreement</i> Implementation Meeting	• BHPB presentation on operational highlights • Agency presentation on findings, recommendations, budget and work plans for 2006-07 and 2007-08
February 15, 2008 Yellowknife	Adaptive Management Workshop	• Agency representatives participated in this workshop sponsored by the WLWB, DFO and DIAND
February 21-22, 2008 Barren-Ground Caribou <i>Cumulative Effects</i> Workshop, Yellowknife	Agency director and staff attend	• Agency representatives participated in this workshop sponsored by ENR • the workshop participants supported implementation of a pilot project in the Bathurst herd range
March 10-11, 2008 Lutsel K'e	Director visit at the request of the Chief and Council	• Agency director provides presentation on the Agency, activities and status of Ekati
March 20, 2008 Yellowknife	BHPB presentation on Pit Lakes Studies	• Agency representatives participated in the meeting; questions were raised around modification and dropping of several approved research tasks
March 20, 2008 Yellowknife	Agency director attends NSMA AGM	• update provided on Agency and BHPB activities

# Waste Rock Management

## Highlights:

- ▶ BHP Billiton (BHPB) expanded the Panda-Koala-Beartooth waste rock pile to handle additional waste from the Beartooth Pit; and
- ▶ BHPB submitted special studies relating to waste rock *geochemistry*. Drainage from the coarse *kimberlite* reject piles may require future attention.

## Activities in 2007-08

Mining continued throughout the year at the Beartooth and Fox Pits, and underground at Panda Pit. By the end of 2007, BHPB had deposited approximately 160 million tonnes of waste rock on the surface. The management of the waste rock was relatively routine, although the company applied for, and received, approval from the Wek'ëezhii Land and Water Board (WLWB) to expand

the Panda-Koala-Beartooth waste rock pile to the north of the main camp for the storage of additional waste rock from Beartooth Pit. We supported this request, although we stated a preference for adding the extra rock to the top of the pile rather than extending the footprint as BHPB had requested. We also recommended that BHPB take measures to store the new waste rock in such a way as to be readily available for the

construction needs for the Sable haul road or wildlife ramps for the waste rock dumps at closure.

BHPB also submitted its regular waste rock seepage monitoring reports, along with several other special studies relating to waste rock *geochemistry*.

## 2006 Waste Rock and Waste Rock Storage Area Seepage Report

Discussed briefly in our last year's annual report, the 2006 Waste Rock and Waste Rock Storage Area Seepage Report is a comprehensive study on the *geochemistry* of Ekati rock types to characterize *metal leaching* and acid generating potential. BHPB believes that rock types are now thoroughly characterized and that

sampling frequency can be reduced or replaced by visual segregation and placement of waste rock. Further, the company suggests that all rock types (including *kimberlite*) and surficial materials (till, overburden, lake sediments), have little or no potential for acid generation. Some waste rocks at the Misery site (biotite schist) are "weakly" acid generating and need to be segregated.

The study indicates that there are issues that may require consideration at some point in the future. For example, typical drainage from the coarse *kimberlite* reject storage area shows that elevated concentrations of some contaminants over reference locations may be expected—for example, *ammonia*, molybdenum, nickel, cadmium, cobalt and zinc. While typical drainage from this rock is expected to have a pH of about 6.3, it could go as low as 3.9, which would also result in elevated concentrations of suspended sediments, aluminum, copper, iron, silica, arsenic, chromium and lead. The report points out that drainage from the coarse reject waste dump currently reports to the Long Lake Containment Facility (LLCF) and "has no direct impact on the receiving environment". While true, there still remains a closure planning issue once the LLCF becomes part of the receiving environment and is subject to potentially contaminated drainage.

BHPB predicts long-term seepage from most of the waste rock piles will not be a concern. Even in cases where high acid drainage has resulted from laboratory test work—such as for the



View of the Fox waste rock pile.

Misery metasediments—actual sampled waste rock drainage at Misery leads the company to believe that acid generation will not be a concern, especially if all waste rock piles freeze in their core zones, as predicted by BHPB.

BHPB is counting on the formation of permafrost within the waste dumps as a factor that will retard or eliminate waste rock seepage in the future. As we mentioned last year, however, in some waste rock dumps freezing is not yet happening. In March 2007 we wrote to the WLWB with this observation, and referred to temperature data from the Fox and Misery waste rock piles and the coarse *kimberlite* rejects stored in the Panda waste rock pile that showed that portions of these were not freezing.

In response, BHPB wrote to us in May 2007, presenting several possible explanations why cooling in these areas may be slower than usual, but predicting that these would eventually freeze. As noted above, this is an issue of potential concern for *reclamation* planning, since all waste rock drainages will at closure report to the receiving environment. We will continue to monitor freezing trends in the waste rock piles to verify that BHPB's predictions are correct.

### Acid Rock Drainage Classification of Kimberlite

In July 2007, BHPB submitted the *Acid Rock Drainage* (ARD) Classification of *Kimberlite* report that analyzed *kimberlite mineralogy* and carbonate content with respect to the acid neutralizing potential. The report confirmed that

although *kimberlite* pipes can have variable carbonate *mineralogy*, using a measurement of total inorganic carbon to approximate the neutralizing carbonate content is a workable method of predicting ARD potential of the rocks. *Kimberlite* has a high neutralizing potential, but the *mineralogy* responsible has never been adequately understood until now. The Agency has been requesting this information for years, and appreciates that BHPB has now completed the mineralogical work in order to better understand *kimberlite geochemistry* and long-term behaviour.

### 2007 Waste Rock and Waste Rock Storage Area Seepage Report

In the spring of 2008, BHPB submitted its updated 2007 Waste Rock and Waste Rock Storage Area Seepage Report. This report shows generally consistent results with previous years, with all parameters meeting water licence criteria in those locations where seeps are flowing directly to the receiving environment. A few seeps show elevated levels—nickel and zinc at Misery “continue to remain a concern”; molybdenum and uranium also are higher than previous years. Water chemistry at most of the Misery sampling stations shows elevated parameters above typical background concentrations, with one seep having the highest recorded concentrations of sulphate, total calcium, total magnesium, and several other trace metals. BHPB notes that the cause of the increase in trace metal concentrations “is under investigation”.

Some of the seeps in Misery, Fox and Panda areas have slightly acidic pH, believed by BHPB to reflect natural conditions and not to be a significant concern.

Seeps in the vicinity of the coarse *kimberlite* reject dump show increases in many parameters to levels above or near the historical high concentrations. BHPB concludes there are no concerns with this drainage since it is directed to the LLCF. As we noted earlier, however, both the LLCF and the waste rock dumps become a part of the receiving environment at closure and, therefore, there may be a potential concern.

The seep that has in the past been the subject of special study (Seep 18b northeast side of the Panda waste rock pile) showed increased levels of aluminum, iron, lead and chromium—all believed by BHPB to be from dust from nearby mining activities at Beartooth Pit, since these metals are all at or near detection limits in the dissolved load. Sulphate, *nitrate*, nickel and aluminum are elevated downstream from Seep 18b, although all concentrations are within water licence limits.

### Geochemistry Studies

In September 2007, as a requirement of its water licence, BHPB submitted an Investigation of Seep 19 Acidity that reported on investigations into why a seep from the Panda waste rock dump had been producing acidic drainage and increased levels of aluminum for several years. Both aluminum and pH levels were fluctuating around the water licence

discharge limits, and the Agency had previously raised concerns about the possibility of the acidic drainage arising from sulphide oxidation of mine waste rock. The new study tested a hypothesis by BHPB that both the lower pH and elevated aluminum could result from an ion exchange mechanism as waste rock seepage interacted with tundra soils. The report concluded that the observed seep concentrations were consistent with the levels that would result from the ion exchange process. In the Agency's view, this explanation seems plausible.

### Agency's Assessment

BHPB's management of its waste rock is generally good, and the company is diligent in conducting the investigations needed to better understand waste rock *geochemistry* and long-term behaviour. This year's monitoring of waste rock seepage shows that some metals are at historically high values, and that the company still has further work to do, as it acknowledges, to understand the mechanisms of trace metal release from various rock types. We continue to be disappointed that BHPB seemingly will not allow its consulting experts, when submitting their technical reports, to write about the management implications of the results, or propose recommendations, so that management decisions will be better informed. We are not as confident as BHPB that all the waste rock piles will effectively freeze internally such that long-term waste rock seepage will be diminished or prevented. ■