INDEPENDENT ENVIRONMENTAL MONITORING AGENCY
P.O. Box 1192, Yellowknife, NT X1A 2N8 ▪ Phone (867) 669-9141 ▪ Fax (867) 669-9145
Website: www.monitoringagency.net ▪ Email: monitor1@yk.com

July 26, 2010

Violet Camsell-Blondin
Chairperson
Wek'eezhi Land and Water Board
Box 32
Wekweeti NT X0E 1W0

Re: Intervention on Interim Closure and Reclamation Plan

Dear Ms. Camsell-Blondin

The Agency is pleased to submit the attached intervention for the scheduled public hearing on BHP Billiton's Interim Closure and Reclamation Plan.

The Agency will be represented at the hearing by Tony Pearse, myself and Kevin O'Reilly, and our legal counsel, Gavin Fitch. We anticipate that it will take approximately 30-45 minutes to make a presentation of our intervention and we would be pleased to answer any questions you or other parties may have. After we have reviewed the other interventions, the Agency will be in a position to provide an estimate of time required for questioning at the hearing.

Should you have any questions regarding our intervention, please feel free to contact our Executive Director, Kevin O'Reilly, at our office in Yellowknife.

Sincerely,

W.A. Ross

Bill Ross
Chairperson

cc. Agency Society Members
Bruce Hanna, Fisheries and Oceans
Anne Wilson, Environment Canada

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BHPB Ekati Diamond Mine

Interim Closure and Reclamation Plan

Independent Environmental Monitoring Agency's

Submission to the

Wek'eezhii Land and Water Board

July 2010

Independent Environmental Monitoring Agency

Submission to

Wek'eezhii Land and Water Board Public Hearing

on the Ekati Diamond Mine

Interim Closure and Reclamation Plan

July 2010

1. Introduction

This public hearing has been called to review the latest version of BHPB's *Interim Closure and Reclamation Plan* (*ICRP*). The Independent Environmental Monitoring Agency (Agency) is pleased to be part of this event because we view the closure planning for the Ekati project as a critical exercise, and a key area of interest of our society members, particularly our Aboriginal members who have been, and remain, intimately concerned about the potential long-term effects of this mine on the environment.

As you know, this Agency was created through the 1997 *Environmental Agreement* signed by Canada, Government of NWT and BHP Diamonds (now BHP Billiton Canada) to serve as an independent public watchdog for how environmental management at Ekati is conducted by both the company and government regulatory agencies. We have a broad mandate in this regard, and we are committed to a diligent review of all environmental matters related to the project as it unfolds.

This Board should know that our experience since we began in 1997 has been that overall the company has been an effective manager of its environmental programs, and that the mine has been constructed and operated in a manner generally consistent with the 1995 *Environmental Impact Statement* predictions about its effects.

We are now more than half way through the active mine life, and as we move into this latter phase, there is a need to be increasingly attentive to the plans being developed for closure and reclamation of the site. In our view, closure planning for Ekati should now be the overriding focus for all parties. This is the process that will establish the conditions for the site and the legacy left behind long after the company has left, and it is important for obvious reasons to get it right. That is why we are all here today.

By law, and by the company's own policy, it is required to have a current plan for the permanent (or temporary) closure of its project. The existing *Interim Abandonment and Restoration Plan* was written in 2000, and approved by the Mackenzie Valley Land and Water Board in 2002.

Since 2000, both the mine and the *Life of Mine Plan* have changed, as has the regulatory regime for the project. Initially approved by the NWT Water Board, inherited by the Mackenzie Valley Land and Water Board in 2000, this project came under the purview of the Wek'eezhii Land and Water Board (WLWB) in 2006. One of this Board's first tasks was to set up a more systematic process for the review of the closure plan in order to help both the regulators and the company work through the requirements in a more collaborative fashion. The result was the WLWB's Working Group process that, while a lengthy one, has now resulted in the evolution of a plan that more closely meets the closure needs of the site and the regulators. The current version of the *ICRP* was submitted to this Board in December 2008. The Working Group process resulted in the draft being revised and submitted for approval in December 2008. The December 2008 draft is much improved over the original submission, and all parties are to be commended for their hard work to this point.

This *ICRP* is now in the final phase of the Board's approval process.

Despite the improvements in the December 2008 draft, a number of important changes are still required. We are in an unusual situation here. All parties agree that revisions to the December draft are required. All parties agree that some of these changes are required at this time, while others can be left to the next update of the *ICRP*, purportedly in three years or so from now. The consensus is, however, that the version in front of the Board at this hearing is not yet in finished form.

At this point there seems to be some uncertainty about the approval process ahead. We would like to propose the following steps for the post-hearing phase:

1. This Board provides direction to BHPB to finalize the current draft of the *ICRP* in accordance with both BHPB's commitments (April 14, 2009 *ICRP Information Request Response)* and other issues as addressed in the hearing;
2. BHPB then finalizes the draft and submits this to the Board within approximately three months;
3. The intervenors have a last opportunity to comment on the finalized draft *ICRP*; and
4. The Board then makes its decision on the *Plan*'s acceptability.

In what follows we describe the issues that ought to be incorporated into a revision of the current draft and, separately, other issues of importance that will need serious consideration in the next revision of the *ICRP*.

First, BHPB has committed in its April 14, 2009 *ICRP Information Request Response* to revise the current draft of the *ICRP* in a number of areas. We support this proposal. There are, however, two serious issues that also need to be addressed before the current *ICRP* can be finalized. These are:

a) a requirement to allow fish passage into cell E and the pit lakes, and to establish shallow zones in pit lakes; and,
b) adequacy of reclamation research plans.

The concluding section of this intervention deals with timing of the revisions and updates of the *ICRP*.

2.0 Finalizing the Current Version of the *ICRP*

2.1 Pit Lakes and Fish Habitat

A significant outstanding issue with respect to the acceptability of the current *ICRP* is BHPB's proposal not to restore the pit lakes for fish use or travel. BHPB's view is that it is under no obligation to reclaim the pit lakes, or cell E in the Long Lake Containment Facility (LLCF), to the point where they are useable by fish or even safe for passage by fish.

As evidenced through the proceedings of the *ICRP* Working Group and submissions made to the WLWB from Working Group members, including ourselves, the company is alone in this view. All other parties apparently take the view that the proper reclamation objective for the pits and cell E is to at least provide opportunities for fish travel through them and, further, to promote the development of ecological conditions such that fish might inhabit the pit lakes. These objectives are consistent with company's overarching goal of returning the site to a functioning ecosystem. While the draft *ICRP* proposes that 'permanent' barriers will be constructed at the outlets and inflows of the pit lakes to prevent fish from moving into them, BHPB then agreed that these will be temporary, and will change the wording in the *ICRP* to reflect this.[1] BHPB changed its position again with the April 14, 2009 submission of its response to the Board's Information Request where it now states that the fish barriers are to be 'permanent'. If another party (such as DFO) wants to remove these after BHPB has left the site it will be up to it.[2]

BHPB's position not to reclaim the pit lakes to the standard of functioning fish habitat is a significant regressive step from the currently approved 2000 *Abandonment and Restoration Plan*. This states that 'a productive post-closure lake will be developed in accordance with the Guidelines for Abandonment and Restoration Planning for Mines in the Northwest Territories (DIAND, 1990).' It also states that the constructed littoral zone will include '…fish refuge and spawning areas.'[3] In other words, the intent for pit lakes to serve as fish habitat post-closure was clear, and the Mackenzie Valley Land and Water Board approved the *Plan* on that basis.

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1 *ICRP* Working Group Final Meeting Transcripts. p.50.

2 *ICRP*. p 5-28 [also BHPB's April 14 *ICRP Information Request Response*]

3 *Abandonment and Restoration Plan*, February 2000. p.20.

BHPB argues now that the loss of fish lake habitat as an impact of the mine has been compensated for through previous arrangements with DFO, and so nothing further is required in the way of restoring fish habitat at closure. This is explained in detail in the company's February 13, 2009 letter to the Board in which the 1996 *Compensation Agreement* with DFO is used as the basis for this position.

In the Agency's view arrangements made by other agencies cannot fetter the discretion of the Board with regard to its jurisdiction over closure planning. It is under the sole jurisdiction of this Board to determine what constitutes an acceptable closure plan with regard to the aquatic environment. The relevant section in the *NWT Waters Act* reads:

> *15.(1) Subject to this Act and the regulations, the Board may include in a licence any conditions that it considers appropriate, including, without limiting the generality of the foregoing...*
>
> *(e) conditions relating to any future closing or abandonment of the appurtenant undertaking.*

The Board has set the conditions regarding acceptability of the *ICRP* in the water licences (see water licence MV2001L2-008 Part L s. 5 and water licence MV2003L2-0013 Part J s.4), and it thus has the authority and jurisdiction to direct changes to the *ICRP*, including where such changes may deal with fish or fish habitat.

It is also clear from the fish habitat and fish quality monitoring protocols established in the Aquatic Effects Monitoring Program (AEMP) of the Ekati water licences that the Board can exercise jurisdiction to manage and protect aquatic habitat (see water licence MV2001L2-008 Part K s. 4 (a) and water licence MV2003L2-0013 Part I s.3a).

We questioned BHPB during the Working Group proceedings whether it had any technical information that would support excluding fish from entering the pit lakes or cell E. The response indicated that BHPB's concern was more about being relieved of all liability with respect to fish impacts than about any technical problems. While the company stated that it will not ensure that aquatic habitat for fish will be restored, it will ensure that water moving downstream from these components will be of sufficient quality not to affect aquatic life.

We think BHPB should go the extra step and adopt closure objectives for the pits and LLCF regarding fish passage and creation of shallow zones that are consistent with, and not contrary to, the overall site closure goal—"to return the Ekati mine site to viable, and whenever practicable, self-sustaining ecosystems that are compatible with a healthy environment, human activities, and the surrounding environment." This is the right thing to do, it has the full support of our Aboriginal members, and it is consistent with the best mine restoration standards being used today by progressive mining companies. Suggested wording for such objectives has been provided previously by the Agency in our final verification letter dated February 11, 2009.

Impending revisions to the *ICRP*, according to BHPB's April 2009 *ICRP Information Request Response*, will now include the construction of shallow zones around the pit

perimeters 'to provide safe access and egress areas at the pit perimeter for people and wildlife.' The shallow zones are a critical building block towards the establishment of fish habitat and, therefore, we believe that the proper objective is to establish such zones in order to provide an opportunity for the re-establishment of aquatic habitat.

To set the record clearly, the Agency's expectations for pit closure are summarized below along with BHPB's current commitments in Table 1:

Table 1. Pit Lake Closure Tasks, Expectations and Commitments

Pit Lake Reclamation Task	Agency Expectation	BHPB Commitment	Status
Pit Perimeter	• Unhindered access for wildlife and humans once pits filled. • BHPB responsibility.	"Barriers will be placed around the open pits during the flooding period to deter wildlife and human access. BHP Billiton has proposed rock berms as a deterrent method. However, other options will be considered. Barriers may remain in place in areas of potential pit wall instability after pits are flooded. If berms are selected it is expected that these barriers will be breached in areas for wildlife access (in stable areas) and to facilitate channel overland flow." (*ICRP* pg. 5-27)	• BHPB already committed to do this.
Pit Edges	• Creation of shallow zones where possible with fill on first bench. • BHPB responsibility.	"Some pit lakes will have steep highwalls remaining above the water surface which may provide raptor nesting locations, while other areas of the lake edge will have shallower slopes that will allow wildlife access and/or egress. Beach areas that are able to support riparian habitat will be encouraged through stabilization work and some plant seeding, where feasible. Research and engineering studies are being used to assess in more detail the final landscape of the pit lake perimeters, with respect to slope angles, beach areas, riparian habitat and remaining high walls." (*ICRP* pg. 5-27)	• BHPB already committed to do this.
Reconnection to Surrounding Watershed	• When pit water quality has stabilized and is safe in terms of upstream and downstream aquatic life, the pits should be reconnected to the surrounding natural watersheds. • BHPB responsibility. Collaboration with others welcome.	**"**Once the open pits are filled with water from pump flooding it is expected that discharge from the pit lakes will occur. This will require re-connection of the pit lake with the local hydrological system to allow drainage. Final pit lake elevations, expected seasonal lake level fluctuations and pit perimeter topographic characteristics have been included as part of the engineering studies plan on open pits (Appendix 5.1-4B). Discharge volumes and other channelflow characteristics such as channel slope and bank width will be provided in future updates of the *ICRP*, once preliminary pit lake and connecting channels designs have been assessed." (*ICRP* pg. 5-28) Further details on surface drainage connections are found in the *ICRP* pages 5-28 to 5-34.	• BHPB already committed to do this.

Fish Barriers	• Depending on timing of the pit flooding and reconnection activities, fish barrier may or may not be necessary, • Barriers are only needed until water quality returns to safe conditions for reconnection. • BHPB should monitor water quality and be responsible for barrier removal. Collaboration with others welcome.	"In all cases it is intended that surface drainage channels from the pit lakes should be designed to prevent fish migration into the pit lakes as per *Fisheries Act Authorizations* with DFO outlined in Section 1.2. In order to achieve this it will be necessary to construct barriers to fish movement at inflow and outflow points to the pit lakes. This is considered to be an area where TK will be important in assisting the design and construction of function barriers. At this time rock barriers (also known as boulder fields) are being considered to discourage fish migration, however the use of TK may provide a better long-term solution. BHP Billiton has also agreed to design and construct fish barriers in such a way that they are removable by DFO, should DFO wish to allow fish passage into pit lakes in the future." (*ICRP* pg. 5-28)	• BHPB first proposed fish barriers in January 2007 *ICRP*. • Permanent fish barriers are unlikely to work forever. • If the water quality is safe for fish passage, barriers are inherently incompatible with overall mine site closure goal.

To be clear the Agency does **not** expect the *ICRP* to require the following reclamation activities:

- Filling pits with waste rock or to a point where a viable lake bottom with benthos can be re-established.
- Restocking pit lakes with fish.
- Monitoring for fish passage or re-establishment of fish populations in pit lakes.

Recommendation

1. **WLWB should direct BHPB to revise its closure objective for the pit lakes and cell E to accommodate fish passage and use through the construction of shallow zones with appropriate vegetation to facilitate a return of habitat suitable for fish, and to revise the current *ICRP* to reflect the appropriate closure methods and criteria.**

2. **WLWB should direct BHPB to retain and complete the full Task 7 in the approved Terms of Reference for the pit lakes studies. This would obtain information necessary to fulfill recommendation 1.**

2.1.1 Effect of the 1996 Fish Habitat Compensation Agreement

(a) Background

The Board's public hearing to review the latest version of the *ICRP* was originally scheduled to take place May 25-26, 2009. IEMA and other participants filed submissions with the Board on or about May 5, 2009. One week later, on May 12, 2009, BHPB filed a Notice of Motion with the Board in which it submitted the following issue for the Board's determination:

> Whether the Wek'èezhìi Land and Water Board, in the context of BHP Billiton Diamonds Inc.'s obligations relating to closure and reclamation of the EKATI Diamond Mine, has the jurisdiction to require that BHP Billiton Diamonds Inc. establish and maintain fish or fish habitat in the closed pit lakes or the Long Lake Containment Facility at the EKATI Diamond Mine.

Upon receipt of BHPB's motion the Board postponed the *ICRP* public hearing pending its consideration of BHPB's motion. The Board convened a public hearing into BHPB's motion on July 15, 2009 and released its Reasons for Decision on July 26, 2009.
In its Reasons, the Board concluded that the 1996 Fish Habitat Compensation Agreement is part of DFO's 1997 HADD authorization and not a private contract which in any way binds the Board in the exercise of its jurisdiction (Reasons, p. 10 of 14). The Board further found that, even if the 1996 Compensation Agreement is a contract, it does not limit the exercise of the Board's statutorily conferred jurisdiction (p. 10 of 14). The Board concluded that the proper construction of the 1996 Compensation Agreement "is that it is about fish habitat compensation, nothing else, and that the Minister of Fisheries was not intending any effect on the Board's reclamation jurisdiction when the agreement was executed" (p. 12 of 14).

BHPB filed a judicial review application challenging the Board's decision on the motion. The judicial review application was heard by Mr. Justice Vertes of the Supreme Court of the Northwest Territories on February 3, 2010. On March 15, 2010, Justice Vertes released Reasons for Judgment in which he dismissed BHPB's judicial review as being premature.

In his Reasons (at para. 25), Justice Vertes noted that none of the parties (including BHPB) "disputed the proposition that the Board has jurisdiction to address generally the issue of fish habitat within the context of reclamation plan". Justice Vertes went on:

> "So the dispute in this case is not one of statutory interpretation as to whether the Board has or does not have jurisdiction over a certain subject matter. The dispute is really about whether it can exercise that jurisdiction in the context of these particular circumstances."

Similarly, at paragraph 39 of his Reasons, Justice Vertes stated that he does not view the question "as a purely jurisdictional one". Given that all parties acknowledged that the Board possesses the jurisdiction to deal with reclamation:

> "The dispute is over how it exercises that jurisdiction and whether there are any limits to it. This is something that is within the competence of the Board to decide."

Notwithstanding that the Board in its Reasons for Decision found that the 1996 Compensation Agreement is part of the *Fisheries Act* authorization and not a private contract and that even if it were a private contract, it does not limit the exercise of the Board's jurisdiction, Justice Vertes concluded (at para. 58) that "as far as I can glean from the record, and from the Board's decision, there was no determined effort to reconcile the different interpretations" of the agreement. Therefore, Justice Vertes held that it "is still incumbent on the Board to determine the effect of that agreement (something about which the parties to that agreement disagree)".

Given that there are ambiguities about the meaning of the 1996 Compensation Agreement, Justice Vertes held (at para. 59) that the Board may be assisted by the introduction of extrinsic evidence in determining the effect of the 1996 Compensation Agreement. He also held that extrinsic evidence may help demonstrate the factual matrix of the agreement.

Subsequent to BHPB's judicial review application being dismissed as being premature, the Board on May 25, 2010 notified interested parties that it was resuming the process for the consideration of the *ICRP*.

On July 2, 2010, BHPB submitted twenty four additional documents to the Board, which it stated would "fill out the factual matrix on the record regarding the 1996 Compensation Agreement".

In this section of our Intervention, IEMA will first briefly summarize its position with respect to the effect of the 1996 Compensation Agreement. IEMA will be brief in putting forth its position as we believe that the Board is well familiar with it, from reviewing IEMA's submissions to the Board on BHPB's motion as well as IEMA's written argument to the Court in the judicial review application.

IEMA will then address the additional documents filed by BHPB. Specifically, IEMA will address the question of whether the additional documents filed by BHPB should cause the Board to come to a different conclusion regarding the effect of the 1996 Compensation Agreement than was reached by the Board in its Reasons for Decision on BHPB's motion.

(b) Position of IEMA on the Effect of the 1996 Compensation Agreement

IEMA submits that the 1996 Compensation Agreement between DFO and BHPB does not operate to fetter or constrain the Board's jurisdiction over reclamation, including its ability to order BHPB to reclaim the pit lakes to facilitate the establishment of fish habitat. This is so for the following reasons:

- Properly interpreted, the 1996 Compensation Agreement is part of DFO's *Fisheries Act* HADD authorization and is not a private contract. As found by the Court in *R. v. BHP Diamonds Inc.*, the January 7, 1997 letter from DFO to BHPB and the attached HADD authorization and Fisheries Habitat Compensation

Agreement "together constitute the s.35(2) authorization". The January 7, 1997 letter explicitly states that the authorization "shall be conditional upon implementation of the mitigation and compensation measures specified in the authorization and the Fish Habitat Compensation Agreement". Indeed, that is the first condition listed in the authorization.

- The Board is not a party to the 1996 Compensation Agreement and is therefore not bound by it. The 1996 Compensation Agreement is between the Minister of Fisheries and Oceans and BHPB. The Board, which did not exist at the time the agreement was executed, was not a party to the agreement. Yet BHPB argues that the Board is bound by the agreement, on the basis that it is a federal agency. IEMA submits that the proposition that an agreement entered into by one Crown agency (DFO) can bind a completely separate Crown agency (the Board), is simply wrong. The only legal authority cited by BHPB in support of its position, the *Wells v. Newfoundland* case, is completely distinguishable on its facts and is of little if any relevance.

- The 1996 Compensation Agreement does not deal with reclamation and therefore does not affect the Board's jurisdiction. In the 1996 Compensation Agreement, DFO authorized the destruction of fish habitat in a series of lakes. The payment of $1.5 million by BHPB, made pursuant to the agreement, was compensation for the destruction of fish habitat. It was entirely unrelated to what BHPB's eventual reclamation obligations (imposed by a different regulatory authority) might be. What is under discussion in the *ICRP* process is not the re-creation of the fish habitat that has been destroyed by the mine. That habitat – the original lakes – is gone, and nobody is suggesting that those lakes be re-created. Rather, what is under discussion is reclaiming the open pits by filling them with water and undertaking work, such as the creation of shallow zones around the perimeters of the pit lakes, that will hopefully result in the pit lakes being useable by fish. BHPB is not being asked "to pay for the same habitat twice".

- Pursuant to Section 8 of the 1996 Compensation Agreement, nothing in that agreement relieved BHPB of other responsibilities for environmental protection, which include reclamation of the pit lakes. Further, the HADD authorization expressly states that it "is valid only with respect to fish habitat and for no other purposes. It does not purport to release the applicant from any obligation to obtain permission from or to comply with the requirements of any other regulatory agencies".

(c) Additional Documents filed by BHPB on July 2, 2010

As noted above, in its Reasons for Decision on BHPB's motion, the Board concluded that the 1996 Fish Habitat Compensation Agreement is part of DFO's 1997 HADD authorization and not a private contract which in any way binds the Board in the exercise of its jurisdiction. Further, the Board found that even if the 1996 Compensation

Agreement is a contract, it does not limit the exercise of the Board's statutorily conferred jurisdiction.

IEMA submits that nothing in the additional documents filed by BHPB on July 2, 2010 warrants the Board changing those conclusions. If anything, IEMA submits that the additional documents filed by BHPB support and confirm the conclusions arrived at by the Board on BHPB's motion last year.

Before providing comments on specific documents filed by BHPB on July 2, 2010, IEMA wishes to offer some general comments on the documents taken as a whole. First, IEMA submits that the Board should place little weight on this additional information. To date, BHPB has not indicated that it will have a witness present at the upcoming public hearing who was involved in the creation of the documents and can thus provide reliable evidence concerning them. Absent a witness who can knowledgeably speak to the documents (i.e., someone who was there at the time and involved in the negotiations and the creation of the documents), the documents stand by themselves. As such, the Board will be not much further ahead in the sense that it will be required to draw inferences from and form conclusions based on historical documents and submissions made by the parties.

Second, it is obvious that the documentary record surrounding the negotiation of the 1996 Fish Habitat Compensation Agreement is more extensive than what has been submitted by BHPB. For example, Document 9 (a September 27, 1996 letter from DFO to BHPB) encloses "Draft II" of the agreement. Document 11 (a November 15, 1996 letter from DFO to BHPB) attaches "Draft IV" of the agreement. Obviously, there must have been additional correspondence between DFO and BHPB enclosing Draft I and later Draft III of the agreement. But that correspondence and those drafts are not included. IEMA is not suggesting that anything significant necessarily turns on this. Our point is that it is obvious that the twenty four additional documents filed by BHPB form only a part of the complete documentary record relating to the negotiation of the 1996 Fish Habitat Compensation Agreement. Consequently, the Board should be careful about the weight it places on the documents taken as a whole.

As stated above, IEMA submits that, on balance, the additional documents filed by BHPB on July 2, 2010 support the conclusions arrived at by the Board in its Reasons for Decision on BHPB's motion. More particularly, IEMA submits that the documents confirm that the Fish Habitat Compensation Agreement was an integral part of the *Fisheries Act* HADD authorization, not a true private contract. Further, IEMA submits that the documents confirm that the subject matter of the agreement was the destruction/loss of fish habitat and that the agreement has nothing to do with reclamation. We will identify below certain of the additional documents which support this interpretation.

For example, Document 2 is an excerpt from BHPB's December 1995 Additional Information Response to the EARP. On the last page (p. 4.3), BHP states:

> "BHP understands the importance and necessity of reaching agreement with DFO on this matter … " [emphasis added]

IEMA submits this confirms that this was not a typical, voluntary negotiation between private parties. Rather, it was part and parcel of the process by which BHPB was required to obtain authorization from DFO in order for the project to proceed.

Another example of this is contained in Document 6, the notes to file regarding the May 31, 1996 meeting between DFO and BHPB with respect to the draft Compensation Agreement. On p. 4, the Minutes reflect a discussion regarding the issuance of the *Fisheries Act* authorization and whether it could be fast tracked. DFO apparently advised BHPB that while the Compensation Agreement could be drafted prior to the Review Panel releasing its decision, "the actual authorization could not be signed before the results". IEMA submits this emphasizes that the Compensation Agreement is really part of the authorization and that the agreement would be of no force and effect until the authorization was issued.

Document 9 is a September 27, 1996 letter from DFO to BHPB. In the third paragraph of that letter, DFO explicitly states that "the Compensation Agreement and the Section 35(2) authorization are inextricable".

As the Board knows, BHPB has argued that the compensation paid for the lost fish habitat was for the "life of the project" and that the life of the project includes reclamation. Document 3 is DIAND's response, dated October 17, 1996, to written questions from other interveners and BHPB in the NWT Water Board licence application proceedings. As noted by BHPB in its index to the additional documents, in that document DIAND discusses general principals regarding reclamation. This discussion starts at p. 10 of the document.

IEMA submits it is clear from the document that in 1996 the discussion about reclamation was necessarily conceptual. What specific measures BHPB would be required to undertake as part of reclamation of the mine were mostly unknown. Further, when pressed by interveners to disclose its position on abandonment and restoration, DIAND simply stated (at p. 12) that it "requires the applicant to follow the act and regulations when filing applications to the Water Board and recommends that the applicant follow the "Guidelines for Abandonment and Restoration Planning for Mines in the Northwest Territories" when developing the plan". In other words, neither DFO nor DIAND was, in 1996, prescribing what BHPB would ultimately be required to do by way of reclamation, both because they did not know and because it was not within their jurisdiction anyway.

Document 16 is a December 17, 1996 letter from DFO to BHPB. The letter encloses a copy of the Fish Habitat Compensation Agreement signed by DFO. As noted in the cover letter, the agreement "documents the obligations of BHP with respect to compensating for the alteration, disruption or destruction of fish habitat in twelve lakes

and associated streams that will impacted by the NWT Diamonds Project" [emphasis added]. Again, IEMA submits this highlights that while DFO and BHPB negotiated an agreement, BHPB was obligated to provide compensation for the destruction of lake habitat, pursuant to the *Fisheries Act* and DFO's no net loss policy. This was not a contract entered into voluntarily between two private parties.

IEMA acknowledges that there are certain passages in a few of the additional documents which BHPB will undoubtedly say supports its position. For example, in Document 1, the transcripts from the NWT Water Board public hearing, DFO's witness Mr. Stein states (at p. 117), that DFO's policy is that the Compensation Agreement forms "in essence a contract between two parties and it is not the policy of the Department to release those kinds of documents to the public". IEMA submits that statement was, as indicated by Mr. Stein, a statement regarding DFO policy on the disclosure of documents to the public as opposed to a statement about the legal nature of Compensation Agreement.

IEMA submits that, on balance, the additional documents filed by BHPB on July 2, 2010 add very little if anything to the Board's understanding of the effect of the 1996 Fish Habitat Compensation Agreement. There is certainly no "smoking gun" which would cause the Board to determine that its previous conclusions as to the effect of the Compensation Agreement were wrong.

Accordingly, and in conclusion, IEMA submits that the Board was correct in concluding in its Reasons for Decision that "the agreement does not in any way limit the exercise of its jurisdiction to require the re-establishment of fish habitat as part of the interim closure and reclamation plan for the EKATI site" (p. 12 of 14).

2.2 Reclamation Research Plans

When a mining company initially develops its ideas for closure it is usually the case that some of the reclamation measures, especially for unique aspects of the project, have significant uncertainties associated with them. In other words, not everything about the mine and what might work as an effective closure approach is known ahead of time. It therefore becomes an important exercise to identify these uncertainties as early as possible, and then conduct the necessary research to answer the questions. This is the concept behind having the proponent prepare reclamation research plans for approval, and why provisions for doing this were included in the original water licence.

An important aspect of this exercise is that the research must be conducted early enough in the mine life such that the answers can arrive in time to inform the reclamation and closure work that needs to be done.

Therefore, in order to determine whether the company's proposed research is acceptable, we need to know both the content of the plans (i.e., what the research is and how it will be carried out) and the timing of the research.

Previous reviews of the reclamation research plans found deficiencies in organization and quality of information provided, with the result that the WLWB issued a directive on February 4, 2009, outlining a new format for revision of the plans. This was followed by another directive on March 6, 2009, for BHPB to complete two of the research plans (#14 and #16) to the standards set out in the February directive in preparation for the public hearing on the *ICRP*.

On October 22, 2009, the Board, noting that the public hearing had now been postponed as a result of BHPB's legal challenge to the Board's jurisdiction, requested the company to complete the remaining 24 research plans to the new standard. These were submitted by BHPB on February 26, 2010.

We are of the view that the revised research plans still do not provide sufficient content about the proposed work (i.e., methods and activities) to be done to understand how the research will achieve the stated objectives, and if it will be completed in time to meaningfully inform reclamation work (while dates for completion are provided, the lack of detail concerning the content means that timely completion is not assured). The plans continue to lack detail about the proposed research methodology, specifically part 5 (Remaining Scope to be Completed) section of the Board's February 2009 framework.

Our review of the revised reclamation research plans has concluded the following:

1. The revisions, in order to be useful to the Board and to other participants in this closure process, require more substance on the remaining research tasks as required by the Board's directive. There are not enough details on the actual activities that will be undertaken to provide the necessary information.
2. The Engineering Studies that are directly related to Reclamation Research Plans should be integrated with the Plans.
3. Without the details of the activities to be conducted, it is not possible to verify that the necessary information will be collected in a timely manner.
4. Task 7 from the approved Terms of Reference for the Pit Lakes Studies is not found anywhere in the research plans and is obviously tied to the issue of fish barriers and pit lake reclamation. The Agency position is that the WLWB should require BHPB to complete this research.
5. Estimates of costs provided for each research plan should be rationalized to specific research activities described in the plan. Accurate cost information will be important for the update of the reclamation liability estimates as well.
6. All revegetation plans dealing with the LLCF should be combined to reduce the very considerable duplication.
7. It is not clear why there needs to be a research plan for Traditional Knowledge. Presumably BHPB is attempting to collect and use TK through its on-going consultative process with Aboriginal governments, and we believe this is the correct process to identify TK.

The following specific recommendations are made with respect to the content of the reclamation research plans:

3. **BHPB should be directed to expand part 5 of all plans so that the discrete activities that will be undertaken to meet the objectives are properly described. Procedures and methods for each research component should be provided. We suggest that, for each of these discrete activities, BHPB should describe precisely what information is to be collected, how that information will be used to meet the reclamation research plan purpose and exactly how the information will be obtained.**

4. **The Board direct BHPB to revise Research Plan #14 to include another method of stabilising Extra-Fine Processed Kimberlite (EFPK): pumping it into a meromictic pit at closure. This appears to us to be a much more certain method than covering the EFPK with water in the LLCF. Extreme weather events (those that happen once every several decades) will happen after the mine is closed and have the potential to carry EFPK downstream. We believe the LLCF ponds will not be meromictic so that pumping the EFPK into a pit is likely to be a much more effective means of dealing with EFPK.**

5. **Reclamation Research Plan #12 involves water quality in and downstream from the LLCF at closure. One of its very important components is the creation of a water quality model. This is encouraging. We believe that the model would be improved and that this crucial aspect of closure would be better managed if the model were to be reviewed by the parties interested in closure at Ekati. BHPB indicates it will have the model available in 2011. We recommend the Board have the model circulated for review at that time so that it can be of high quality by the time the *ICRP* is next reviewed.**

6. **The Board direct BHPB to revise Research Plan #16 to include specific research aimed at measuring revegetation sustainability to develop appropriate closure criteria. Without specific criteria for sustainability of this vegetation, it is likely, based on the results BHPB reports, that a vegetation monitoring period of over 20 years would be necessary.**

It will become increasingly important to monitor progress on the Reclamation Research Plans from now until final closure. This will require public reporting, preferably on an annual basis, and circulation of the most significant research results for key reclamation activities such as revegetation, water quality predictions, and LLCF cover design. BHPB's annual environmental report is to report on progress being made with respect to reclamation and reclamation planning, and we expect to see a higher level of detail on these topics in future annual reports.

In our view there are a few research tasks that are especially important for effective closure, and these would benefit from a wider review in the design stage.

Recommendation

7. **The Board direct BHPB to submit the following specific research task outputs from Reclamation Research Plans for review and comment:**
    a. **The design of the LLCF Pilot Revegetation Study; and**
    b. **The design of the LLCF cover.**

2.2.3 Next Steps for Finalizing the Reclamation Research Plans

The question for the Board is what to do with these research plans following the public hearing. Given the inadequate level of detail to date, substantive revisions are required.

At this point we have been through a number of iterations of the reclamation research plans. They all continue to lack the level of detail needed to describe the research BHPB intends to do regarding selecting appropriate reclamation activities. It may be that a different approach is required. Reconvening the *ICRP* Working Group for a one-time, special session to develop one detailed research plan may be beneficial. This activity, and the subsequent revisions of the remaining plans by BHPB could, and should, be done fairly quickly. There is an urgency for at least several of these plans to get developed, and to be implemented, in the very near future. We believe that it is possible to do this in time for BHPB to resubmit revised research plans to the Board at the same time it resubmits the revised *ICRP* following the public hearing.

Recommendation

8. **The Board reconvene the *ICRP* Working Group for a special session to work with BHPB to enhance a selected reclamation research plan as a basis for revising all the remaining reclamation research plans and engineering studies.**

As an alternative, the Agency is willing to work with BHPB and others as appropriate to enhance selected reclamation research plans.

2.3 Minor Recommended Revisions for the Current *ICRP*

2.3.1 Wildlife Objectives

Reclamation objectives for wildlife are unresolved. BHPB has recently moved away from mine component-specific objectives for wildlife to a site-wide approach, stating that closure objectives and criteria should be addressed at the scale of the general claim block "to ensure that the WEMP continued through to end of closure". The company's argument is that the wildlife environmental monitoring program (WEMP) will continue into closure, and can monitor wildlife patterns against those observed pre-development and during operations.

To the Agency this is contrary thinking—it is fitting the objective to fit the tool, instead of fitting the tool to accomplish the objective. All parties have previously agreed and, indeed, the Water Licence requires such an approach, that component-specific objectives for reclamation are required.

This means that BPHB's proposed closure objective of having wildlife 'using the Ekati claim block', and the accompanying criterion of 'wildlife observed using the Ekati claim block' are not acceptable. The reason is that the objective is meaningless. Regardless of the condition of the mine components, there will always be wildlife using the claims block. Wildlife always will be observed on the claim block, but this does not mean that BPHB's reclamation of the waste rock dumps, or roads, or the LLCF will be effective for wildlife protection or use.

The current WEMP is not up to this task—it does not provide objectives and measurable criteria to ensure that closure has returned any specific mine component to "viable, and wherever practicable, self sustaining ecosystems". We will never know if reclamation has been successful from a wildlife perspective if we rely on the WEMP to tell us.

There should be clear wildlife use objectives for each mine component and some way of measuring such use to ensure that proper closure has taken place. Examples of more appropriate closure objectives might be:

- Indigenous wildlife species can safely use (name the component);
- Indigenous wildlife can move freely through (the component); or,
- The (component) does not pose an increased risk of injury or mortality to wildlife.

Examples of closure criteria might be:

- Wildlife are observed safely using (the component);
- Wildlife are not deflected from moving freely across roads;
- The vegetation on waste rock piles or LLCF is safe for wildlife consumption; or
- Injury or mortality rates of caribou are not greater on the waste rock piles (or LLCF) compared to analogous landforms or habitat.

Recommendation

9. **This version of the *ICRP* should be revised to set out component-specific objectives and closure criteria for wildlife.**

2.3.2 Soil Remediation Standard

The remediation standard proposed for hydrocarbon contamination of Ekati soils is identified in the *ICRP* as the 'industrial' standard. A number of intervenors, including the Agency, objected to this standard or requested further information, and proposed alternate standards as being more appropriate. To resolve this issue, BHBP submitted a memo from one of its consultants (Rescan) with its April 14, 2009 *ICRP Information*

Request Response that reviewed different standards and concluded that the 'agricultural' standard was the most appropriate for the site.

In short, the Agency can accept this conclusion. In proposing the agricultural standard, the Rescan report noted that 'a site assessment defining the extent of contamination (and complexity) and localized potential receptors would be required to confirm the applicable standard and whether values can be adopted from Tier 1, modified to Tier 2 values, or derived using a Tier 3 risk-based approach.'

Recommendation

10. **This version of the *ICRP* should be revised to reflect the use of the agricultural standard for contaminated soil remediation at Ekati. The revision should include further details on how, when and by whom the site assessments might be conducted.**

3.0 Next Revision of the *ICRP*

3.1 Pit Lake Water Quality and Reconnecting to Watershed

BHPB plans to pump freshwater from adjacent lakes into the open pits when mining is finished. The earliest pumping is scheduled for approximately 2015 (Fox pit), and will be conducted more or less continuously in the various empty pits until 2050 when the flooding of the Panda-Koala pits will be completed. The *ICRP* states that when pit water meets licence discharge criteria to be determined, water will be allowed to flow out of the pits and into the downstream receiving environment, thereby restoring hydrological connection in the watershed.

Information about the protocol for reconnecting the pits to the surface drainage is notably absent. For example, uncertainty exists about the water quality that will characterize the various pits once they are flooded and whether it will be acceptable for discharge into the downstream aquatic environment? The *ICRP* says only that reconnection will be established once water quality meets water licence criteria but does not address the question of what happens if criteria are not met by the time of pit overflow.

Recommendation

11. **BHPB should provide more description in the next version of the *ICRP* about the procedures and protocols that will be used in re-establishing hydrological connection between the flooded pits and the receiving environment. Contingency plans for the possible outcomes of pit flooding should be included. If water treatment is an option, then the logistical and bonding requirements for this strategy should be also be described.**

12. **The next version of the *ICRP* should also resolve the question of whether or not Koala and Panda pits will remain hydraulically connected at depth, and what closure methods are going to be adopted. If BHPB cannot resolve this issue by that date (approximately 3 years from now), then it should describe in full the closure methods for both options.**

4.0 Timing of *ICRP* Revisions and Renewal

The *ICRP* review process that seems to be in place is that BHPB is expected to make certain revisions to the current draft of the *ICRP* in the next few months, and other revisions in an updated plan to be submitted about three years from now.

In its April 14, 2009 document, BHPB provides a list showing what revisions will be made in the short term, and what will be delivered three years from now. We have some comments and recommendations about this allocation.

Recommendation

13. **This version of the *ICRP* should be revised in accordance with the April 14, 2009 submission by BHPB, as well as recommendations made in this and other submissions to the WLWB on the 'short-term' deficiencies. The *Plan* should then be resubmitted for approval by the Board no later than six months after the release of the Board's *Reasons for Decision* from the public hearing.**

14. **The next update of the *ICRP* should occur no later than three years from the approval date of this *ICRP*. This is, we understand, consistent with BHPB's own corporate *Closure Standard*.**

4.1 Reclamation Liability Assessment and Financial Security

The Agency notes that once the *ICRP* is finally approved, it will be time for a reassessment of the reclamation liability for the Ekati mine and a revised financial security arrangement to ensure that public exposure to risk is minimized to the extent possible. We expect that the company will produce its own reclamation liability assessment using the Monte Carlo approach and that the Department of Indian Affairs and Northern Development will provide a new assessment based on the RECLAIM

model. These should be provided in a timely manner with an opportunity for public input.

Recommendation

15. **The Board should request revised reclamation liability assessments within six months of the final *ICRP* approval. There should be an opportunity for public comment and an exchange of views prior to the Board making a final decision on revisions to financial security under the water licence.**

APPENDIX 1
Detailed Critique of Selected Reclamation Research Plans

1.0 Plan #14—Stabilization of Extra-Fine Processed Kimberlite (EFPK) in LLCF

1.1 Background on EFPK

This work is intended to address uncertainties about the reclamation of the extra-fine processed kimberlite slurries in LLCF. EFPK does not behave like ordinary sand-size mine tailings—it behaves as a fluid, having a density only slightly higher than milk. Managing such material has been a challenge for the company during operations, and it likely will be an even bigger problem post-closure. We are especially concerned that this material may escape from the LLCF at some future point and flow downstream, perhaps during a storm event or when an engineered structure fails. This would likely have a negative effect on fish and other aquatic life.

The management and reclamation of these materials has been an issue since the Ekati mine first underwent environmental assessment and, subsequently, its first water licence hearing in 1996. At that time, lab studies commissioned by BHPB showed that settling and consolidation of these clay-rich ultra-fine materials would, for some kimberlites, take an inordinately long time. One sample of Fox tailings showed that 98% consolidation of a 3 metre column of suspended tailings would take over 4000 years. [4] Whatever the real rate of settlement and consolidation in the LLCF, the reality is that EFPK occurs as large volumes of highly mobile clay slurries.

Expert evidence at the 1996 environmental assessment panel and the NWT Water Board hearings was presented to show that stabilization and permafrost aggradation in the tailings would be confounded by these clays, and that reclamation would be exceedingly difficult. Igor Holubec submitted a report to the panel that suggested the company could be looking at tailings ponds of up to 30% clay slurry, with depths up to 40 metres. [5] He stated that freezing of these highly plastic clay slurries was complex because of the consolidation process and that there were no case histories available where such an undertaking had been performed with a high clay content in permafrost. He also went on to recommend that, as a result of the extraordinary challenges of keeping these materials in place in the LLCF, the company pump the slurry into an empty open pit when one becomes available.

This early evidence of potential closure issues with EFPK has been the stimulus for the Agency's concern over the years about this topic. Subsequent operational experience in the LLCF bore out Holubec's predictions about the space problem, causing BHPB to rework its tailings management plan, as part of its planned review, to accommodate the storage volumes

[4] EBA Consultants. *Wastewater and Tailings Management Plan Ekati Diamond Mine*. 1998. Cited in table 13.

[5] Igor Holubec. Submission to the Water Technical Session, BHPB Diamond Mine Environmental Assessment Panel. Prepared on behalf of Government of Northwest Territories. February, 1996.

taken up by the Fox clay slurries. The use of flocculants, and chloride, in the processing plant appears to have substantially aided in the rate of settling of the clays, but not the consolidation.

This 'space' problem resulted in a special LLCF study done in 2004 by the company to improve operations, and the results of the study warn of some of the challenges facing reclamation managers. Here are some key findings:

- As a consequence of the increasing fines content, as well as ice entrainment and thaw effects, the PK beaches have poor stability, do not support traffic well, and can liquefy when subjected to vibrating loads. This means hazardous conditions for construction on the beaches, limiting the beach zone over which safe access can be gained during the summer. The shorter the beaches, the less the area of beach that is safely accessible to construction equipment.
- On closure EFPK will be located along the main drainage route of the water flowing through LLCF and is expected to be highly susceptible to erosion. The placement and maintenance of stable durable heavy rip-rap lined channels over such deposits is of concern. One option to address this is to leave ponds or lakes in the lower end of each cell such that these deposits have a significant water cap, and hence flow velocities that are not erosive.
- Access on the beaches and ponds may be possible in winter; however the nature of the construction or reclamation measures that can be performed is restricted. For example, it is possible to place covers and fills, but regrading and excavation are often not practical. Summer access onto the lower beaches is hazardous.
- Fine PK is highly susceptible to erosion by water. Where small streams from side drainages are allowed to flow across the PK, it has been observed that the erosion of the fine PK is rapid and progressive. Such erosion results in the re-suspension of the PK and sediment plumes in the downstream receiving waters. This indicates that the routing of side drainage across the post closure PK surface is to be minimized to the maximum extent possible. Where it is unavoidable the construction of stable durable rip-rap lined channels is required, of a size large enough to tolerate frost deformations. The erodability of the PK also indicates that it is likely undesirable to reduce pond elevations in each cell after final PK deposition. Such lowering would expose the steeper underwater PK slopes and could result in rapid beach erosion from these slopes. [6]

Because the *ICRP* is silent on these issues, they are presented here to remind the Board about the seriousness of the several challenges facing reclamation planners with respect to the EFPK ponds and the Water Interface Zone. The company has conducted field work, including the LLCF tailings study, to better identify the physical and settling characteristics of the kimberlite fines to improve operations, and continuing this work as it proposes to do will no doubt help to refine our understanding of PK behaviour in the LLCF.

[6] Don Hayley & Andy Robertson. Ekati Mine Processed Kimberlite Containment Facility; Summary of Key Lessons Learned from 5 Year Review. October, 2004.

However, there is little evidence that we are any closer to understanding how to keep these materials secure in the long-term. In addressing this subject, the *ICRP* simply states that 'EFPK that collects in the ponds during operations will be confined to the pond bottoms where it will consolidate over time' (pg. 5-136).

This is an assumption not supported by the information provided above. In our view, how to secure the EFPK from release into the post-closure downstream environment is a major issue for this mine and, thus, a key focus of a research program for this mine component. This is why, as early as 2004 the Agency suggested that BHPB seriously examine the option of depositing the EFPK into the bottom of a pit lake should the lake be meromictic.

1.2 Review of the Plan

The research objective stated in Research Plan #14 is to "develop an understanding of the expected behaviour of EFPK in the LLCF and evaluate how to maintain EFPK containment within the LLCF post-closure." The second part of this statement is the key; (sustainably containing the EFPK); the first part is the means to get there.
The plan also notes that research will be undertaken 'to evaluate possible practical and economic methods to increase the settling rates of EFPK and to evaluate both sub-aerial and sub-aqueous EFPK stabilization measures to maintain containment...'
A close examination of the proposed scope of work reveals that little information is provided on how evaluating 'practical' and 'economic' approaches to stabilizing the EFPK will be conducted. Further, it is not apparent how 'sub-aerial' techniques could be relevant to stabilizing a material that is submerged.

We are also concerned that BHPB has limited the scope of the research to leaving the EFPK in the LLCF.

The plan identifies the following data gaps:

1. updated EFPK volumes
2. characterization of EFPK performance with time in cell C, including understanding difference between EFPK deposition for previous ores with that for Fox kimberlite
3. understanding of the ability to place physical covers to augment water covers in zones where water covers alone could be inadequate
4. water balance modeling and verification of final surface elevations in cells post-closure.

Plan #14 describes the field investigations that will be done in the next three years or so:

1. periodic plumb line surveys to estimate settled profile of EFPK
2. review of various sampling methods and current industry practice
3. consolidation and settling tests in cell C and new EFPK deposit areas in cell A; plus lab column tests for sedimentation rates of PK
4. evaluate practical and economic methods to increase settling rate of EFPK
5. estimate distribution of EFPK at closure
6. conduct a literature review and desktop evaluation to assess minimum water cap

needed to contain EFPK and minimize risk of re-suspension and transport
7. model EFPK distribution at closure
8. field evaluation of EFPK stabilization measures.

Most of this appears to be geared to obtaining more information about EFPK settling characteristics and distribution patterns within LLCF. Two of the eight identified research activities (#6, #8) appear to be focused on 'stabilization methods' for EFPK.

It is not explained how task #2 will achieve any of the stated objectives. Moreover, the project schedule shows that this task was supposed to have been completed last year. Have the results now been incorporated into reclamation planning? Why is this item still listed as on-going?

The project schedule shows 'field work and lab testing' for the settling tests will be completed in 2010, while 'construction of settling column' will be initiated in 2011. The distinction between 'lab tests' and the 'settling column tests' is not provided, so this component remains confusing given that the lab tests are scheduled for completion before the settling columns are constructed. There is no description of how the lab work, or the field work, will be conducted.

The distinction between task #5 and #7 is not clear and should be described.

Task #6 proposes 'to evaluate measures to stabilize the EFPK through a 'desktop evaluation and literature review' to 'determine the need for and, if necessary, design future field trials.' There is no description about how the evaluation exercise will be done.

Task #6 also mentions that the measures may include a water cap, sand or rip-rap cover. From the available information we have on the physical characteristics of the EFPK, these last two options seem less than viable. Similarly, desktop research and literature reviews are hardly likely to produce any useable information to design stabilization measures since there are no obvious candidate projects with reclaimed EFPK wastes in the sub-arctic environment—almost assuredly field investigations will be required to produce meaningful results. This work should properly have been underway by now. BHPB's use of Beartooth pit as a mine water storage sump has removed this option for experimenting now with the long-term storage of EFPK.

Task #8 proposes only that a 'field trial program' will be undertaken to evaluate EFPK stabilization measures "<u>if</u> it is determined to be needed under Task #6" [*emphasis added*]. There are two difficulties with Task #8. First, the Agency believes, based on what we now know about EFPK, that actual field trials <u>will</u> be required to identify an effective strategy. Second, stating only that a field trial program will be conducted, without any details, is <u>not</u> a description of a research task. At this point in the mine life, we should know what the field investigation is going to look like, where and how it will be done, what data it will collect so as to inform the design of the closure approach, and when it will be completed such that the reclamation measure can be implemented in a timely fashion. A key question, unidentified and unaddressed in the research plan relates to the susceptibility of the stored EFPK to

extreme storm events. What thickness of water cover would be necessary to prevent mobilization of the EFPK by wind-generated turbulence from, say, a 1:200 year storm event?

Plan #14 focuses on the assumption that the EFPK will remain in the LLCF. For some years now, the Agency has advanced the notion to this Board and the company that the use of exhausted pits for the disposal of kimberlite tailings is a serious option that needs to be considered in the closure plan. The reason in part is that meromictic pits would provide a much greater range of potential water cover thickness to sequester the EFPK, and would be much more physically stable, than the LLCF.

Engineering Study #5 appears to address this question. It identifies four tasks, without any further details about how these will be done, as follows:

- measure the density of EFPK in LLCF;
- conduct short and long-term settling tests (presumably in a lab but not described);
- estimate volume of kimberlite tailings that could be placed in open pits; and,
- predict behaviour of tailings in flooded pit and effects on water quality.

Task 1 has been done—the density of EFPK is known. Settling tests (Task 2) were conducted at the beginning of the project. If they need to be redone, then the plan should explain why additional testing is required, what further needed information will be generated, and how the tests will be conducted. Task 3 is already known, or can be determined in short order. Task 4 is simply a prediction, not an actual measurement of tailings behaviour following discharge into an open pit. All this begs the question why this work not going to be completed until 2016, as proposed, instead of much sooner in 2010?

The key objective here for closure is to determine what thickness of a water layer would be sufficient to keep the EFPK immobilized (whether in a pit or the LLCF). A close examination of this list of tasks from both Reclamation Research Plan #14 and Engineering Study #5 shows that they will not be able to deliver the answer.

We are also concerned about the timing of the proposed field trials for the water cover on the LLCF over the EFPK. This work is scheduled to begin in 2014. The field trials may have some bearing on the need or desirability of PK discharge into cell D and the above information will be essential to making an informed decision.

2.0 Plan #16—Establishment of Self-Sustaining Plant Communities in LLCF

BHPB is proposing that parts of the LLCF, essentially the mid zones between the impoundment edges and the central wetted portions, will be revegetated at closure. The question is, what plant communities can grow on kimberlite tailings on a self-sustaining basis? Accordingly, the stated research objective here is to determine what self-sustaining plant community type(s) can be established on the LLCF.

This objective raises a number of important questions that require answering. While it appears possible to grow plants on kimberlite, especially with the aid of fertiliser, will the vegetation persist? What are the early indicators of such persistence (sustainability) and how can these be used as closure criteria? Will such plants attract wildlife that will eat the plant cover and possibly destroy it? Should such plants act as a deterrent (or attractant) to wildlife, or be neutral in this regard? Will there be risks posed to wildlife if they are attracted to, and consume, the established plant populations? These are the kinds of questions that reclamation research plan #16 should attempt to answer.

Some early work has been done by BHPB on some of these issues, as Plan #16 describes. Trial plots using various mixtures of soils and fertilizers were established in the upper reaches of cell B early in the history of the LLCF. These were maintained and monitored until approximately 2005 when the company revamped its LLCF operations and found it necessary to again discharge tailings into the area where the pilot plots had been set up. It appears that useful information was gained during this early period about what plants can be established on the tailings, and what conditions will be necessary to ensure their permanence.

Plan #16 remains unchanged, from its last revision on April 14, 2009. The following research tasks are identified:

1. suitability of PK as a revegetation substrate
2. seed collection, storage and propagation
3. natural colonization and plant succession on LLCF
4. weeds monitoring
5. pilot vegetation study on cell B

1. Suitability of PK as Revegetation Substrate

The following data gaps are identified:

- methods to establish erosion-controlling cover of native grass cultivars;
- measures to protect initial vegetation cover from grazing during establishment phase;
- long-term fertilizer requirements;
- methods to establish native species by direct seeding or planting and by natural colonization; and
- successional trends and characteristics of plant community that will develop on PK.

The proposed work to answer these information gaps is the Pilot Revegetation Study, not to be initiated until 2013. Our concerns about this research task are provided under item #6 below.

2. Identification of Locations in LLCF Suitable for Revegetation

The identified data gap is the location of upper and lower boundary of the ‘central zone’.
The proposed research is to develop a methodology, based upon physical characteristics of processed kimberlite, to determine location of central zone upper and lower boundaries.

Comments:

1. The research is 'to develop a methodology' to determine the location. The objective is confusing–why is the objective not simply 'to determine the location'?
2. No explanation is provided as to why determining the central zone boundaries is a research task for reclamation planning. Sec. 4.2.1 indicates that natural colonization of the central zone in cell B by alkali grass 'roughly outlined the lower limit of the upper zone', so it seems that this is known. It also seems logical that the lower boundary will be defined by the moisture content and physical stability characteristics of the wet zone, so it is unclear why 'research' needs to be undertaken.
3. The methods to be employed 'to develop a methodology' are not provided.

3. Survey of Tundra Plants for Potential Revegetation of LLCF

The identified data gaps are:

1. identify additional tundra species adapted to growth in PK; and
2. determine methods to enhance establishment of tundra plants by direct seeding or planting into an existing grass cover.

Research work is identified as:

1. Research into additional species suited to growth in processed kimberlite; and
2. Research methods to enhance establishment of tundra species.

Comments:

This task proposes to assess suitability of 'additional' tundra species for revegetation. In discussing the research already conducted, the *Plan* notes that past surveys conducted by the company in the surrounding region have 'identified tundra species with potential for revegetating selected areas of the LLCF.' It then concludes that 'additional species need to be tested.' There is no reason given for why the species already identified are not satisfactory, or what further investigations need to be conducted to satisfy the research objective here. The only additional information on this task is that field trials will be conducted if a suitable location on the LLCF can be found, or that greenhouse trials will be carried out. Since the LLCF appears to be committed for tailings discharge until at least 2013, we conclude that only the greenhouse option is available. No further details are provided.

4. Seed Collection, Storage and Propagation

Data gaps are identified as:

1. location of collection sites of tundra species;
2. additional collection sites for existing SOP species;
3. optimum time of seed collection;
4. collection methods;

5. volumes of seeds required by species;
6. storage conditions for seeds; and
7. out-planting regime to minimize mortality.

The proposed research is:

1. build on and expand existing seed collection SOP and address missing information; and
2. work closely with Coast to Coast Nursery in development of methods to minimize out-planting mortality.

Comments:

The stated purpose of this task is 'to provide seed and suitable stock for the pilot revegetation study'. This is to be done in the next three years, using those species already identified as candidates for the establishment of an early protective cover. The previous research task calls for identification of additional species of tundra plants that could be used for reclamation. The effort going in to a seed bank and propagation research may have to be repeated for any new species identified in the previous task. Out-planting of six tundra species is scheduled for 2009 and 2010, and that 'research into the rearing of seedlings and development of practices to increase survival of out-planted seedlings will be directly applicable to revegetation of the LLCF'. A 'rock pad reclamation study' is referenced, but there are no details about how this research will take place.

The plan states that 'direct seeding' will be the preferred method of plant establishment in the Water Interface Zone, and that 'seeding trials' will be initiated on site. No further information is provided about how these trials will be conducted.

Some lessons learned from the field trials appear to be contradictory. On page 4 of the Plan it is noted that the survival of tundra plant seedlings transplanted onto kimberlite was poor due to high mortality from burial by windblown kimberlite. This appears to contradict the conclusion on page 5 that seedling plugs have been identified as 'the most reliable method of establishing native plants in processed kimberlite.' Moreover, on page 6 it is stated that 'drill seeding' is preferred in the central zone while 'broadcast seeding' is proposed for the Water Interface zone because of poor trafficability and favourable moisture conditions. This, too, is confounded by a statement on page 5 that states that 'establishment of native plants from seed (other than native-grass cultivars) proved unsuccessful due to unfavourable site conditions.' It is impossible to discern from all this exactly what is being proposed, or what the best method for replanting the various parts of the LLCF may be. The lessons learned about powdery kimberlite blowing around and smothering plantings speaks to the improbability of revegetation success and the possibility of impacts on tundra vegetation in the vicinity of the LLCF during and after reclamation.

Other lessons learned raise more questions. The plan states on page 6 that 'sewage sludge could be used as a source of soil nutrients, if a practical application can be developed.' We wonder why there is no research proposed to answer this question? It is also noted that fertilizer to maintain the plant cover will be required 'for a period of time'. The pilot

vegetation study to start in 2012 merely notes that one of the research components will be to 'assess maintenance fertilizer requirements.'

Another lesson learned is that natural colonization by at least two species of plants was observed in the early studies in cell B. If this occurred, then why is research being undertaken for the replanting and growth success of other species? We wonder whether further research is really necessary into plant succession or other possible species for revegetation unless this work is somehow tied to development of closure criteria to measure the success of revegetation.

5. Assessment of Natural Colonization and Successional Trends

Data gaps are identified as:

1. LLCF site conditions that enhance conditions for colonization by tundra species;
2. methods to accelerate colonization; and
3. changes in community composition and structure over time.

Proposed work to address data gaps includes:

1. research site conditions requirements for tundra species;
2. research methods to assist establishment of tundra species;
3. research successional trends in low arctic ecosystems and disturbed sites; and
4. assess natural colonization of abandoned tailings impoundments and similar sites.

Comments:

1. Task #3 sets out to characterize 'the expected plant community and the successional changes that might occur over time', but then provides no detail on how this will be undertaken. Plant succession may be quite different if planted species will be different than the natural colonizers. As we noted above, the successional trends, indeed the question of whether the revegetated plants will persist, is a far more important research question to be asked than those included.
2. There is no meaningful description of the research tasks that will be conducted to address the information gaps.
3. Four research tasks are proposed to address three information gaps—why, is not explained. One of the gaps (accelerating colonization) is not referred to in the research tasks.
4. Why researching abandoned tailings impoundments, none of which will have a PK substrate for comparison purposes, to address natural colonization success is not explained and is not intuitively obvious.

6. Assessment of Weeds

No data gaps are identified. Three research tasks are identified:

1. continue to watch for weeds when monitoring revegetation success;

2. take appropriate action if weeds are found; and
3. request certificate of analysis for no weeds when purchasing seeds from commercial vendors.

Comment:

1. This appears to be a monitoring rather than a research project. There seems to be no obvious research need for this component.

7. Pilot Revegetation Study

Plan #16 proposes to now carry out another pilot study in the north end of cell B starting in 2013 when tailings disposal ceases in that location, and going to 2019 when all tailings disposal in LLCF is finished. The plan rightly states that the objective is to determine what kind of a self-sustaining plant community can be established in the LLCF.

Data gaps are identified in #1 above. Identified Pilot Revegetation Study research tasks are 'to assess':

1. equipment and methods for site prep, seeding and planting;
2. influence of grazing on established vegetation;
3. construction and effectiveness of islands of planted species;
4. establishment of vegetation through assisted and natural colonization;
5. fertilizer requirements for long-term;
6. geochemical changes in PK from weathering and grazing;
7. changes in soil organic carbon and plant nutrients;
8. drainage and erosion control; and
9. location of central zone boundaries.

Comments:

1. A 'self-sustaining plant community' is not described. How will we know when an ecologically appropriate, self-sustaining plant community has been established on the LLCF, and the reclamation obligations of the company have been satisfied? Without such definition we can have no criteria for success, and without the criteria we will never know the answer to this question. We had expected to see matters such as species diversity, biomass accumulation, percentage cover, nutrient cycling and similar matters presented to begin to assess the sustainability of vegetation covers.

2. A number of topics are identified as part of this study to assess the stocking, growth and survival requirements of plant communities in the Central and Water Interface zones of the LLCF. Presumably this pilot project will take some years to deliver the answers needed to design the revegetation and reclamation program. The provided schedule indicates that seven years will be required to complete the research. The *ICRP* provides no further information on the actual reclamation schedule of the LLCF, but presumably it will then be replanted in a manner consistent with the research results. Subsequent to the revegetation project, the *ICRP* indicates that it

may then take at least two decades for a mature plant cover to establish. The Agency is concerned about the length of time being proposed here to conduct the trial studies in LLCF, design and implement the revegetation program, and then manage the replanted landscapes to a standard of self-sustaining plant communities. This apparent schedule puts full reclamation completion somewhere in the timeframe of year 2040.

3. The section on linkages to other research and the *Life of Mine Plan* (page 17) does not mention any further work on the palatability of the species to be used during revegetation and to what degree this will attract or deter wildlife and whether these species may uptake materials hazardous to wildlife.

4. Estimated costs of the research from 2009-2012 are up to $350,000, but since there is no breakdown of actual research activities, it is not known how this figure is devised.

5. The table below attempts to match 5 data gaps to 9 research tasks. There is no clear correspondence, and this needs to be rationalized.

Data Gap	Research Task
• methods to establish erosion-controlling cover of native grass cultivars	
• measures to protect initial vegetation cover from grazing during establishment phase	• Pilot Revegetation Study to assess influence of grazing. No methods described.
• long-term fertilizer requirements	• Pilot Revegetation Study to assess long-term fertilizer requirements. No methods described.
• methods to establish native species by direct seeding or planting and by natural colonization	• may be addressed by task 'to evaluate construction and effectiveness of islands of planted species''--not clear. No methods described. • may be addressed by task 'to evaluate equipment and methods for site prep, seeding and planting--not clear. No methods described.
• successional trends and characteristics of plant community that will develop on PK	• not addressed
	• changes in soil organic carbon and plant nutrients
	• location of central zone boundaries
	• drainage and erosion control
	• geochemical changes in PK from weathering and grazing

Finally, we are concerned about BHPB's proposed monitoring for LLCF reclamation. Their schedule supplied in Appendix 5.1-5 indicates a 10-year program, but doesn't say at what point this begins. This needs to be clarified in the next version of the *ICRP* and, as a critical principle for all mine reclamation work, such monitoring must be conducted to the point at which the reclamation criteria are achieved, however long this takes. For the LLCF this may well require significantly longer than 10 years. The extra time will be more certain if early reclamation research on closure criteria are not commenced very soon.