



# ENVIRONMENTAL ASSESSMENT BOARD

EA-97-01

## Notre Development Corporation (Adams Mine Site)

### Decision and Reasons for Decision

**In the matter of** an application submitted by Notre Development Corporation for the development and operation of the South Pit of the Adams Mine as a Landfill located in Boston Township, south east of the Town of Kirkland Lake;

**And in the matter of** the questions concerning the proposed "hydraulic containment" design, as referred to the Board by the Minister of the Environment, pursuant to Section 9.2 of the *Environmental Assessment Act*;

**And in the matter of** the *Environmental Assessment Act*, R.S.O. 1990, c.E-18, as amended.

<b>Before:</b>	Len Gertler	-	Chair
	Pauline Browes	-	Member
	Don Smith	-	Member (Dissenting)

**Dated at Toronto this 19th Day of June, 1998.**

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- Appendix C Schedule A Draft of Terms and Conditions of Approval Environmental Assessment Act, Referral of Minister of Environment, December 16, 1997 (on matters not referred to the Board)
- Appendix D WP.1.7 Hydraulic Containment Landfill, Notre Witness Panel 1
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- Appendix H Exhibit 95, Schedule for Groundwater Level and Groundwater Quality Monitoring Program (Response to Undertaking from April 7/98, Mr. McFarland to Mrs. Browes) without attached drawing WP4.2
- Appendix I
- (i) Part of Exhibit 104, Witness Statement of Petr Cizek (Beaverhouse First Nation), pp. 8 - 10, April 15, 1998
  - (ii) Exhibit 108, Proposed Monitoring/Contingency Condition and Proposed Financial Assurance Condition, April 5, 1998
  - (iii) Exhibit 131 MOE/Notre, Joint Submission on EAA Conditions, April 29, 1998
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**In the matter of** an application submitted by Notre Development Corporation for the development and operation of the South Pit of the Adams Mine as a Landfill located in Boston Township, south east of the Town of Kirkland Lake;

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**And in the matter of** the *Environmental Assessment Act*, R.S.O. 1990, c.E-18, as amended.

**Appearances:**

Robert Power ) Notre Development Corporation  
Adam Chamberlain )

Pat Moran ) Ministry of the Environment  
Laura Nemchin )

Richard D. Lindgren ) Adams Mine Intervention Coalition

Christopher M. Reid ) Beaverhouse First Nation

**Participants:**

Paul Filteau	Jim Rorison
Dr. George Duncan	James D. Smyth, Town of Haileybury
Stan Gorzalczynski	Barry Story
Glenn J. King, United Transportation Union, Local 1161	Mike Sutton
Robert A. MacGregor	Larry Wiwchar
Joe Muething	Don Wright

**Witnesses:**Notre Development Corporation

- Dr. Gail Atkinson - Engineering Seismologist, Dept. of Earth Sciences, Carleton University
- Bill Balfour - Civil Engineer, Principal, Gartner Lee Limited
- Dr. Frank Barone - Geoenvironmental Specialist, Golder Associates
- Stanley Frost - Vice President, Environment and Safety, Cameco Corporation
- Sean McFarland - Senior Hydrogeologist, Golder Associates
- Doug McLachlin - Geological Engineer (landfill design), Golder Associates
- Paul Murray - Environmental Engineering, Principal, Gartner Lee Limited
- Steven Usher - Senior Hydrogeologist, Gartner Lee Limited

Adams Mine Intervention Coalition

- Paul Bowen - Hydrogeologist, Principal, Terraprobe Limited
- David Keith - Former Miner, Rock Driller, Adams Mine
- George McGuire - Former Miner, Adams Mine
- Joe Muething - Businessman (Pump Sales and Repair), Spokesperson Englehart Area Residents Concerned About the Adams Mine
- John Vanthof - Dairy Farmer, near Earlton, Board Member - Temiskaming Federation of Agriculture

Ministry of the Environment

- Linda Cioffi - Environmental Inspector, Keele Valley Landfill
- John Walter Parks - Surface Water Evaluator, Technical Support Unit, Northern Region
- David Staseff - Senior Engineer, Waste Section, Approvals Branch, Technical Review Co-ordinator, Adams Mine Landfill
- Dr. Ernst Zaltsberg - Waste Management Hydrogeologist, Waste Section, Approvals Branch

Beaverhouse First Nation

- Petr Cizek - Environmental Consultant (land use planning, environmental impact assessment, natural resource management)
- Emmaline MacPherson - Councillor, Beaverhouse First Nation
- Chief Roy Meaniss - Chief, Beaverhouse First Nation

Other Witnesses

Norman Arthur Brown	June Korhonen
Paul Crombeen	Morris Labine
Frans Crombeen	Mary Kramp LaLonde
James Robert Crockin	Dan Louie
Virginia (Jinny) Daigneault	Norman MacDonald
Dorothy DeChamplain	Brenda MacDonald
Elizabeth Denton	Joseph Mavrinac
Murray Norman Doner	Robert McChesney
Dr. William Durocher	Peter McLean
Fern Fournier	John Merrell
Lynn Fraleigh	Eleanor Newton
Doug Fraser	Francine Patterson
Mike Gelinis	Karen Evelyn Pilch
John Lyle Goodwin	Hugh Reynolds
Debra Gail Graham	Joseph Sauve
Terry Martin Graves	Bradley Sherratt
Kathy Hakola	Bettyanne Thib-Jelly
Dennis Hakola	Victoria Trott
David Scott Hughes	John Wallace
Dorothy James	Sue Wozny
Craig David Lawrence Kemp	Clem Yantha

## The Decision

The Board, having considered the four questions referred by the Minister of the Environment, concludes that the proposed hydraulic containment design would be an effective solution for the containment and collection of leachate that will be generated at the proposed site, subject to the twenty-six conditions of approval set out in Appendix L.

The conditions of approval include two conditions that must be submitted by the proponent as part of its application for a Certificate of Approval under the *Environmental Protection Act*, namely a monitoring program for groundwater and surface water (Condition 2); and the further testing of groundwater levels by drilling two additional deep angled boreholes under the South Pit (Condition 10).

## Reasons for Decision

### 1. Introduction

#### 1.1 The Application and the Minister's Referral

The hearing on the Adams Mine landfill originated in a referral by the Minister of the Environment in a Notice, dated December 16, 1997, requiring the Environmental Assessment Board to hold a hearing under Section 9.2 of the *Environmental Assessment Act* ("EAA"). Under the authority of the Act, as amended in 1996, the Minister defined the scope of the hearing, and set a deadline for the completion of the Board's decision. While the proponent, Notre Development Corporation, completed and filed its environmental assessment ("EA") application in December, 1996 under the provisions of the EAA before amendments to the Act came into force on January 1, 1997, the Minister ordered that the major part of Part II of the amended Act apply to the Notre EA application.

The Minister's referral reads, in part, as follows:

Pursuant to subsection 12.4 (3) of the amended *Environmental Assessment Act*, I order that the provisions of section 9.1 to 9.3 of the Act (other than paragraph 9.2 (5) 2, and other than the reference to subsection 6.4 (2) in paragraph 9.2 (5)4) apply with respect to this Environmental Assessment.

Having received requests under subsection 7.2 (4) of the Act requiring a hearing by the Environmental Assessment Board with respect to the above-mentioned undertaking, having considered the submissions received, the undersigned has determined, pursuant to subsection 9.3 (4), that a hearing is appropriate in respect to only some matters.



Pursuant to subsection 9.2 (1) of the Act, the undersigned hereby refers to the Board for a hearing and decision, only the matters set out in the following questions relating to the application submitted by the proponent:

Questions:

1. Is the proposed “hydraulic containment” design an effective solution for the containment and collection of leachate that will be generated at the proposed site?
2. If the answer to Question 1 is “No”, is there an alternative method that would be an effective solution for the containment and collection of leachate that will be generated at the proposed site?
3. If the answer to Question 1 or 2 is “Yes”, are the attached draft Conditions of Approval set out in Schedule A-1 appropriate?
4. If the answer to Question 3 is “No”, in whole or in part, what changes to the draft Conditions in Schedule A-1, or additional Conditions, would you impose?

Pursuant to subsection 9.2(6), **May 30, 1998** (emphasis in original document, Exhibit 1) is specified as the deadline by which the Board shall make its decision.

The undersigned, pursuant to subsection 9.2(3), hereby informs the Board that, with respect to those matters not referred to the Board, I propose, subject to approval by the Lieutenant Governor in Council, to issue an approval subject to the Conditions of Approval set out in Schedule A.

The Minister, through Question 1, places the onus on the proponent to demonstrate the effectiveness of hydraulic containment design, consistent with the requirements of the *Environmental Assessment Act*, for the containment and collection of leachate at the South Pit of the Adams Mine.

Schedule A-1, the draft Conditions of Approval referred to in Questions 3 and 4, is attached as Appendix A. Along with the above Notice, the Minister forwarded a set of documents

encompassing an environmental assessment, and addendum materials, received from the Notre Development Corporation (“Notre”), for the development and operation of Adams Mine as a landfill.

Adams Mine is located in the unorganized Township of Boston in the District of Timiskaming, about 10 kilometres southeast of the Town of Kirkland Lake. The decommissioned, open pit iron mine is located in an upland area of partly exposed Precambrian rock in the vicinity of local watersheds: Boston Creek and Misema River. The proposal is for the disposal of solid wastes: 20 million tonnes at the rate of 1 million tonnes per year for an operating period of 20 years, in the 200-metre deep South Pit. The wastes would be solid non-hazardous municipal, industrial, commercial and institutional waste. The proposed fill area is approximately 27 hectares within an operating area of 330 hectares. The site is part of a larger property of some 1500 hectares owned by the proponent, and which includes two other decommissioned pits: Central and Peria, which were part of the original Environmental Assessment, but are not the subject of this application.

Road access to the site is provided by Highway 650, approaching from the west and terminating at the site. The site is serviced by an electrical corridor and a gas line - both on the west side of the site. A branch of the Ontario Northland Railway extends to the southern end of the site. The surrounding land use is predominantly rural.

This referral by the Minister of the Environment was a “first” in the sense that (i) the Board was required to consider, under the *Environmental Assessment Act*, a hearing in which the terms of reference were defined to include only a part of the undertaking and only part of the scope of the environmental assessment (excluding, for example, “alternatives to the undertaking”) as defined by section 6.1 (2) of the Act; (ii) the Minister has indicated his intention to approve the other aspects of the undertaking: “those matters not referred to the Board” and (iii) the Minister established a deadline for delivery of the Board’s decision. In that context, the Board wanting to leave no doubt concerning the Minister’s intent, addressed a letter to the Minister (on February 6, 1998) requesting clarification of Question 1 in the Minister’s referral notice. The Minister’s response, dated February 19, 1998, which is included in Appendix B of this report, states that the following parts of *Technical Appendix B, Design and Operations - South Pit (1996)* are directly related to Question 1:

- Leachate Management Objectives
- Leachate Management Concept

- Leachate Characterization
- Final Cover Design
- Leachate Volumes
- Leachate Management System Design
- Surface Water Monitoring
- Groundwater and Leachate Monitoring
- Remedial Action/Contingency Plans: Leachate Control and Surface Water Control

The response indicates that aspects of the above, such as leachate treatment or landfill gas, “that are clearly not part of the question” are not included. With regard to surface water monitoring, the Minister indicates that it is a relevant consideration “only to the extent surface water monitoring may indicate the existence of accidental leachate contamination of surface water, as a trigger for contingency plans”.

As a result of a preliminary hearing held on February 24, the Board, acting on behalf of the Parties, requested from the Minister and was granted an extension of the decision deadline from May 30, 1998 to June 19, 1998.

The nature of the Minister’s referral: the defined scope of the matter before the Board and the obligation to meet a deadline, has affected both the hearing and decision-writing process. In both, there has been a striving for focus and a certain conciseness, without the sacrifice of essential information.

## **1.2 The Hearing Process**

Responding to the Minister’s request, the Board issued Directions for Notice on January 13, 1998 of a Preliminary Hearing to be held in Kirkland Lake on February 24, 1998. The Notice included a request that those seeking party status reply in writing to the Board by February 10, 1998. Accordingly, the Board was able to identify four potential parties before the commencement of the hearing, namely the two statutory parties: the proponent, Notre Development Corporation; and the Ministry of the Environment; and a Coalition, representing a number of regional and local groups; and Beaverhouse First Nation. These were confirmed at the preliminary hearing along with 12 participants: individuals or organizations, such as municipalities, wishing only to make submissions and to receive requested information. There were, in addition, a considerable number of other individuals (42), not seeking participant status, who sought an opportunity to submit their views to the

Board. The Coalition, which declared its opposition to Notre's application, was represented by counsel from the Canadian Environmental Law Association ("CELA") and included eight groups: Residents for Environmental and Economic Prosperity Association ("REEPA"), Temiskaming Environmental Action Committee ("TEAC"), Nipissing Environmental Watch ("NEW"), Northwatch, Temiskaming Federation of Agriculture ("TFA"), and a number of 'Residents Concerned about the Adams Mine' - from Round Lake, Englehart and South Timiskaming; and two individuals: Ambrose Raftis and Murray Doner.

At the Preliminary Hearing, the Board's draft Procedural Directions, guidelines for the conduct of the hearing, were considered by the parties, and as a result processes and datelines were set up for the exchange of information among the parties, the filing of witness statements, and consultations and meetings to identify priority issues, and confirm the hearing schedule. The parties also, after considerable deliberation, decided consensually to seek an extension of the decision deadline from the Minister of the Environment.

At a meeting of counsel for all parties, together with the Board's counsel, Mario Faieta, held at the Board's offices on March 19, 1998, the parties reached agreement on an approach to the preparation of a joint statement on hearing issues, and confirmed a hearing schedule, extending intermittently from March 23 to April 29, 1998. It was possible to do the latter with some confidence because the Board received, on the same day, a letter from the Minister of the Environment, confirming **June 19, 1998** as the **extended deadline** "by which the Board shall make its decision". The Minister's letter, confirming the decision deadline, also enabled the Board to issue, on March 19, 1998, final Procedural Directions to parties and participants. The schedule featured the hearing of participants and the public (at special evening sessions, announced by public notice) up front, during the first two days of the hearing; hearing days continuing until 10 pm; a site visit in the morning of March 25, the third day of the hearing; an opportunity for concluding submissions by participants; brief oral argument by the parties on the final day of the hearing; and the submission of written argument by the parties after the end of the hearing through a process (confirmed on the final hearing day) that concluded on May 14 with the proponent's reply argument.

The site visit, commencing with an explanation of the site tour by some of Notre's consultants, provided an effective opportunity for the Board, the parties, and some of the participants and public (who asked to be included) to become acquainted with the physical setting of the undertaking, including the location of the deep drillhole, the pit bottom and

walls, the tailings area, and the surface water management pond. The tour included a look at the downstream area as far as the hamlet of Boston Creek about 7 kilometres to the south.

The hearing, including evening sessions, was completed in about 15 hearing days. This was made possible by all parties and their counsel accepting the discipline of a scoped hearing, and conscientiously focussing on the Minister's questions.

### 1.3 The Policy and Legislative Context

While the scope of the hearing on the Adams Mine landfill is limited, the Board's assessment of the referral questions, that is, of the application to proceed with the undertaking, is governed by the broad purpose of the *Environmental Assessment Act* ("EAA"):

The purpose of this Act is the betterment of the people of the whole or any part of Ontario by providing for the protection, conservation and wise management in Ontario of the environment.

Simultaneous with its application under the EAA, Notre has applied to the MOE for related approvals, as follows:

- *Environmental Protection Act*, s.27 approval for a waste disposal site
- *Ontario Water Resources Act*, s. 53 approval for:
  - leachate treatment facility
  - storm water management facilities
- *Ontario Water Resources Act*, s. 34 permit to take water

Since the *Environmental Assessment Act* approval is required before any of the foregoing approvals, it is important to note that the definition of "environment" in that Act is broader than it is in the other statutes. It not only includes the physical and biological aspects of environment, but as well "the social, economic, and cultural conditions that influence the life of humans or a community".

The main policies, guidelines, and objectives that govern the use and management of water in Ontario are:

**for groundwater** - *Ontario Drinking Water Objectives*, revised 1994 ("ODWO")

- Guideline B-7 - *Incorporation of the Reasonable Use Concept into MOEE Groundwater Management Activities*, April 1994 (“RUC”)

**for surface water** - *Policies, Guidelines, Provincial Water Quality Objectives, July 1994* (“PWQO”)

While the authority for the foregoing derives from the *Ontario Water Resources Act* (“OWRA”) and the *Environmental Protection Act* (“EPA”), these instruments are the only technically based standards controlling the discharge of contaminants into and pollution of the surface and ground waters of Ontario, and as such were filed as Exhibits (respectively #s 102, 66, 103) in the hearing and frequently cited in the evidence. Their declared purposes are, indeed, relevant to the application before the Board. Some of the key statements are the following:

ODWO        The primary purpose of Drinking Water Objectives is to protect public health. Water intended for human consumption should not contain disease-causing organisms or hazardous concentrations of toxic chemicals or radioactive parameters. Water should be aesthetically acceptable. . . . Objectives are considered to be the minimum level of quality and in no way should be regarded as implying that degradation of a high quality supply to the specified level is acceptable.

RUC         This guideline establishes the basis for determining the “reasonable use” of groundwater on property adjacent to sources of contaminants and for determining the levels of contaminant discharges considered acceptable by the Ministry.

PWQO        The surface water quality management goal is :

TO ENSURE THAT THE SURFACE WATERS OF THE PROVINCE ARE OF A QUALITY WHICH IS SATISFACTORY FOR AQUATIC LIFE AND RECREATION.

Provincial Water Quality Objectives are useful indicators of, but not direct measurements of aquatic ecosystem health. Non-chemical factors such as the loss of habitat, sedimentation, water quantity regulation and the introduction of non-indigenous species often have profound and over-riding influences on aquatic ecosystems.

Meeting the Provincial Water Quality Objectives is the minimum requirement.

Each of these instruments include numerical criteria as a means of applying the objectives or guidelines. The ODWO lists “maximum acceptable concentrations” (“MAC”) for lists of both health related and non-health related parameters; and describes the characteristics and effects of individual parameters: volatile organics, inorganics, pesticides and PCB. The PWQO encompasses ambient surface water quality criteria for an extensive list of parameters. The specific objectives, expressed in terms of micrograms per litre, “represent a desirable level of water quality that the MOEE strives to maintain in the surface waters of the Province”. The RUC uses a formula to determine the limits of acceptable change in quality of the groundwater on property adjacent to an undertaking, which incorporates the ODWO (Exhibits 66 and 115).

Two other documents (Exhibits 67 and 73) complete the Provincial policy context for evaluating the matters before the Board. They are MOE Guideline C-13, *Engineered Facilities at Landfills that Receive Municipal and/or Non-Hazardous Wastes*, April 1994, and *Proposed Regulatory Standards for new Landfilling Sites Accepting Non-Hazardous Waste*, June 1996.

In addition to invoking Government policies and guidelines, the Board will be cognizant of the implications of EAA decisions on landfill applications which are already in the public domain.

The Board’s Procedural Directions (#17) provide for the filing of proposed conditions of approval from the Ministry of the Environment, and for the review of these and comment, on a “without prejudice basis”, by the other parties, in the interval between the preliminary and main hearing. That process of discussion, and to a degree negotiation, carried on mainly informally throughout the hearing. In view of the conditions included in the Minister’s referral

and the multi-legislative track of Notre's application, the repertoire of conditions under review in that process included:

- Schedule A-1, the draft Conditions of Approval, under the EAA, related to The Minister's Question 1
- Schedule A, the draft Conditions of Approval, under the EAA, with respect to those matters not referred to the Board, and forwarded by the Minister along with his referral (Exhibit 1) (attached as Appendix C).
- The Draft Provisional Certificate of Approval for the Adams Mine waste disposal site, related to the application under the *Environmental Protection Act* ("EPA"), submitted as part of the witness statement of David Staseff, Senior Engineer, Approvals Branch - Waste Section, MOE (Exhibit 68).

The proposed elaborated and revised conditions submitted by the parties for the consideration of the Board (Exhibit 104- Beaverhouse; Exhibit 108 - Coalition; Exhibit 131 - MOE/Notre), and their further elaboration in final argument, emerged as either a response to or refinement and revision of the those three sets of information.

## **2. An Issue of Jurisdiction - Financial Assurance**

In the morning of March 31, on the second day of the proponent's evidence (hearing of Panel 1), the board heard a motion on financial assurance submitted by Mr. Power, counsel for Notre, having received Notice of Motion on March 27, 1998. The motion was for:

1. An order declaring that matters relating to financial assurance, site security, performance bonds and matters generally relating to landfill development, operation and post-closure costs ("Financial Matters") are outside of the jurisdiction of the Board;
2. An order that the evidence of the Coalition which relates to Financial Matters be declared inadmissible.

Mr. Power advanced several grounds for the motion, including:



- the terms of the Minister’s referral to the Board, which did not explicitly include a reference to Financial Assurance in the draft Schedule A-1, in contrast to Schedule A for ‘matters not referred to the Board’; and
- the jurisdiction of the Director (MOE) under the *Environmental Protection Act*, Part XII on Financial Assurance - “the calculation and ongoing review of Financial matters is exclusively within the jurisdiction of the Director”.

Each party spoke to the motion and the Board raised clarifying questions. In response to questions from the Board to Mr. Power, it was established that:

- the two parts of the motion are connected
- the first part raises the question: Does the Board have jurisdiction to deal with financial assurance?
- the answer to this question would determine whether evidence of the Coalition on financial matters was admissible: a negative ruling indicating that it was not, and an affirmative ruling - ‘the Board has jurisdiction’ - indicating that such evidence would be admissible.

(*Transcript*, March 31, 1998, pp. 68, 69)

On the first question: Board jurisdiction - the MOE, the Coalition, and Beaverhouse were in agreement - all advanced arguments affirming the Board’s jurisdiction on financial matters.

The expressed views of Mr. Moran on behalf of the MOE approximated a consensus among the affirming parties. On the implications of the Minister’s referral he stated, in part:

So the question is, by virtue of putting in a condition for financial assurance in Schedule A, does this then mean that the Board is not entitled to look at financial assurance matters at all? . . . with respect to matters that are referred to you, I think what you have to look at is all four questions.

The first question clearly says: ‘This is what I’m referring to you, the central issue’. And then when you look at Questions 3 and 4, I think you are asked to determine if the conditions in Schedule A-1 are appropriate conditions.

And in Question 4, you're asked to consider whether any additional conditions are required.

And so what that means is that you are entitled to consider conditions over and above what is currently set out in Schedule A-1, but the rule has to be that they have to have a logical connection to question 1 or question 2. . . . There has to be a clear, direct connection between the question and the condition.

Further, on the suggestion that the Director has exclusive jurisdiction, Mr. Moran stated, in part:

The Director clearly has jurisdiction, but the Director doesn't take the position that that's exclusive.

Clearly the Environmental Assessment Board has dealt with financial assurances in the past and, from the Ministry's perspective, does have the jurisdiction to deal with financial assurance as a general principle.

(*Transcript*, Volume 4, pp. 32, 33)

On the second question - specific evidence on financial assurance, Mr. Moran then proceeded to develop the position (not expressly shared by the Coalition and Beaverhouse) that due to the "stringent timelines associated within this hearing", that it would not be practical for "a detailed costing exercise" to be pursued within the forum of the Adams Mine hearing.

After completing the hearing on the motion, the Board adjourned to deliberate on the matter and then returned to announce its ruling, as follows:

Well, on the question of the Motion, the Board concludes that we do have jurisdiction. This is based, of course, on the *Environmental Assessment Act*, particularly section 9.2 (v). That, .... is the section that deals with the referral of matters from the Minister to the Board.

Sub(5) sets out the matters that are relevant and states that:

"The Board shall observe any directions given and conditions imposed by the Minister when referring the matter to the Board; and shall consider, et cetera...."

And there are 6 criteria. Without going into the specifics of the criteria, we believe that the acknowledgment of jurisdiction on financial assurance is consistent with those criteria and, specifically, with the conditions imposed by the Minister, in that, in those conditions, the critical question, of course, is question 1 on hydraulic containment which is the touchstone for everything else that follows.

Included in what follows, .... is question 4 and; that is, if the conditions that are suggested in Schedule A-1 are not considered wholly appropriate; in other words, if the answer to question 3 is “no”, in whole or in part, the Board is invited to consider what changes to the draft conditions may be necessary; that is, those suggested in Schedule A-1 or additional conditions that may be necessary.

Now having said that - and that really was the central question before us - does the Board have jurisdiction? I think the parties were also asking for some indication of how the Board feels this matter might be addressed in the hearing.

We want to say right off that we do not feel that this hearing with its particular terms of reference - and all of us have gone down a considerable road in preparation for this hearing in relation to those terms of reference - is the forum for the consideration, the deliberation over detailed estimates, financial estimates related to financial assurance.

In fact, we have learned that the Ministry, under the *Environmental Protection Act*, has already gone some way in exploring an appropriate financial assurance plan and, no doubt, they have the larger picture because they're dealing with a broader scope than the matter that is being referred to this Board.

Nevertheless, as we indicated earlier, we have been asked to adjudicate an important link in the whole system involved in this undertaking. That link has been called by the Minister in his letter the leachate management system and that, perhaps with your help, this is the forum where we will learn more about that aspect of the system than in any other forum.

So we feel that we have some – indeed, we have an obligation as a Board to hear the evidence that may come forward in the normal course of your proceeding with the program that we've already outlined and all the parties have agreed to.

So we do not contemplate any new witnesses on this matter, and what we hope is that if we are in the position of having to set out conditions, that we would be in a position, based upon the insights derived from this process, to set out principles and guidelines related explicitly to the leachate management system that would be helpful to the Director in formulating an appropriate and effective financial assurance plan.

So I think that really is the essence of what we have to say. It's a ruling. It speaks for itself, I hope.

Then, in response to a question from Mr. Lindgren, counsel for the Coalition, the Board offered this further clarification:

We're not in a position in this forum . . . to get into a process where one set of figures will have to be challenged by another witness of another party. That will get us along a path that I don't think we can pursue in this forum.

On the basis of the Board's ruling, the Board heard evidence on various aspects of Financial Assurance: concepts, purposes, principles, scope, components, and notional costs.

### **3. The Proposal**

#### **3.1 Design and Operations**

The synoptic exposition of the design, and related operations, of the proposed deep pit landfill based on the principle of hydraulic containment, is based on the following documents:

*Adams Mine Environmental Assessment, Technical Appendix B, Design and Operations - South Pit (1996), December 1996; and Notre Development Corporation 1988. Excerpts From Documents Relevant to the Environmental Assessment Board Hearing (EA-97-01). (Exhibits 48A & 44)*

Witness Statement of Doug McLachlin, Sean McFarland, Panel 1, *Hydraulic Containment Landfill Design Concept, Existing Geological and Hydrogeological Conditions*, March 4, 1998. (Exhibit 50)

Witness Statements of Doug McLachlin, Frank Barone, Sean McFarland, Panel 2, *Landfill Design and Leachate Collection (Pumping Phase)*; Panel 3, *Landfill Design and Leachate Collection (Gravity Drainage Phase)*, March 4, 1998; Panel 4, *Leachate and Groundwater Monitoring and Contingency Plans*. (Exhibits 51, 52 & 53)

*Memorandum to Environmental Assessment Board Re: Clarification of Gravity Drainage Phase, Panel 3*, from Sean McFarland and Doug McLachlin. (Exhibit 85)

*Transcripts* on the evidence related to the foregoing documents

*Transcripts*, Volumes 8 and 9, evidence of MOE staff, David Staseff and Ernst Zaltsberg

*Final Argument of the Notre Development Corporation*, May 9, 1998.

*Written Submission of the Ministry of Environment*, May 13, 1998.

### **3.1.1 Hydraulic Containment**

The design of the proposed landfill is based on the concept of hydraulic containment. The basic proposition, as explained by Notre consultants, is that as long as the leachate and water levels in the landfill are maintained below the surrounding groundwater table, thereby maintaining a differential in water pressures, groundwater will flow inward to the landfill and there will be no outward movement of contaminants from the landfill into the groundwater.

Maintenance of hydraulic containment in the proposed leachate management concept would be achieved in two phases: a pumping phase of approximately 100 years including the 20-year landfilling period, and a gravity drainage phase of approximately 900 years.

The centrepiece of the design is a drainage layer or blanket of permeable, crushed stone (from the Adams Mine waste rock) surrounding the landfill at the base of the pit and around the pit walls. It becomes, during the pumping phase, the conveyor of leachate and water (groundwater and precipitation) to the base of the pit where it is collected and distributed through a pipe network along an adit (a nearly horizontal opening or tunnel) to a sump, and then pumped up a pipe located in an access shaft to

the leachate treatment plant at the surface. In the gravity drainage phase, after the pumping has ceased, it becomes the conduit of groundwater flow from the surrounding bedrock, with the water rising in the drainage layer until it is intercepted by a perimeter collection system, located 20 to 25 metres below the water level elevation in the surrounding rocks, and discharged via a gravity drain into a surface water management system.

Notre's consultants draw attention to the thickness of the drainage layer and the size of its stones as a positive design feature: 5 metres thick at the base of the pit, and 4 metres along the pit walls compared to the customary 0.3 to 0.5 metres; and a stone size of 4 to 6 inches (100 to 150 millimetres) in the coarsest part of the proposed drainage layer compared to the customary 2 inch (50 millimetres) maximum. The attributed advantages of the thickness are: sufficient space to accommodate four collection pipes at the base of the pit where one will serve - a kind of benign redundancy; and, generally, a higher capacity, by virtue of the additional pores to transmit the liquid effluent flow. The advantage of the larger stones is that the larger void spaces between the stones and the smaller surface area would enhance the resistance of the blanket to biological or chemical clogging - by accommodating clogging without filling up or blocking, and by providing less opportunity, less surface area, for the accumulation of precipitates or biological slime (note Exhibit 97 on relationship of stone size to biological clogging).

To illustrate the features (and some of the hardware) of the proposed design and its operation, the following drawings from Notre documents are appended:

Appendix D - WP1.7      Hydraulic Containment Landfill

Appendix E - WP2.1      Adams Mine Landfill Cross-Section

Appendix F - WP2.2      Edge of Fill Section

The drawing in WP 2.2 shows another feature of the drainage layer, namely filters between the solid waste and the main drainage layer, consisting of sand and gravel, to minimize the washing of small particles of soil or tailings within the waste, into the drainage layer.

To complement Notre's exposition of its proposed hydraulic containment design there are several additional features that need to be briefly noted.

### 3.1.2 Monitoring, and Remedial Action and Contingency Plans

The goal of Notre's proposed groundwater monitoring program is to ensure that hydraulic containment is maintained. This breaks down into three objectives: (i) to confirm that groundwater levels in the perimeter wells around the South Pit and in the deep borehole under the base of the Pit are higher than the effluent level in the drainage blanket; (ii) to confirm by monitoring of perimeter and boundary wells that there is no leachate migration out of the pit; and (iii) to obtain baseline information for designing groundwater trigger mechanisms, that is, the indicators of exceedances of maximum acceptable concentrations of parameters calling for remedial action and/or implementation of contingency plans.

As explained in the Witness Statement of Notre's Panel 4, remedial action involves repair or replacement of existing facilities, such as the cleaning of clogged pipes; and contingency plans involve the unanticipated construction of additional landfill components like leachate purge wells, and an interception trench to collect leachate migrating from the landfill, or reinitiating the operation of existing components, such as the pumping system at the bottom of the pit in the event of the failure of the gravity drain. The Notre document on *Design and Operations, South Pit 1996* states that "detailed design and costing of the appropriate contingency measures would be carried out if and when they are required . . ."

The goal of surface water monitoring is to ensure compliance with the Provincial Water Quality Objectives. This leads to operational objectives such as (i) detecting impacts on surface water in the event of an unexpected outward flow; and (ii) to determine the impact of effluent from the leachate management system at points along the surface water management system as it extends eastward through the constructed wetlands and tailings towards Moosehead Creek and the Misema River. The final sanction is meeting the PWQO at Dam 6, before it gets to the Misema River.

To accomplish these goals and objectives the Notre design includes a program of systematic testing of leachate, both drainage layer water levels and quality; groundwater, both levels and quality; and surface water quality - in both the pumping

and gravity drainage phases; and a Predictive Monitoring and Response Plan (*Notre Witness Statement*, Panel 4, Attachment WP4.C and Drawing WP4.4, Exhibit 53; Exhibit 95 on *Schedule for Groundwater Level and Groundwater Quality Monitoring Program*; *Notre Witness Statement*, Panel 4, Drawing WP4.2, Landfill Monitoring Well Locations, South Pit; WP4.3, Selected Surface Water Monitoring Locations, Adams Mine Landfill Project).

### 3.1.3 Contaminating Life Span

This is related to groundwater quality. Contaminating lifespan is defined “as the period during which the landfill may produce contaminants at levels that could have an unacceptable impact on groundwater quality at the property boundary if outward leachate flow from the landfill were to occur.” The governing criteria are those of the Reasonable Use Concept, and through that the ODWO, applied at the closest property boundary: the south boundary about 500 metres from the South Pit. While health-related parameters like dichloromethane and vinyl chloride have a considerable contaminating life span (80 and 140 years respectively), they are overshadowed for this purpose by non-health related chloride, which does not degrade biologically and gives water an undesirable taste. The contaminating life span of the Adams Mine landfill on the basis of chloride is estimated by Notre as 1000 years, which is the period of time over which the predicted average concentration in leachate from the most permeable upper half of the landfill exceeds the Reasonable Use criterion of 130 mg/L.

### 3.1.4 Service Life of the Containment System Components

Service life refers to the length of time that an engineered component can be expected to fulfil its design function. Dr. Barone, Notre’s geotechnical specialist, estimates that service life of the sidewall drainage layer of the upper one-third of the pit, which would receive the highest leachate and groundwater flows and experience the highest rate of clogging during the gravity drainage phase, would be 3,000 years. “Service life” in this case “represents the time it would take for the ‘film’ to occupy 50% of the total porosity of the drainage stone over this upper zone of the drainage layer.”

Other possible failure mechanisms of the sidewall drainage layer: dissolution or physical breakdown of the drainage stone, or deformation or sloughing of the drainage



layer, were evaluated and unsubstantiated. Since the other key components: the perimeter collection system and gravity drain, can be accessed for maintenance, repair and if necessary, replacement, they are deemed to have a service life of more than 1000 years. (Evidence on Contaminating Lifespan and Service Life, Notre Witness Statement, Panel 3, pp 8-11)

### 3.1.5 Hydraulic Conductivity

This dimension refers to the capacity of a material, in this instance the fractured bedrock, to transmit water. Notre's consultants assert that the level of conductivity is important because it affects drainage and pumping requirements; and, therefore, low hydraulic conductivity ("HC") is a desirable but not essential precondition for attaining hydraulic containment. The range of HC levels are indicated by the HCs for high and low permeability soils: from approximately 1000 ft/year for sands and gravels to approximately 0.1 ft/year for clay deposits. Sean McFarland, Notre's hydrogeologist, reported that numerous tests of HC were conducted in three pits of Adams Mine in 1990, 1995 and 1996; and specifically, in 1995, of the bedrock beneath the base of the South Pit through packer tests (a technique to isolate and inject or remove water from a portion of a drillhole) in the deep drillhole (DH 95-12) extending about 180 metres beneath the Pit. These tests, according to Mr. McFarland, indicate four zones of hydraulic conductivity (at DH95-12), moving from relatively high to low down the bedrock cross section, as follows:

<b>Shallow Bedrock Zone</b>	- from the bedrock surface to a depth of 5 metres - HC of 100 ft/year
<b>Upper Bedrock Zone</b>	- between a depths of 5 and 30 metres - average 7 ft/year
<b>Intermediate Bedrock Zone</b>	- between depths of 30 and 100 metres - average 0.8 ft/year
<b>Deep Bedrock Zone</b>	- below a depth of 100 metres - average HC 0.02 ft/year

On this basis Mr. McFarland concluded that the bedrock in the area of the South Pit had low permeability indicating the prospects of low rates of groundwater inflow, as well as low pumping and drainage requirements, which would facilitate leachate management in the hydraulic containment system.

### **3.1.6 Computer Modelling**

In Notre's witness statements, modelling is defined as follows:

An investigative technique using a mathematical or physical representation of a system or theory that accounts for all or some of its known properties.

Notre used this technique mainly for the following aspects of their concept: contaminating lifespan, drainage blanket clogging, stability of sidewall drainage layer, drainage area effluent quality, groundwater movement, and the total hydraulic containment failure scenario. Apart from the mathematics, which were generally accepted, the validity of the modelling depends, the Board was told, on the underlying assumptions and the empirical reference. Generally, the models were understandably limited to the approximately thirty years of landfill experience, particularly leachate collection systems, in Ontario. Although the models employed, such as the work of Dr. Rowe at the Geotechnical Research Centre at the University of Western Ontario (which Notre tapped into), were recognized as 'state-of-the-art', because of the limited historical data for very long term forecasting, there is an acknowledged uncertainty about their predictions. For this reason, Notre would not rely exclusively on modelling results for crucial decisions, like the shift from the pumping to the gravity drainage phase. That, the Board understands, would be based on the outcome of monitoring of leachate effluent to determine whether it would be 'safe' to release the effluent into the surface waters.

These elements: hydraulic containment in two phases - pumping and gravity drainage, monitoring of groundwater and surface water and remedial action and contingency plans, contaminating life span, service life of the engineered system, hydraulic conductivity, and hydrogeological and other modelling, are the key features of the Notre proposal.

## **4. The Referral Questions**

## 4.1 Question 1 - Proposed Hydraulic Containment Design - Effective Solution?

### 4.1.1 Alignment of Evidence

The Minister's first question was the focus of the evidence submitted to the Board. The information base on which the Board relies for its decision with respect to this question was provided by the witnesses identified on pages 1-3 of this decision report. The expertise provided by the proponent consisted of 4 specialists concerned with the engineering design, hydrogeology, geotechnics (e.g., drainage layer design and performance), and seismology of the proposed development; 1 engineering physicist/corporate executive reporting on the hydraulic containment design of the uranium mining tailings disposal system at Rabbit Lake, Saskatchewan; and 3 from the peer review team of Gartner Lee: an engineer/general coordinator of the review, a hydrogeologist, and an engineer responsible for reviewing the design and operations of the undertaking.

The MOE, which concluded that "the proposed hydraulic containment design is an effective solution for containment and collection of leachate", submitted evidence in support of a set of recommended conditions of approval (accepted, through consultation and discussion, by the proponent) through 3 specialist witnesses, concerned respectively with hydrogeology, engineering design and operations, and surface water evaluation; and the environmental inspector of the Keele Valley Landfill.

The expertise of the Coalition consisted of 1 hydrogeologist. In addition, the Board heard from 4 lay witnesses: two former miners, a farmer, and a small businessman.

Beaverhouse First Nation led evidence from an environmental consultant with expertise in environmental impact assessment, working predominantly in northern Canada; and from the Chief and a councillor of Beaverhouse.

Additional witnesses consisted of 12 participants: 4 in support of the proposal and 8 opposed; and 42 submissions at the public evening sessions: 15 in support, 26 in opposition, and 1 neutral.

The following was the broad pattern of the evidence:

- a preponderance of professional expertise: of Notre’s consultants, Golder Associates Ltd.; the peer review group of Gartner Lee Limited; and MOE specialists, directly or indirectly upholding the effectiveness of hydraulic containment;
- local/regional community support for the proposed landfill mainly from organized groups like the Chambers of Commerce (local and regional), the Ontario Northland Transportation Commission, the United Transportation Union, the principal of Northern College, the Northeastern Mayor’s Action Group, and the Mayor of Englehart - a town, which along with Kirkland Lake, Larder Lake and the “Adams Mine Neighbourhood”, has completed a corporate agreement providing for annual royalty payments to the municipality in proportion to the amount of waste deposited in the landfill;
- limited expertise, a senior engineer/hydrogeologist of Terraprobe Limited, initiating critical consideration, as a Coalition witness, of the proposed hydraulic containment design as an effective solution for the containment and collection of leachate at the South Pit; and
- a considerable opposition to the Adams Mine landfill from individuals, community groups, and municipalities throughout the District of Timiskaming - from as close to Adams Mine as Mousseau Lake (about 2 km, northeast) and Round Lake (about 6 km, southwest) to as far south as the Town of Haileybury (about 80 km), concerned with the risk of long term pollution in the watershed of Lake Temiskaming.

The differences in the alignment of community support was illustrated by witnesses from the Town of Englehart, which is about 32 kilometres south of Adams Mine. In the evening of March 23, Mayor Bettyanne Thib-Jelly affirmed her support in no uncertain terms: “We are looking to the future and the Adams Mine project is very important to the future of our community.” On the other hand, in the evening of March 24, Norman Brown, a resident of Englehart told the Board that a door-to-door survey was conducted in 1995 of the approximately 400 households of Englehart, asking them whether the Town should be a “willing host” to the Adams Mine landfill, and that 271

households, about 68%, “ indicated they were not in support of the project”.  
(*Transcript*, Volume 1, p. 54; Volume 2, p. 456)

The social dimension of the environment was expressed in the felt concerns of members of the public, as, for example, in the observations of:

NORMAN MacDONALD: “I was a miner for 31 years. . . . I feel so bad about this project that I told my wife . . . I always dreamed about living in Round Lake because I was born there. I told her if the garbage comes from Toronto to the Adams Mine site, I will leave my dream home because I will not stay and watch the groundwater get destroyed. My sons live here, my grandchildren live here, and I speak from the heart. I speak as a miner to you people and I hope you listen very well. . . .” (*Transcript*, Volume 1, p.108)

the representations of:

DOROTHY DeCHAMPLAIN: “I am . . . . a Councillor from the Township of Chamberlain. Our Township is located just to the north of Englehart, between Englehart and the Adams Mine Site. Our northern boundary lies about 8 or 9 miles from the Adams Mine site. We are a Township of 389 people living in approximately 155 households, of which 12 are viable farm operations and four or five are private businesses. . . . Chamberlain Township Council and its residents are very concerned that the hydraulic containment system envisioned by Notre Development and its geologists will not work over the long haul, but will eventually fail and contaminate the drinking water supply for the homes, farms and businesses of our Township.” (*Transcript* Volume 1, p. 64-67)

or the questions of:

VICTORIA TROTT: “I work at a local community organization. I work for youth and try to show them by example that what you accept, you teach . . . .and it is my concern here that their future will be jeopardized

by this project . . . . We need to consider them and their futures . . . Is there a 50 per cent chance, a 75 per cent chance that our children will be adversely affected by this experiment, not just today or tomorrow, but generations from now? Is any per cent worth the consequences?" (*Transcript, Volume 2, p.437*)

This background of community concern is a factor that the Board would wish to take into account in considering the terms and conditions that might be imposed in its decision.

#### **4.1.2 Key Considerations**

Throughout the hearing, questions, concerns and criticism raised about the effectiveness of hydraulic containment were carefully and systematically addressed by Notre's impressive array of expertise. And, on most of the issues raised, the MOE provided often illuminating confirmation of the viability of the proponent's design. After due study and reflection, the Board finds that the response to Question 1 turns upon four considerations: (i) the results of the testing of groundwater levels in the single deep angled borehole (DH 95-12) drilled beneath the South Pit; (ii) the risk of clogging in the drainage layer; (iii) the proposed monitoring program for both groundwater and surface water; and, influencing each of the foregoing, (iv) the uncertainties and risks of disposing of a very large volume of waste over a contaminating lifespan of 1000 years. Each of these were raised in the testimony of the Coalition's hydrogeologist, Paul Bowen. These considerations have been singled out on the premise that the conditions of approval would adequately address the need for remedial action/contingency plans, and financial assurance.

##### **4.1.2.1 Groundwater Levels in the Deep Angled Borehole Beneath the Pit**

The drilling of this borehole in the summer of 1995, to a depth of 180 metres below the base of the South Pit, was undertaken by Golder Associates in the summer of 1995, who at the time were consultants for Metro Toronto, as a result of a recommendation of the peer reviewer, Gartner Lee.

This was explained by Steven Usher, the peer review hydrogeologist:

We understood that the landfill design relied upon the consistent presence of a hydraulic trap, wherein all groundwater flowed towards the pit. Earlier Golder documents had demonstrated that the shallow groundwater around the periphery of the pit would indeed do this, but the inflow from below the pit only had been shown theoretically. We recommended that this condition be demonstrated with field measurements from below the pit. It was on this basis that a deep angled borehole (later designated DH 95-12) was drilled under the pit and tested for water levels.

(Witness Statement of Bill Balfour, Steven Usher, Paul Murray, Panel 6, *Peer Review* March 2, 1998. [Exhibit 55])

The borehole is shown as a landfill perimeter monitoring well, located on the northeastern edge of the South Pit (Drawing WP 4.2 in Notre Witness Statement, Panel 4). The water level tests took the form of packer tests (which isolated various portions of a drillhole from which water could be removed) which provided measurements of groundwater levels. These are shown in Drawing WP1.10 in the *Notre Witness Statement* Panel 1, attached as Appendix G.

The important aspects and implications of these measurements, based on the evidence of Paul Bowen, are as follows:

- A considerable variation in the maximum (375 metres - elevation above sea level) and minimum (306 metres) water levels was discovered.
- The lowest water level, which was found near the middle of the borehole, is lower by 19 metres than the designed elevation of the gravity drain outlet, namely 325 metres.
- This finding may be due either (a) to the protocol of the testing which may not have allowed sufficient time for water levels in each part of the borehole to stabilize at actual water levels, or (b) to “differences in the bedrock conductivity and structure”.

- If the variation in water levels is due to the latter, that is differences in geologic structure and hydraulic conductivity, then during the gravity drainage phase when pumping is stopped, the water rising in the pit would flow towards the lowest groundwater level (at elevation 306 metres instead of 325 metres), hydraulic containment would be lost, and leachate would flow outward through a more conductive structure in the bedrock and not just to the gravity drain.
- The ability to “correct” this situation by lowering the elevation of the gravity drain outlet is constrained by the elevation of the receiving surface waters at the eastern end of the drain, which is about 320 metres (as illustrated in WP3.3, Notre Witness Statement, Panel 3)
- Since measurements are available from only a single borehole, it is difficult, without drilling additional deep wells (say two more) beneath the pit, to determine whether the finding in DH 95-12 is an anomaly, or indeed a structural phenomenon requiring a basic change in design strategy to sustain hydraulic containment.
- In the absence of the additional deep boreholes, the ability of Notre’s design to maintain hydraulic containment during the 900-year gravity drainage phase is called into question.  
(*Notre Witness Statements*, Panels 1 and 3; *Transcript*, Evidence of Paul Bowen, Volume 10, pp. 82-86, 140-152; Volume 11, pp. 57-62, 81, 84-86, 95-96, 175-180)

In relation to this critique, the relevant Notre evidence was as follows:

- The low groundwater measurement (elevation, 306 metres) or hydraulic head occurs under existing conditions.
- Hydrogeological modelling demonstrates that groundwater levels vary with the water level in the pit - down during the pumping phase, and up during the gravity phase “when the pit is flooded up”.
- As a result, the model also demonstrates that the lowest level in the gravity phase would be 329 metres, or about 5 metres above the gravity drain outlet.



- This is a conservative estimate because the model underestimates the groundwater levels in the deep drillhole by more than 30 metres “due to the restriction of the two dimensional modelling which does not take into account the influence of features off the model sections, such as higher surface topography.”
- Examination of the core of the deep drillhole shows that the portion with the lowest hydraulic head has a high rock quality designation, indicating unbroken rock, and displays a low index of fracture frequency - two features which are contra the presumption of a structure with high permeability.
- Instead of drilling another deep angled borehole, Notre proposes to instrument the existing borehole with a multi-level monitoring device: the Westbay System; and supports a proposed MOE/Notre condition of approval (Exhibits 131 - #6) that includes a commitment to “monitor groundwater levels and groundwater quality such that a minimum of four consecutive quarterly sets of monitoring data are submitted to the Director prior to placement of waste in the South Pit.”  
(Transcripts, evidence of Sean McFarland, Volume 5, pp. 93-97; *Notre Witness Statements*, Panel 2, Drawing WP2.10, Hydrogeological Modelling Results in Pit Areas, Pumping Phase; and Panel 3, Drawing WP3.4, Hydrogeological Modelling Results in Pit Areas , Gravity Drainage Phase; Exhibit 44, *Notre Development Corporation 1998. Excerpts from Documents Relevant to the Environmental Assessment Board Hearing, EA-97-01*, Addendum F7, Supplemental Hydrogeological Modelling (1996), p.F7.3-2; Exhibit 78, *Attachment BA, Rock Mechanics Considerations, Adams Mine, Kirkland Lake, Ontario*, Figure BA.5, Cross Section C-C Through East Wall OF South Pit; Exhibit 131, *MOE/Notre Joint Submission, Proposed EAA Conditions Adams Mine Landfill*, April 29, 1998, Condition # 6).

#### 4.1.2.2 Evaluation of the Issue of Groundwater Levels in the Deep Angled Borehole

This critical issue which relates to the very effectiveness of hydraulic containment in the gravity drainage phase is admittedly difficult to resolve. Both positions are supported by pertinent facts and persuasive rationale. On balance, because of the criticality of this issue (so much is at stake), the Board is inclined to exercise caution. Some of the considerations underlying the Board’s judgement are, as follows:

- The peer review hydrogeologist, Steven Usher believed in 1995, as his statement cited above states, that field measurements below the pit, that is by means of a deep borehole, under existing conditions were necessary to demonstrate future inflow (“the consistent presence of a hydraulic trap”) from below the pit.
- The same assumption (although inarticulate) underlies the cited MOE/ Notre condition which requires that multi-level, Westbay monitoring be undertaken for at least one year before any waste is deposited in the South Pit.
- Extrapolating findings and an interpretation of groundwater levels from a single borehole with a diameter of several inches to a large area of 27 hectares would seem to be a heroic, and not entirely credible exercise.
- Mr. Bowen’s observation on the rock found in the core of the deep borehole:

The fact that the rock right at the borehole, the several inches that the borehole went through is not fractured doesn’t mean that it’s not directly adjacent to some sort of a structure that didn’t show up in this precise borehole.

- The inconclusive outcome of Mr. Power’s cross-examination of Mr. Bowen on this matter on April 22, 1998, as illustrated by the following exchange:

MR. POWER: “. . . I don’t know if you are aware of it, but if Mr. McFarland testified that there would be inward hydraulic gradients and inward groundwater flow from the deep bedrock beneath the South Pit during both the pumping and the gravity drainage phases of the landfill, would you generally agree with that?”

MR. BOWEN: “ No I don’t agree with that.”

MR. POWER: “Okay. Do you agree with it during the pumping phase?”

MR. BOWEN: “During the pumping phase that is what the information available tells us, yes.”

MR. POWER: “Right. And your only point of contention is on the gravity drainage phase, based upon that drawing WP1.10 reading, I take it?”

(Note: reference is to the drawing, in the Witness Statement for Notre’s Panel 1, on *Comparison of Groundwater Levels in DH95-12 with South Pit Configuration and Pit Water Levels.*)

MR. BOWEN: “That’s correct.”

MR. POWER: “Okay, thank you.”  
(*Transcript*, Volume 10, pp. 216, 217)

This cross-examination took place on April 22 some three weeks after Mr. McFarland’s testimony on the gravity drainage phase (Notre’s Panel 3) - on the face of it, ample time for both Mr. Power and Mr. Bowen to have reflected on Mr. McFarland’s insights on the hydrogeology of the deep borehole, but Mr. Power chose not to get very deeply into the differences between the experts’ views.

For the foregoing reasons, the Board acknowledging its obligations under the EAA, will, in addressing the Minister’s Question 4, “err” on the side of caution and set out an additional condition of approval related to monitoring under the base of the pit, as follows:

**The owner shall drill at sites and to specifications approved by the Director two additional angled boreholes beneath the South Pit, conduct packer tests at appropriate elevations, and report results, as part of its application for an *Environmental Protection Act* Certificate of Approval, to the Director. No waste shall be placed in the South Pit until the Director evaluates the results of the tests and determines, without reservation, that the recorded groundwater levels will sustain hydraulic containment in the South Pit such that the environment will be protected, during both the pumping and gravity drainage phases.**

The requirement of two more deep angled boreholes arises out of a direct response of Mr. Bowen to a question from the Board. (*Transcript*, evidence of Paul Bowen,

Volume 11, p. 81). That was on April 23, 1998 in response to Board member, Don Smith, as follows:

MR. SMITH: "I'm wondering, if we think in terms of this whole question of looking at WP1.10 and your suggestion that the range of information you're getting out of there requires more work, it seems to me this comes down to maybe one of your, the main sticking point in your mind on the problem with this whole undertaking..

I guess you are suggesting considerably more boreholes being done and considerably more work in order to get a better feeling for what is actually going on down there in terms of the fractures and whatever in the rock that might cause problems?"

MR. BOWEN: "Yes. When I say – or when you say "considerably more", I think it would be reasonable as an example to put two more deep angled boreholes beneath the pit.

I think – that might sound like "considerably more" or not, but that's the sort of number that I'm looking at.

That sort of work couldn't be accomplished in a timeframe of several weeks. It would take much more time than that to do the work, properly instrument the holes and get the results back.."

MR. SMITH: " If I look at Drawing WP1.10 and you were suggesting – you weren't sure. We'd have to look at the more detailed drawing, but if there's something like 10 metres between those blue lines and, say, you have got one here, 10 metres at one spot that seems high enough. Then you've got another, a low one."

MR. BOWEN: "Yes."

MR. SMITH: " Then you've got another high one. Could almost be a suggestion here that you could have a localized problem –"

MR. BOWEN: (Nodding head)

MR. SMITH: " – within what; something like 20 metres –"

MR. BOWEN: "That's correct."

MR. SMITH: “ – that could cause some real problems to the whole concept of hydraulic containment.

And if you're talking - is it 27 hectares we are talking about altogether - if that borehole identified a localized problem, why couldn't a borehole 20 metres away from it find another one?"

MR. BOWEN: “It may or may not, and that's the thrust of my reason to drill some more boreholes, to see whether, first of all, this is a remnant of the field testing; in other words, whether it's an accurate measurement or not. And, second of all, to see whether this problem occurs at other locations, as well, or whether it's simply found at one location.

And if you drill more boreholes, you will get a better indication of that.”

#### 4.1.2.3 The Other Considerations: Clogging, Monitoring, Uncertainty and Risk

The evidence on the other considerations that most directly affect the issue of hydraulic containment suggests that they are addressed by either the design of the undertaking, or proposed conditions of approval as the latter have evolved, in response to criticism and advice, during the course of the hearing.

The issue of clogging is fundamental because it affects the service life of the drainage layer. All of the experts agreed that the drainage layer could be affected by two types of clogging in the South Pit: one from the waste side - leachate-based biological clogging caused by the growth of bacteria forming a slime or film of mainly calcium carbonate deposits on the rocks of the layer, occurring in the first tens of years of operations; and one from the bedrock side - chemical clogging due to the high iron content in the groundwater and the precipitation of iron promoting growth of iron bacteria on the stones of the drainage layer, occurring throughout the contaminating lifespan. The service life of the drainage layer is entirely dependent on it not becoming clogged over the 1000 years of the contaminating lifespan; but if clogging does occur there is little opportunity (except perhaps near the top of the rising waste deposit), once the waste has been deposited in the pit, to access and “fix” the drainage layer.

The basic protection against this kind of breakdown is in the design of the drainage layer, as described above in 3.1.1, Hydraulic Containment, and 3.1.4, Service Life of the Containment System Components. The essential assertion is that in anticipation of the clogging problem, the drainage layer has been over-designed: some five hundred thousand cubic metres of pore space (the open space between the stones in the layer) are available to accommodate only a combined groundwater and leachate flow in the gravity drainage phase (when the water is permitted to rise in the pit) of 30 to 40 gallons per minute. Also, the coarse, granular layer will be shielded (from small particles of mine tailings, for example, to be used as interim cover) by the half-metre thick filter layer of sand and gravel. There will be some clogging of the filter layer and some mounding of leachate, but, according to Dr. Barone, the filter layer would retain “a residual permeability sufficient to allow the leachate to enter it and enter the granular drain layer.” On the basis of Notre’s modelling, which included the effects of long term clogging due to the iron in the groundwater, Dr. Barone estimates a service life of 3000 years. The MOE Technical Review Coordinator, Mr. Staseff, generally confirmed the longevity of the drainage blanket, emphasizing the advantages of large stone size in offsetting biological clogging. (*Transcripts*, evidence of Doug McLachlin, Sean McFarland, Frank Barone, Volume 4, pp. 196 and 210; evidence of Dr. Barone, Volume 5, p.30-33 and 74-75; Exhibit 132, *Evidence of Dr. Barone Establishing the Calculation of Bacteria from Groundwater Inflow*)

An effective monitoring program is critical for ensuring that Provincial water quality standards are met, that is, of the ODWO for groundwater and the PWQO for surface water. In the event of the breakdown (for example, due to clogging) of hydraulic containment, complete or partial, there are some health-related parameters in the leachate: organics like vinyl chloride and dichloromethane; inorganics like lead or mercury, that could, if not detected, have serious cumulative effects. The evidence of the Coalition identified a number of gaps in Notre’s original monitoring program (for example, the absence of multi-level groundwater monitoring, of monitoring in the waste and in the drainage layer) which caused Notre to revise its monitoring program. This is reflected in the Joint MOE/Notre Submission on Proposed EAA Conditions (Exhibit 131), which sets out conditions necessary for a comprehensive monitoring program, including the following features:

- a groundwater program, including water and leachate levels and quality with several lines of “defence” - landfill perimeter wells, boundary wells, monitoring in

the waste, multi-level monitoring in the drainage blanket and in the deep angled borehole under the pit, and monitoring of “a representative number of domestic water supply wells” in the concerned communities of Boston Creek and Dane Road.

- a surface water program that includes provisions related to obtaining the data necessary to detect and control any accidental leachate contamination of surface water, such as parameter-specific trigger levels as a basis for initiating contingency plans, and a monitoring facility at the point of discharge (No.6 dam, on Drawing WP4.3, Panel 4, Witness Statement) from the surface water system into the receiving waters of Moosehead Creek and the Misema River.

The Board requested and received from Notre a detailed *Schedule for Groundwater Level and Groundwater Quality Monitoring Program* (Exhibit 95) which is attached as Appendix H. The schedule shows the depth and proposed monitoring frequency for 13 landfill perimeter wells, 12 property boundary wells, and 19 other wells around the site. For monitoring of groundwater level in the above wells, the predominant frequency in the pumping phase is monthly, except for the deep borehole under the pit which will be quarterly. In the gravity drainage phase it varies in four periods: quarterly, monthly, annual, biennial to the year 1000. For monitoring of groundwater quality, the schedule shows 4 landfill perimeter wells and 12 property boundary wells with a quarterly monitoring frequency during the pumping phase; and for the same wells in the gravity phase, the frequency in three periods to the year 1000 is quarterly, annual, and biennial. Continuous groundwater level monitoring using automated water level recorders will be carried out at 6 wells along the southern perimeter of the South Pit in both the pumping and gravity drainage phases. This program does not yet include provision for multi-level monitoring in the waste and drainage layer as prescribed in the MOE\Notre Joint Submission on EAA Conditions.

While the monitoring conditions in the proposed MOE/Notre EAA conditions form the basis for the program necessary to ensure the effectiveness of hydraulic containment, further consideration of these conditions will be required in relation to the Minister’s fourth referral question.

(Witness Statement of Doug McLachlin, Frank Barone, Sean McFarland, Panel 4, *Leachate and Groundwater Monitoring and Contingency Plans (Gravity Drainage*

*Phase*), March 4, 1998, Attachment WP4.C, Drawings WP4.2&WP4.3; *Transcript*, evidence of Mr. Bowen, Volume 10, pp. 88-94 and 166-172; Exhibit 92, Memorandum to Environmental Assessment Board Re: *Status of Surface Water Quality Monitoring Program*, from Sean McFarland, April 7, 1998)

The above considerations, like all aspects of the landfill design, are affected by the uncertainties and risks associated with a contaminating lifespan of 1000 years. The longer the contaminating lifespan the greater the risk. It is a dimension, which demands sustained excellence in design and operations. It also places a special onus on the institutional aspects of the project. The very long term commitment required stretches the credulity of most people. Can public confidence in the management of such a large and demanding undertaking be sustained indefinitely? In the circumstances, if the proposal is to proceed, special attention must be given to management aspects in relation to the role of the affected groups and communities.

#### **4.1.3 Response to Question 1**

From the foregoing, it is apparent that the response to the Minister's first question is a qualified "yes". The Board has no basis for believing that the proponent has not met the civil standard of proof - balance of probabilities. Counsel agree on the fundamental requirement that the proponent has the "burden of proof" to demonstrate "that it is more likely than not that its factual allegations are true" (Lindgren), or "that the existence of a fact is more probable than its nonexistence" (Power). The comments above (in 4.1.2.2) on the groundwater levels in the deep angled borehole provide a good test of this standard of proof. The issue is basic - the way it is resolved could make or break hydraulic containment. Each side of the debate had a valid knowledge base for its position. The facts were incontrovertible. The difference lies in the interpretation of the facts.

Mr. Lindgren argues, and Mr. Power demurs, that the extraordinary nature of Notre's Adams Mine proposal demands an extraordinary standard of proof: "clear and convincing proof based upon cogent evidence". It is not necessary to pursue this encounter. For in a hearing before this Board there can be no higher criterion than the purpose of the EAA: ". . . the protection, conservation and wise management in Ontario of the environment." And, indeed, as indicated in 1.3 above, this is reinforced with respect to groundwater and surface water by the ODWO and the PWQO. With



this criterion in mind, the Board, in the case of the groundwater levels in the deep borehole beneath the South Pit, felt constrained to apply the precautionary principle. The doubt arising from the alignment of opposing views leads the Board to a prudent conclusion - to be sure that the undertaking is safe, a way must be found through the EAA conditions to test the findings on groundwater levels in the first monitoring exercise in the single deep borehole. This conclusion is reinforced by one of the widely acknowledged site suitability criteria invoked in the Halton Landfill decision (1989, CH-86-02):

Natural containment and attenuation of contaminants is preferred to engineered containment and design.

When everything depends on engineering design and works, it better be right.

Hence the Board's conclusion - "yes", if this landfill design dependent upon hydraulic containment can be kept environmentally viable and safe over a very long period of time by appropriate conditions of approval.

#### 4.2 The Other Referral Questions

The answer to **Question 2**: Is there an alternative method, is simply "No". The only other method discussed was a liner, which is a relatively thin structure of natural clay or a plastic which provides a barrier preventing leachate from reaching or mixing with groundwater in landfills. Notre's Panel 1 Witness Statement (Exhibit 50, p. 10) contains the following comment, attributed to Doug McLachlin, on the use of a liner:

The objective of a liner at the Adams Mine site in a hydraulic containment design is to minimize the volume of water contaminated by the waste and thereby reduce the volume of leachate to be treated. As . . . I will explain later, the low volume of water flowing into the South Pit means a liner is not required. In fact, a liner would needlessly complicate the simple design being proposed, particularly over the long run. A simple design is considered to be more reliable.

This view was not challenged by any of the other witnesses.

#### 4.2.1 EAA Conditions

With regard to **Question 3**, the Board finds that the intent and some of the specific provisions of Schedule A-1 (attached as Appendix A) are appropriate. These were, however, used at the hearing by MOE and Notre, working together, to produce a longer and more inclusive set of proposed EAA conditions (Exhibit 131). As indicated at the end of 1.3 above, some proposed conditions were also submitted by the Coalition and Beaverhouse. Exhibit 104, pp. 8-10 and *Beaverhouse First Nation, Final Argument, May 12, 1998, Appendix A* (Beaverhouse); Exhibit 108 (Coalition), and Exhibit 131 (MOE/Notre) are attached as Appendix I. On the basis of these submissions, **Question 4** (what changes to the draft conditions? or what additional conditions?) can be most usefully pursued in terms of the following themes:

Monitoring/Operations, and Remedial Action & Contingency Plans

Contaminating Lifespan

Financial Assurance

Community Consultation and Participation

In considering EAA conditions, the Board is mindful of the observations of MOE counsel, Patrick Moran, in his closing written submission (May 13, 1998), on the advisability of recognizing the overall regulatory context. Mr. Moran stated:

The *Environmental Assessment Act* approval is required before any other approvals can be granted. *Environmental Assessment Act*, s.12.2(2)

At the same time, it is clear that the subject matter of applications for Certificates of Approval to be dealt with by the Director overlaps to a significant degree with the subject matter to be dealt with by the Board in the context of the questions that have been referred to the Board by the Minister.

Given this overlap, and given that the *Environmental Assessment Act* approval must be granted prior to any other approvals, the Ministry took an approach to the hearing which was designed to allow the Board to understand where the Ministry stood with respect to all of the approvals that would apply to the undertaking. Mr. Staseff, as Technical Review Coordinator for the environmental assessment, was able to describe the nature of the technical review that was carried out with respect to the environmental assessment that was submitted by the proponent. As a senior review engineer in the Ministry's Approvals Branch, he was also able to describe the kind of Certificate of Approval that the Director was proposing in relation to the undertaking. The reason for doing this was to give the Board the benefit of having the same view of the undertaking that the Minister would have had if there had been no hearing under the *Environmental Assessment Act*. The Board is in a position to know what kind of Certificate of Approval will be issued by the Director under Part V of the *Environmental Protection Act* if the Board decides to grant an approval under the questions referred to it by the Minister.

In setting out the Conditions of Approval with respect to the above themes, the Board has used the *MOE/Notre Joint Submission on EAA Conditions* as a framework, since it is the most inclusive of the parties' submissions on proposed conditions; and will, as appropriate, incorporate aspects of the other submissions. Each of the four themes will be preceded by a brief explanation, followed by the revised text. For convenience, additions or changes to the Conditions MOE/Notre Joint Submission (Exhibit 131) will be identified in **bold**. Unless the context otherwise requires any reference to the "Director" in the conditions refers to the Director as defined in the *Environmental Protection Act* and the *Ontario Water Resources Act*.

## **Part A - Monitoring/Operations, and Remedial Action and Contingency Plans**

Explanation

- The first goal of the monitoring program related to “the technical and scientific requirements” refers to the need to meet the exacting conditions of monitoring in fractured bedrock.
- The monitoring program shall be guided by the project objectives for groundwater and surface water identified in 3.1.2 in this document and further elaborated in Condition 2 below; and by the broader objectives, really goals (Condition 1), formulated by the Coalition (Exhibit 108, 1.3).
- Based on the analysis in 4.1.2.1 and 4.1.2.2 in this document, a condition requiring two additional deep angled boreholes has been added to the monitoring program. Results of tests conducted in the borehole are to be available as part of the proponent’s application under the EPA; and no wastes are to be deposited in the South Pit, until authorized by the Director, after evaluation of the tests.
- The scope of the required monitoring and contingency program (PART A) contains a number of provisions which are direct responses to needs identified at the hearing, notably:
  - S Condition 3 (iv) requiring monitoring of the drainage layer at levels between the base of the pit and the perimeter collection system , and monitoring in the waste mass;
  - S Condition 6, giving the Community Liaison Committee (“CLC”) the opportunity to review, comment and make recommendations on monitoring and contingency plans;
  - S Condition 7 on the monitoring of groundwater quality in a representative number of domestic wells in local communities;
  - S Condition 9 requiring multi-level monitoring of groundwater levels and quality, and conductivity tests in the deep angled borehole beneath the pit;
  - S Condition 11 on determination of the elevation of the perimeter collection system; and

- S Condition 13 on determination through monitoring results when it is environmentally safe to move from the pumping to gravity drainage phase.
- The Conditions have been strengthened by implementing the Coalition’s advice to go beyond identification of monitoring locations to installation and maintenance; and the advice of Beaverhouse to go beyond providing for review and comment by the CLC to “review and recommend”.
  - Where necessary for clarity there are cross references to the specific provisions of the relevant Notre documents.
  - While monitoring and remedial action & contingency plans will be developed, in consultation with the proponent, by a technical, inter-Ministerial Monitoring and Contingency Planning Working Group, the plans will be subject to review and recommendation by an independent CLC assured of required technical assistance.

Revised Part A, Conditions on Monitoring/Operations, and Remedial Action & Contingency Plans

- 1. The goals of Notre’s monitoring program shall be:**
  - (a) to achieve the technical or scientific requirements of monitoring the landfill’s performance in collecting and containing leachate;**
  - (b) to achieve the social objective of monitoring key areas of concern to local residents (i.e. well water, local water courses, or other features which may be impacted by the escape of leachate from the landfill); and**
  - (c) to establish baseline conditions for the purposes of detecting and evaluating potential or actual escapes of leachate from the landfill.**
2. The Owner shall submit to the Director as part of its applications for an EPA Certificate of Approval, a monitoring and contingency plan for the site that will achieve the following objectives and principles:

- (i) establish accurate baseline conditions to ensure that data is available regarding the existing environment;
  - (ii) during landfilling operations, to monitor operations of the landfill to ensure it is being operated in accordance with the EPA Certificate of Approval;
  - (iii) during landfilling operations and the contaminating lifespan, to ensure that impacts, including consideration of long-term and cumulative impacts, are in accordance with those predicted;
  - (iv) identify, **install and maintain** appropriate locations to monitor leachate levels in both the waste and at appropriate elevations in the drainage blanket;
  - (v) establish criteria to ensure that, in the event of a leachate escape from the landfill to Basin Number 2, the water quality meets Ontario Provincial Water Quality Objectives prior to discharge;
  - (vi) ensure that any discharge from the tailings basin at Dam 6 and prior to entering the Misema River, meets the PWQOs or the established background levels;
  - (vii) establish parameter-specific trigger levels for surface water for initiating contingency actions;
  - (viii) gather data **for approximately 2 years** suitable for the establishment **within 2 years of the issuance of a Certificate of Approval** of groundwater trigger levels, and groundwater quality parameters for initiating contingency actions to be included in a Predictive Monitoring and Response Plan. These trigger levels will be based on maximum allowable concentrations for the site, in accordance with the Reasonable Use Guidelines and PWQOs.
- 3. The Proponent will establish a Monitoring and Contingency Planning Working Group to facilitate the participation of, and consultation with the following members of the Government Review Team during the finalization of the required monitoring and contingency plans, and related components of the EPA Certificate of Approval process, and the Ministry of Natural Resources Work Permit requirements:**

- **Ministry of the Environment**
- **Ministry of Natural Resources**
- **Environment Canada**
- **Ministry of Transportation**

(Note: This was Condition 13(1) in Schedule A-1)

4. **In accordance with the foregoing objectives and principles, the monitoring program and the remedial action & contingency plans shall include, but not be limited by, the measures identified in *Technical Appendix B, Design and Operations (1996)*, Sections 10.0 and 11.0.**
5. No waste shall be received at the Site until the surface water triggers have been approved by the Director. The Owner shall implement all monitoring programs as approved by the Director.
6. The Owner shall ensure that the CLC, with the assistance of the Peer Reviewer, has a 45 day period in which to review and comment **and make recommendations** on the monitoring and contingency plans to be developed by the Monitoring and Contingency Planning Working Group, **in consultation with the Owner**, prior to the plans being forwarded to the Director.
7. The Owner shall select, in consultation with the CLC and the owners of the wells, and monitor groundwater quality of a representative number of domestic water supply wells in Boston Creek and the Dane Road on an annual basis and provide the results to the CLC.
8. The Owner shall contour the ground surface area around the landfill site to ensure that any leachate that may escape from the landfill cover is collected by ditches around the perimeter of the landfill, so that perimeter ditches convey the leachate to either Basin 1, the planned discharge point during the gravity phase, or to Basin 2.
9. The Owner shall install the proposed Westbay Well Monitoring System in DH 95-12 and monitor groundwater levels and groundwater quality such that a minimum of four consecutive quarterly sets of monitoring data are submitted to the Director prior to placement of waste in the South Pit. In addition, a hydraulic conductivity test will be

conducted in each interval as indicated in Table B. 19.3, Technical Appendix B, Design & Operation - South Pit (1996) and the results submitted to the Director. The Westbay Well Monitoring System will continue to be operated throughout the contaminating lifespan of the landfill, in accordance with the monitoring plans.

- 10. The owner shall drill at sites and to specifications approved by the Director two additional angled boreholes beneath the South Pit, conduct packer tests at appropriate elevations, and report results, as part of its application for an *Environmental Protection Act Certificate of Approval*, to the Director. No waste shall be placed in the South Pit until the Director evaluates the results of the tests and determines, without reservation, that the recorded groundwater levels will sustain hydraulic containment in the South Pit such that the environment will be protected, during both the pumping and gravity drainage phases.**
11. The Owner shall review **and confirm** the final elevation of the perimeter collection system prior to construction based on the results of on-going water level monitoring during the previous years of monitoring. (See Technical Appendix B, Design & Operations - South Pit (1996), page B.6-3). The CLC shall have a period of 90 days in which to review, comment upon **and make recommendations to the Owner concerning** the proposed final elevation of the perimeter collection system prior to its construction.
12. Except in accordance with the appropriate approvals, the Owner shall not alter the water elevation within the Central Pit such that hydraulic containment conditions around the South Pit are lost during the contaminating lifespan of the landfill in the South Pit.
13. The Owner may discontinue pumping of the drainage layer and on-site leachate treatment only upon written approval by the Director, and in consultation with the CLC, based on a written request by the Owner to the Director, with supporting documentation. The supporting documentation will include an evaluation of the potential for downstream long-term and cumulative effects to confirm that pumping and treatment is no longer necessary for protection of the natural environment.
14. Within 6 months of the Ministry or the Owner identifying a risk of the effluent levels in the drainage layer rising to the groundwater levels in the adjacent bedrock during the pumping or gravity drainage phases, the Owner shall implement any required



contingency measures to ensure that hydraulic containment conditions are maintained at the South Pit. **For the purpose of implementing this condition the Owner shall, at the request and to the satisfaction of the Director, define an operative concept of “risk”.**

## Part B - Contaminating Lifespan

### Explanation

- Contaminating lifespan (“CL”) may be defined as the period of time during which the landfill is expected to produce contaminants at levels that could have an unacceptable impact on water quality if they were discharged into the surrounding environment.
- CL is a critical consideration in landfill operations and design because it affects the necessary duration of the service life of the engineered works as well as the period of landfill maintenance and operation well beyond the date of landfill closure.
- The estimated CL of 1000 years for the Adams Mine (see 3.1.3 above), with its attendant uncertainty and risks, makes it necessary to:
  - periodically assess the opportunity of applying effective measures, including new technologies, to reduce the contaminating lifespan. (Condition 15)
  - annually reassess the CL in relation to the results of the on-going monitoring program, particularly on the quality of groundwater and surface water. (Condition 16)
  - annually reassess the list of contaminants, particularly the indicators, used to assess the impact on water quality. (Condition 17)
- These conditions respond, in part, to the expressed interest of the Board in reducing the contaminating lifespan by accelerating the decomposition of wastes and the production of leachate; and to the interest of the participant, James Robert Rorison, a local engineer, who stated: “Given the current rate of change of technological advancement and the fact that the concept of leaching is commonly used in the mining industry to extract minerals from ores, I’m not convinced that it wouldn’t be possible to accelerate the production of leachate by using some form of reagent rather than rainwater, thereby

rendering a site neutral in some significantly shorter period of time following closure.”  
(*Transcripts*, Volume 11, p.31; Volume 2, p.29)

#### Revised Part B, Conditions on Contaminating Lifespan

15. The Owner shall, every five years after the site becomes operational, assess means of reducing the contaminating lifespan of the landfill, including the review of new technologies or methodologies. The Owner will provide the MOE and the CLC with details of the assessment and consult on the applicability and feasibility of new technologies to reduce the contaminating lifespan at the site.
16. The Owner shall reassess the contaminating lifespan annually with respect to groundwater quality and quantity, and surface water, based on results of the environmental monitoring programs. The assessment shall be provided to the Regional Director (Director of Northern Region, Ontario Ministry of Environment) and the CLC.
17. The Owner shall reassess annually the list of contaminants used to determine the contaminating lifespan of the landfill with respect to the impact of drainage layer effluent on groundwater and surface water quality. The reassessment shall be provided to the Regional Director, and the CLC.

#### Part C - Financial Assurance

##### Explanation

- These conditions have the effect of implementing, through the Director, the Financial Assurance provisions of the *Proposed Regulatory Standards For New Landfilling Sites Accepting Non-Hazardous Wastes* (Exhibit 73). These cover Closure and Post-Closure Care (Section 33) and Contingency Plan (Section 34). (See Appendix J)
- By making these part of this decision, the standards assume, in effect, the authority of a regulation for the purposes of the Adams Mine Landfill.
- The Adams Mine Landfill involves a demanding engineering solution, requiring highly disciplined monitoring and management to assure hydraulic containment and the protection of the environment over the period of a long contaminating lifespan.

- The need for financial assurance with respect to a contingency plan arises out of the concept of such a plan - “an organized, planned and coordinated course of action to follow in case of any unexpected failure in the design of a waste management facility.” It is simply prudent to set aside funds in advance for the eventuality (no matter how low the risk) of a failure.
- The provision that “the financial assurance shall be a cash deposit in the Consolidated Revenue Fund of the Province of Ontario or an alternate form of funding acceptable to the Director” is designed to prevent the costs associated with the risks of a private undertaking being assumed by the public purse. (Section 34 through Condition 18)
- The six principles of financial assurance set out in Condition 19 were (with some clarifying changes) originally formulated by the MOE Technical Review Coordinator, David Staseff, in response to a Board request, endorsed (and indeed recommended) by Notre. The changes consist of (1) adding “remedial action” to contingency plans in (iii) following the scope and title of Section 11 in Notre’s Appendix B, Design and Operations, South Pit, 1996; and (2) providing in principle (iv) for periodic review of the Owner’s Financial Assurance Plan by the CLC.
- While Notre’s Contingency Plan: interceptor trench, purge wells and/or continued pumping, has not yet proceeded beyond the conceptual stage, the proponent has a carefully formulated, 5-step Predictive Monitoring and Response Plan, setting out a systematic protocol leading from the identification of a problem to the design and construction of the contingency feature.  
(Appendix K, Drawing WP4.4)
- The time to proceed through the five steps: 1 year and some months, according to Mr. MacLachlin, would represent a serious challenge when juxtaposed to the most exacting constraint. Due to high groundwater velocity, in the event of accidental escape of leachate into the groundwater, the leachate plume would reach the southern property boundary (the closest boundary) within about 1 year, thus leaving a relatively short time for implementing contingency action.
- Accordingly, the financial assurance plan must be operative, virtually as soon as waste deposition begins, in the manner set out in Section 34 by requiring that “a minimum of 10 percent of the future value amount [the future value of the 1996 base year unit

amount of fifty cents per tonne of waste multiplied by the expected total waste tonnage of the site]. . . within two years of waste being deposited at the new site . . .”; and that “the amount of financial assurance . . . be accumulated at least in proportion to the filling of the site but with 100 per cent to be in place five years before the anticipated date of closure or upon filling 80 percent of the total waste disposal volume, whichever comes first.”

- The rationale for closure and post-closure care - providing for on-going operation (e.g. final cover), maintenance and monitoring, is particularly important for a site with a very long contaminating lifespan. Section 33 of the proposed standards also contains the opportunity for the Director to obtain funds for covering the costs of any unplanned or early closure of the site.
- Condition 20 covers an area of concern not within the scope of the provincial standards, but not uncommonly applied in such cases, namely environmental impairment liability insurance. (See *Gary Steacy Dismantling Limited*, EP-97-03, December 4, 1997, Condition 5),
- As a means of evaluating the Owners’s Financial Assurance Plan in relation to local and regional needs, Condition 21 provides for review, comments, and recommendations by the Community Liaison Committee.

(Exhibit 53, Notre Panel 4, Witness Statement, *Leachate and Groundwater Monitoring and Contingency Plans*, Drawing WP4.4; *Transcripts*, Volume 7, Doug McLachlin evidence, pp. 70-71; Volume 10, Paul Bowen evidence, pp. 53-54; Volume 11, Paul Bowen evidence, pp. 51-53; Coalition Memorandum of Fact and Law, par. 181, p. 55)

#### Revised Part C, Conditions on Financial Assurance

18. In determining financial assurance requirements for the landfilling operations, the Director shall **adhere to** the report entitled “Backgrounder - Proposed Regulatory Standards for New Landfilling Sites Accepting Non-Hazardous Waste”, in particular Standards 33 and 34 entitled “Financial Assurance - Closure & Post-Closure Care and Financial Assurance - Contingency Plan” (pages A45 to A47). This condition is not

intended to constrain the Director's obligation to consider all relevant matters required by the EPA.

- 19. The provision of financial assurance by the Owner shall be guided by the following six principles:**
- (i) Financial Assurance shall be in an amount and form acceptable to the Director.**
  - (ii) Financial Assurance shall be maintained as long as the length of the contaminating lifespan.**
  - (iii) Financial Assurance shall be provided to cover the costs of site closure, long-term post-closure monitoring, maintenance and inspection and remedial action/contingency plans.**
  - (iv) Financial Assurance shall be reviewed on a regular basis, at least every three years.**
  - (v) Financial Assurance shall be provided during site operational life in proportion to the filling of the site.**
  - (vi) The CLC should be consulted to review, comment and make recommendations upon the Financial Assurance Plan, and the periodic review of the Plan.**
- 20. The Owner, in consultation with the Director, shall explore the need for and feasibility of environmental impairment liability insurance.**
- 21. The Owner shall ensure that the CLC, with the assistance of an appropriately qualified Peer Reviewer, will have a 45 day period in which to review and provide comment and recommendations on the Financial assurance Plan prior to it being forwarded to the Director.**

## **Part D - Community Consultation and Participation**

### Explanation

- The model of Community Liaison Committee ("CLC") embodied in Conditions 22 to 26 arises out of the special challenge of the Adams Mine Landfill, namely

- to sustain a management regime that protects and conserves the environment, particularly groundwater and surface water over a very long period of time - a contaminating lifespan of 1000 years; and, related to this,
  - to respond to the evident anxiety about potential environmental impacts of local residents who addressed the Board; and
  - to acknowledge the heritage and aspirations for involvement of the Beaverhouse First Nation.
- This challenge requires a body, a CLC, which provides a credible and meaningful opportunity for the people and communities who would be affected by any failure of hydraulic containment to participate in the decision-making process of the landfill project.
  - This opportunity is provided by:
    - the representative composition of the Committee: community, municipal, agricultural, environmental, First Nation, academic/research, management, and the Provincial Ministry; (Condition 22)
    - the mandate which provides for review, comment and recommendations on key aspects of landfill management, related to both operations and impact; (Condition 24)
    - funding, based on an agreement between the Owner and the CLC, enabling the Committee to act on and fulfil its mandate; (Condition 25)
  - These features, together with the ability of the Committee to create its own terms of reference (Condition 23), provide the basis for a responsible, representative, self-managing group, with potential for maintaining constant vigilance on the environmental integrity of the Adams Mine Landfill, while being, on such matters, the conscience of the community.

- In this respect, in fashioning an institution designed expressly for the context and circumstances of the Adams Mine Landfill, the hearing parties may have initiated a promising new path for community consultation and participation.

Revised Part D, Conditions on Community Consultation And Participation

## **22. Nature and Composition of the Community Liaison Committee**

**(i) The Owner shall establish, within 6 months of the issuance of this decision, a self-managing group, a Community Liaison Committee, concerned with the operation and impact of the Adams Mine Landfill, to serve as a focal point for the local communities and residents, and interested members of the public.**

**(ii) The following shall be entitled to appoint a member to the CLC:**

1. the Owner
2. the municipalities of Kirkland Lake, Englehart and Larder Lake
3. Northern College
4. Round Lake and Area Taxpayers Association
5. Residents of Dane Road/Boston Creek
6. Adams Mine Neighbourhood Improvement Funding (AMNIF) Committee
7. Beaverhouse First Nation
8. Temiskaming Federation of Agriculture
9. Residents living in close proximity to the site (2 representatives)
10. Temiskaming Municipal Association
11. Residents for Environmental and Economic Prosperity Association (“REEPA”)
12. the Ministry of the Environment (“MOE”)

## **23. Terms of Reference**

**(i) The CLC shall be entitled to prepare and be governed by its own Terms of Reference and Procedures with respect to the form of its organization (corporate or other), its operating procedures, appointment of officers, conduct of meetings, and other matters related to its mandate.**

**24. Mandate of the CLC**

The purposes of the CLC shall include the following:

- (i) to serve as a liaison with constituencies (interests they represent) and generally the residents, groups and communities of the area, and the general public, through various forms of communication (formal and informal), including the publication of newsletters;**
- (ii) to review and to make recommendations to the Owner and to the MOE (when appropriate) on key aspects: plans, programs, activities, decisions related to the undertaking, including:**
  - Operations: landfill and site**
  - Monitoring Programs: groundwater, surface water, leachate**
  - Remedial Action and Contingency Plans**
  - Financial Assurance Plan**
  - Complaint Response Program**
  - Changes to the Certificate of Approval**
  - Reports on the foregoing, including the Annual Report;**
- (iii) to assume an active role in developing and implementing a Complaint Response Program by**
  - advising the Owner on a procedure for receiving and responding to complaints**
  - receiving, hearing, and reporting on complaints to the Owner**
  - making recommendations to the Owner with respect to unresolved complaints**
  - monitoring actions taken by the Owner and results through the inspection of records kept by the Owner;**
- (iv) to develop and sustain a learning program for CLC members on the environmental, scientific, technical and administrative aspects of the undertaking; and on group and community dynamics, including inter-cultural communication;**



- (v) to serve as a clearing-house on information: studies, reports, data on the Adams Mine Landfill;
- (vi) to engage the services of professional expertise for Peer Review and on-going technical assistance with respect to (i) to (v) above;
- (vii) to hold meetings of the CLC and its sub-committees;
- (viii) to facilitate communication between the Owner, the Environmental Inspector, the MOE (Director) and members of the community;
- (ix) to maintain a small, but appropriate administration: staff, facilities, equipment to fulfil the foregoing purposes;
- (x) to establish and maintain a suitable permanent office, conveniently located with respect to the landfill site and the members of the CLC, appropriate for administering (i) to (ix) above.

## 25. Funding of the CLC

- (i) The Owner shall provide sufficient funding on an on-going annual basis to cover the costs of the CLC mandate as set out in Condition # 24 above, through a funding agreement between the Owner and the CLC, ensuring the continuity of the CLC mandate throughout all phases of the project.
- (ii) The CLC shall have full autonomy in the allocation of funds, as negotiated in 25(i) above, for the purposes of its mandate.
- (iii) The CLC shall provide to the Owner and the Director, on an annual basis, an audited financial statement of the receipts and expenses of the CLC.
- (iv) If the CLC and the Owner are unable to reach an agreement on funding, an arbitrator agreed to by both the CLC and the Owner may impose one. If the CLC and the Owner are unable to agree on an arbitrator, the Director may name one. The professional fee of the arbitrator shall be borne by the Owner during the first three years of operations;

subsequently, the fee shall be shared by the Owner and the CLC on a 2/3 (Owner), 1/3 (CLC) basis. As an alternative, the CLC and the Owner may request that the Board perform this service.

**26. Other Matters to Facilitate the Mandate of the CLC**

- (i) The time available to the CLC to provide comments and recommendations on monitoring programs, remedial action/contingency plans and the Financial Assurance Plan, prior to their submission to the Director for approval, shall be at least 45 days, or longer by agreement (note: 90 days for the perimeter collection system in Part A, #11 above) between the CLC and the Owner.**
- (ii) The time available to the Owner (or the Director when considered appropriate) to respond to CLC comments and recommendations shall be at least 45 days, or longer by agreement between the Owner (or the Director) and the CLC.**
- (iii) The Owner shall provide the Peer Reviewer with access to the technical experts conducting monitoring (or other technical work) and to the monitoring results, in accordance with protocols agreed to between the Owner and the Peer Reviewer acting through the CLC.**
- (iv) The Owner shall allow reasonable access to the site by CLC members and their technical advisors to observe site operations, subject to all applicable safety regulations.**
- (v) The Owner's Annual Report on the operation, development, and monitoring of the Site shall be submitted annually to the CLC, as well as to the officials of MOE.**

**5. Conclusion**

For these reasons described above, we answer the four questions posed by the Minister as follows:

- Question 1 - Yes, with conditions
- Question 2 - No
- Question 3 - No, in part
- Question 4 - The referred conditions are changed and extended in the manner outlined

**Dated at Toronto this 19th day of June, 1998.**

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Len Gertler, Chair

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Pauline Browes, Member

## Dissenting Decision

I have reviewed and considered the majority decision. While we share many areas of agreement, I regrettably find myself unable to agree with my colleagues on the conclusion for reasons which I will describe.

Before entering into my reasons for dissent I wish to indicate how I would answer the four questions posed by the Minister's referral letter:

QUESTION # 1 I believe the answer to question # 1 should be NO.

QUESTION # 2 I believe the answer to question # 2 should be NO for the same reasons expressed in the majority decision.

QUESTION # 3 Not applicable.

QUESTION # 4 Not applicable.

### Reasons

**W**ith respect to Question 1 I have come to the conclusion that the proposed hydraulic containment design is not an effective solution for the containment and collection of leachate that will be generated at the proposed site.

This conclusion is based upon the following areas of concern:

1. Uncertainty and Risk of 1000 Year Contaminating Lifespan
2. Service life of Drainage Layer
3. Monitoring
4. Contingency Plans
5. Financial Assurance
6. Groundwater levels in the Deep Angled Borehole Beneath the Pit

## Provincial Policy Guidelines

In describing “Environments Unsuitable for Waste Disposal” section 5.2 of Guideline B-7, Incorporation of Reasonable Use Concept into MOEE Groundwater Management Activities warns that:

A disposal facility may not be supported in a location where the ability of the natural environment to attenuate contaminants is weak, as in fractured rocks...

Because of the lack of natural attenuation in the fractured bedrock at the Adams Mine site the hydraulic containment design relies 100% on engineered works for the collection and containment of leachate.

Attachment B (Preference for Natural Protection Landfill Sites) of Ministry of the Environment Guideline C-13, Engineered Facilities at Landfills that Receive Municipal and/or Non-Hazardous Wastes, states that:

Engineered facilities are used to compensate for deficiencies in the ability of the natural environment to attenuate the contaminants produced in a landfill. However, it is the Ministry position that there are limitations to engineered facilities and therefore sites in environments with characteristics that provide a high degree of natural protection or where there is no useful or potentially useful groundwater resource are preferred.

When asked about the above documents and whether he considered the South Pit to be “not a preferred site...in the sense that it’s a fractured bedrock site” Ministry witness David Stassef replied, “ Well we can’t leave aside the engineered components to answer that question. Again the site has been designed based on hydraulic containment. All rock is fractured to a certain degree. The fact that we have inward hydraulic gradients and inward groundwater flow to the site is, I guess, a positive attribute to the site even though it’s in a fractured bedrock environment”. (Transcript Vol. 8, p.172)

## The Halton Principles

Coalition witness Paul Bowen put forth seven principles from the Joint Board’s decision under the Consolidated Hearings Act, 1981, in the Regional Municipality of Halton that

the Joint Board thought were “...of considerable significance when considering the hydrogeological suitability of a landfill site”. The Joint Board’s 7 principles are:

1. The hydrogeology of the area must be comprehensible to the Board.
  2. The loss of contaminants should be minimal (and preferably zero), as a result of either natural containment or engineered works.
  3. Natural containment and attenuation of contaminants is preferred to engineered containment and attenuation.
  4. If it is predicted that contaminants may move away from a landfill site, then the postulated contamination migration pathways must be predictable.
  5. It should be demonstrated that predicted leachate migration from the site will have no significant adverse impacts on surface water.
  6. Monitoring to identify contaminant escape and migration pathways should be straightforward.
  7. There should be the highest possible confidence in the effectiveness of contingency measures to intercept and capture lost contaminants
- (File CH-86-02, Feb. 24, 1989, pp.109-112)

I agree with Mr. Bowen’s statement:

It is my opinion that the proponent has failed to adequately demonstrate that items 1, 3 & 7 have been adequately addressed. Some of these items may be addressed through further investigation and design measures. However...it is my opinion that some of these items fundamentally cannot be addressed as a result of the intrinsic characteristics of the fractured bedrock environment around the site. (Exhibit 65, Coalition Panel 1 Witness Statement, pp.3-4)

### **1. Uncertainty & Risk of 1000 Year Contaminating Lifespan**

The contaminating lifespan of the Adams Mine landfill, as outlined in 3.1.3 of the majority decision, is estimated by the proponent to be about 1000 years. This estimate was generally accepted but Mr. Bowen did point out that it was far from precise since it was arrived at by using computer modelling based on actual landfill data covering a period of only 10-30 years. (Exhibit # 65, Coalition Panel 1 Witness Statement, p.5)

This means that although the landfill will accept waste for only 20 years, at a projected rate of 1 million tonnes per year, the engineered leachate collection and containment system will have to continue to operate for 1000 years to make sure that contaminants don't escape from the pit into surrounding water resources.

This 1000 year contaminating lifespan is an important factor because it heightens the importance of each of the 5 following areas of concern since each concern will continue over such a long term.

## **2. Possible Failure of the Drainage Layer**

As outlined in 3.1.4 of the majority decision all the engineered components must have a service life of 1000 years to match the contaminating lifespan of 1000 years. Most of the engineered components can be replaced so the only relevant factors are cost and financial assurance.

However, as outlined in 4.1.2.3 of the majority decision, the service life of the drainage layer becomes a crucial issue since it is fundamental to the hydraulic containment design and it cannot be replaced once it is buried under tonnes of waste.

Mr. Bowen pointed out the proponent's estimate of the effects of clogging was arrived at using computer modelling based on laboratory experiments and very short term actual landfill experience raising doubts about its accuracy. (Transcript, Vol. 10, p.67, pp.69-71 and pp. 223-24; Transcript, Vol. 11, pp.15-18 and p.129)

Dr. Barone said the proponent's estimate of a 3000 year service life for the drainage layer was based on "...calculations for the rate of clogging which look at the growth of a film consisting of bacteria and calcium carbonate. And the reason for this very large lifespan of the drainage system is very simple, it's because again it's a large size stone, it's a very large volume of stone, and it has a very low flow rate going through it, 32 gallons per minute." (Transcript, Vol 5, pp.30-33)

On the question of clogging of the drainage layer, I question Dr. Barone's assertion that the drainage blanket will "never clog" and his estimate of a service life of 3000 years. (Transcript, Vol 4, pp.190-91, pp.194-95; Transcript, Vol 5, p.79)

I prefer the more cautious approach taken by Mr. Bowen:

“I think it’s a very real risk. It’s one that has not been addressed sufficiently and the most important issue arising out of that risk is that there’s an absolute necessity to clearly identify the costs and feasibility of contingency works as an upfront issue with respect to landfill design... You can make assumptions, you can look at what has happened at other sites and you can come up with some very, very approximate timeframes, but what it ultimately leads me to conclude is that there will be clogging of the system.” (Transcript, Vol. 10, p.74; Transcript, Vol. 11, p.25)

Although he does not have the *academic* qualifications of the expert witnesses, all of whom, including Mr. Bowen, disagreed with his analysis, Stan Gorzalcynski, a mechanical technologist, who specializes in the design of material haulage and transport systems in the aggregate and mining industries made a very convincing presentation, using the proponents calculations, to suggest the shear forces from the settling of the waste could seriously damage the drainage layer thereby causing a failure of hydraulic containment and the subsequent escape of leachate. (Exhibits 14 and 25; Transcript, Vol 2, pp.85-126; Transcript, Vol 12, pp.48-49)

I believe there is enough evidence to suggest the drainage layer could fail over the 1000 year contaminating life span leading to a failure of hydraulic containment and the subsequent migration of leachate out of the pit.

### **3. Inadequate Monitoring**

I agree with my colleagues conclusion, as outlined in 4.1.2.3 of the majority decision, that the monitoring program suggested by the proponent, and agreed to by the Ministry, has been significantly improved as a result of concerns raised by Mr Bowen throughout the hearing.

I feel it is still deficient in terms of monitoring beneath the pit and the large interval distance between groundwater monitoring wells along the south side of the pit. As a result it will not warn of the escape of leachate from the pit in the event of loss of hydraulic containment.

The proponent’s expert hydrogeologist, Mr. McFarland, confirmed this concern.

Q. If there’s a leachate pathway, fractures, whatever, either in the upper 30 metre zone or in the upper 100 metre zone... if these monitoring wells are not hydraulically



connected to the pathways, is it possible that the leachate could slip through in this interval distance?

A That's correct. (Transcript, Vol. 6, p.195)

I believe that because of the nature of the site (fractured bedrock, structures, variable conductivity) it is impractical to effectively monitor groundwater for migration of leachate out of the pit and for water levels indicating variable conductivity under the pit and this concern will remain for the 1000 year contaminating lifespan of the project.

#### **4. Lack of Design Detail on Contingency Plans**

Because of the lack of natural protection at this site, because of the proponent's 100% reliance on engineered works over the 1000 year contaminating lifespan of the landfill and because of concerns raised about possible failure of hydraulic containment, the effectiveness (technical and financial feasibility) of contingency measures becomes a crucial concern.

The proponent has identified several possible contingency plans such as purge wells, an interceptor trench and the resumption of pumping during the drainage phase but, in Mr. Bowen's opinion, they have not provided the level of design detail required to assess their effectiveness:

"In our opinion, it is necessary to provide more detailed information and, in particular, establish the potential long term costs and operational implications of the above contingency measures. It is of particular importance given the extended period of time (several hundred years) over which the leachate collection will be necessary. Without properly identifying the detailed design and potential costs of the above measures, it will be difficult to provide a reasonable basis for assessing the financial assurance matters." (Exhibit # 65, Coalition Panel 1 Witness Statement, p.7)

The majority decision concludes in Part C-Financial Assurance, Explanation that while the proponent's contingency plans have not proceeded beyond the conceptual stage, a combination of the 5-step Predictive Monitoring and Response Plan and the financial assurance condition that requires 10% of the total contingency fund be accumulated in the first two years of operation (and thereafter in proportion to the filling of the site) would allow a contingency plan to be put in effect within the predicted time (about one year) it would take

escaping leachate to reach the south boundary of the property in the event of loss of hydraulic containment.

I believe the lack of design detail on contingency plans and the resulting lack of financial assurance information is not as crucial as earlier concerns but it is a part of the hydraulic containment design package and is important for a complete understanding of that package.

## **5. Financial Assurance Information**

As outlined in Section 2 of the majority decision (An Issue of Jurisdiction-Financial Assurance), the proponent brought a motion for a ruling that financial assurance and financial matters be declared outside the jurisdiction of the Board and that Coalition evidence on financial matters be declared inadmissible. The Board issued a unanimous ruling that financial assurance was within our jurisdiction as long as it related to the central question of hydraulic containment design but that due to the stringent timelines it would not be practical for a detailed costing exercise. The Board stated that it would be in a position, based upon insights derived from this process, to set out conditions containing principles and guidelines related explicitly to the leachate management system that would be helpful to the Director in formulating an appropriate and effective Financial Assurance Plan.

Mr. Bowen argued for the coalition that in order for the Board to judge the effectiveness of the engineered components it must consider the technical feasibility (can you do it?) and the financial feasibility (can you afford to do it?). A proposal may be technically feasible but if you can't afford to do it, then it can't be said to be effective. (Transcript, Vol. 10, pp.228-29; Transcript, Vol. 11, pp.158-59)

Mr. Bowen argues the financial assurance information is inadequate in three areas;

- long term operating costs for engineered works are not available;
- costs for the contingency plans are not available; and,
- inherent difficulty predicting rate of return on funds set aside over the 1000 year contaminating lifespan. (Exhibit # 65, Coalition Panel 1 Witness Statement, pp.7-8)

The Board did accept as evidence, and listen to argument on, financial information regarding:

- a Proposed Financial Assurance Plan:

- Financial Assurance Contingency Allowance Calculations as they relate to hypothetical early closure scenarios; and,
- estimated costs of building an interceptor trench as a contingency plan for loss of hydraulic containment. (Exhibits # 84, 88 and 101)

Given the stringent timelines imposed on the hearing it was not practical to engage in a detailed costing exercise but I agree with Mr. Bowen more financial information would have allowed the Board to better judge the effectiveness of the engineered works and contingencies that are an integral part of the hydraulic containment design.

#### **6. Groundwater Levels in the Deep Angled Borehole Beneath the Pit**

This is the same concern that I mentioned earlier in the section on monitoring but I concur with the majority decision that it is of crucial importance and deserves to be dealt with separately.

Section 4.1.2.1 of the majority decision outlines in some detail the importance of further study of the fractured bedrock beneath the pit to be certain there are no geologic features (dykes, faults) that could serve as a pathway for leachate flow out of the pit when there is less inward flow pressure during the drainage phase when the pit is allowed to fill up.

The evidence on the anomalous low water level reading from the deep angled borehole and the opinions of the proponent and of Mr. Bowen for the coalition are clearly and fairly set out in sections 4.1.2.1 and 4.1.2.2 of the majority decision.

I am totally in agreement with my colleagues in their analysis of this issue. I disagree with their solution because, notwithstanding Mr. Bowen's conclusion, I don't believe 2 more deep angled boreholes beneath a 27 hectare pit, sited in fractured bedrock with possible fault and dykes, is sufficient to effectively monitor groundwater levels that may indicate loss of hydraulic containment during the gravity phase.

#### **Conclusion**

When I weigh the totality of the evidence presented on all the above concerns (uncertainty and risk of a 1000 year contaminating lifespan, possible failure of the drainage layer, inadequate monitoring, lack of design detail on contingency plans and the resulting lack of financial

assurance information, and uncertain groundwater levels beneath the pit) I come to the conclusion that enough concerns have been raised that a proper exercise of the precautionary principle would lead us to say no to this project.

Having regard to all of the above concerns it is my considered opinion the proponent has not fulfilled the onus placed on it to demonstrate the effectiveness of the proposed hydraulic containment design, consistent with the requirements of the Environmental Assessment Act.

**Dated at Toronto this 19th day of June, 1998.**

Don Smith, Member

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## APPENDICES

- Appendix A Schedule A-1 Draft Terms and Conditions of Approval Environmental Assessment Act, Referral of Minister of Environment December 16, 1997
- Appendix B Letter of Hon. Norman Sterling, Minister of the Environment to Peter Fischer, Secretary, Environmental Assessment Board, February 19, 1998.
- Appendix C Schedule A Draft of Terms and Conditions of Approval Environmental Assessment Act, Referral of Minister of Environment, December 16, 1997 (on matters not referred to the Board)
- Appendix D WP.1.7 Hydraulic Containment Landfill, Notre Witness Panel 1
- Appendix E WP2.1 Adams Mine Landfill Cross-Section Notre Witness Panel 2
- Appendix F WP2.2 Edge of Fill Section  
Notre Witness Panel 2
- Appendix G WP1.10 Comparison of Groundwater Levels in DH95-12 with South Pit Configuration, and Pit Water Level  
Notre Witness Panel 1
- Appendix H Exhibit 95, Schedule for Groundwater Level and Groundwater Quality Monitoring Program (Response to Undertaking from April 7/98, Mr. McFarland to Mrs. Browes) without attached drawing WP4.2
- Appendix I (i) Part of Exhibit 104, Witness Statement of Petr Cizek (Beaverhouse First Nation), pp. 8-10, April 15, 1998
- (ii) Exhibit 108, Proposed Monitoring/Contingency Condition and Proposed Financial Assurance Condition, April 5, 1998
- (iii) Exhibit 131 MOE/Notre, Joint Submission on EAA Conditions, April 29, 1998
- (iv) Beaverhouse First Nation, Final Argument, May 12, 1998 Appendix A, Proposed Terms and Conditions
- Appendix J Proposed Regulatory Standards for New Landfilling Sites Accepting Non-Hazardous Wastes  
Section 33 - Closure and Post-Closure Care  
Section 34 - Contingency Plan
- Appendix K Notre Witness Statement, Panel 4  
Drawing WP4.4 Predictive Monitoring and Response Plan
- Appendix L Conditions of Approval
- Appendix M Exhibit List

## CONDITIONS OF APPROVAL

### Monitoring/Operations, and Remedial Action and Contingency Plans

1. The goals of Notre's monitoring program shall be:
  - (a) to achieve the technical or scientific requirements of monitoring the landfill's performance in collecting and containing leachate;
  - (b) to achieve the social objective of monitoring key areas of concern to local residents (i.e. well water, local water courses, or other features which may be impacted by the escape of leachate from the landfill); and
  - (c) to establish baseline conditions for the purposes of detecting and evaluating potential or actual escapes of leachate from the landfill.
  
2. The Owner shall submit to the Director as part of its applications for an EPA Certificate of Approval, a monitoring and contingency plan for the site that will achieve the following objectives and principles:
  - (i) establish accurate baseline conditions to ensure that data is available regarding the existing environment;
  - (ii) during landfilling operations, to monitor operations of the landfill to ensure it is being operated in accordance with the EPA Certificate of Approval;
  - (iii) during landfilling operations and the contaminating lifespan, to ensure that impacts, including consideration of long-term and cumulative impacts, are in accordance with those predicted;
  - (iv) identify, install and maintain appropriate locations to monitor leachate levels in both the waste and at appropriate elevations in the drainage blanket;
  - (v) establish criteria to ensure that, in the event of a leachate escape from the landfill to Basin Number 2, the water quality meets Ontario Provincial Water Quality Objectives prior to discharge;
  - (vi) ensure that any discharge from the tailings basin at Dam 6 and prior to entering the Misema River, meets the PWQOs or the established background levels;

- (vii) establish parameter-specific trigger levels for surface water for initiating contingency actions;
  - (viii) gather data for approximately 2 years suitable for the establishment within 2 years of the issuance of a Certificate of Approval of groundwater trigger levels, and groundwater quality parameters for initiating contingency actions to be included in a Predictive Monitoring and Response Plan. These trigger levels will be based on maximum allowable concentrations for the site, in accordance with the Reasonable Use Guidelines and PWQOs.
3. The Proponent will establish a Monitoring and Contingency Planning Working Group to facilitate the participation of, and consultation with the following members of the Government Review Team during the finalization of the required monitoring and contingency plans, and related components of the EPA Certificate of Approval process, and the Ministry of Natural Resources Work Permit requirements:
    - Ministry of the Environment
    - Ministry of Natural Resources
    - Environment Canada
    - Ministry of Transportation
  4. In accordance with the foregoing objectives and principles, the monitoring program and the remedial action & contingency plans shall include, but not be limited by, the measures identified in *Technical Appendix B, Design and Operations (1996)*, Sections 10.0 and 11.0.
  5. No waste shall be received at the Site until the surface water triggers have been approved by the Director. The Owner shall implement all monitoring programs as approved by the Director.
  6. The Owner shall ensure that the CLC, with the assistance of the Peer Reviewer, has a 45 day period in which to review and comment and make recommendations on the monitoring and contingency plans to be developed by the Monitoring and Contingency Planning Working Group, in consultation with the Owner, prior to the plans being forwarded to the Director.
  7. The Owner shall select, in consultation with the CLC and the owners of the wells, and monitor groundwater quality of a representative number of domestic water supply wells in Boston Creek and the Dane Road on an annual basis and provide the results to the CLC.
  8. The Owner shall contour the ground surface area around the landfill site to ensure that any leachate that may escape from the landfill cover is collected by ditches around the perimeter

of the landfill, so that perimeter ditches convey the leachate to either Basin 1, the planned discharge point during the gravity phase, or to Basin 2.

9. The Owner shall install the proposed Westbay Well Monitoring System in DH 95-12 and monitor groundwater levels and groundwater quality such that a minimum of four consecutive quarterly sets of monitoring data are submitted to the Director prior to placement of waste in the South Pit. In addition, a hydraulic conductivity test will be conducted in each interval as indicated in Table B. 19.3, Technical Appendix B, Design & Operation - South Pit (1996) and the results submitted to the Director. The Westbay Well Monitoring System will continue to be operated throughout the contaminating lifespan of the landfill, in accordance with the monitoring plans.
10. The owner shall drill at sites and to specifications approved by the Director two additional angled boreholes beneath the South Pit, conduct packer tests at appropriate elevations, and report results, as part of its application for an *Environmental Protection Act* Certificate of Approval, to the Director. No waste shall be placed in the South Pit until the Director evaluates the results of the tests and determines, without reservation, that the recorded groundwater levels will sustain hydraulic containment in the South Pit such that the environment will be protected, during both the pumping and gravity drainage phases.
11. The Owner shall review and confirm the final elevation of the perimeter collection system prior to construction based on the results of on-going water level monitoring during the previous years of monitoring. (See Technical Appendix B, Design & Operations - South Pit (1996), page B.6-3). The CLC shall have a period of 90 days in which to review, comment upon and make recommendations to the Owner concerning the proposed final elevation of the perimeter collection system prior to its construction.
12. Except in accordance with the appropriate approvals, the Owner shall not alter the water elevation within the Central Pit such that hydraulic containment conditions around the South Pit are lost during the contaminating lifespan of the landfill in the South Pit.
13. The Owner may discontinue pumping of the drainage layer and on-site leachate treatment only upon written approval by the Director, and in consultation with the CLC, based on a written request by the Owner to the Director, with supporting documentation. The supporting documentation will include an evaluation of the potential for downstream long-term and cumulative effects to confirm that pumping and treatment is no longer necessary for protection of the natural environment.
14. Within 6 months of the Ministry or the Owner identifying a risk of the effluent levels in the drainage layer rising to the groundwater levels in the adjacent bedrock during the pumping or gravity drainage phases, the Owner shall implement any required contingency measures



to ensure that hydraulic containment conditions are maintained at the South Pit. For the purpose of implementing this condition the Owner shall, at the request and to the satisfaction of the Director, define an operative concept of “risk”.

#### Contaminating Lifespan

15. The Owner shall, every five years after the site becomes operational, assess means of reducing the contaminating lifespan of the landfill, including the review of new technologies or methodologies. The Owner will provide the MOE and the CLC with details of the assessment and consult on the applicability and feasibility of new technologies to reduce the contaminating lifespan at the site.
16. The Owner shall reassess the contaminating lifespan annually with respect to groundwater quality and quantity, and surface water, based on results of the environmental monitoring programs. The assessment shall be provided to the Regional Director (Director of Northern Region, Ontario Ministry of Environment) and the CLC.

#### Financial Assurance

17. The Owner shall reassess annually the list of contaminants used to determine the contaminating lifespan of the landfill with respect to the impact of drainage layer effluent on groundwater and surface water quality. The reassessment shall be provided to the Regional Director, and the CLC.
18. In determining financial assurance requirements for the landfilling operations, the Director shall adhere to the report entitled “Backgrounder - Proposed Regulatory Standards for New Landfilling Sites Accepting Non-Hazardous Waste”, in particular Standards 33 and 34 entitled “Financial Assurance - Closure & Post-Closure Care and Financial Assurance - Contingency Plan” (pages A45 to A47). This condition is not intended to constrain the Director’s obligation to consider all relevant matters required by the EPA.
19. The provision of financial assurance by the Owner shall be guided by the following six principles:
  - (i) Financial Assurance shall be in an amount and form acceptable to the Director.
  - (ii) Financial Assurance shall be maintained as long as the length of the contaminating lifespan.
  - (iii) Financial Assurance shall be provided to cover the costs of site closure, long-term post-closure monitoring, maintenance and inspection and remedial action/contingency plans.
  - (iv) Financial Assurance shall be reviewed on a regular basis, at least every three years.

- (v) Financial Assurance shall be provided during site operational life in proportion to the filling of the site.
  - (vi) The CLC should be consulted to review, comment and make recommendations upon the Financial Assurance Plan, and the periodic review of The Plan.
20. The Owner, in consultation with the Director, shall explore the need for and feasibility of environmental impairment liability insurance.
21. The Owner shall ensure that the CLC, with the assistance of an appropriately qualified Peer Reviewer, will have a 45 day period in which to review and provide comment and recommendations on the Financial assurance Plan prior to it being forwarded to the Director.

#### Community Consultation and Participation

22. Nature and Composition of the Community Liaison Committee
- (i) The owner shall establish, within 6 months of the issuance of this decision, a self-managing group, a Community Liaison Committee, concerned with the operation and impact of the Adams Mine Landfill, to serve as a focal point for the local communities and residents, and interested members of the public.
  - (ii) The following shall be entitled to appoint a member to the CLC:
    - 1. the Owner
    - 2. the municipalities of Kirkland Lake, Englehart and Larder Lake
    - 3. Northern College
    - 4. Round Lake and Area Taxpayers Association
    - 5. Residents of Dane Road/Boston Creek
    - 6. Adams Mine Neighbourhood Improvement Funding (AMNIF) Committee
    - 7. Beaverhouse First Nation
    - 8. Temiskaming Federation of Agriculture
    - 9. Residents living in close proximity to the site (2 representatives)
    - 10. Temiskaming Municipal Association
    - 11. Residents for Environmental and Economic Prosperity Association (“REEPA”)
    - 12. the Ministry of the Environment (“MOE”)
23. Terms of Reference
- (i) The CLC shall be entitled to prepare and be governed by its own Terms of Reference and Procedures with respect to the form of its organization (corporate or other), its

operating procedures, appointment of officers, conduct of meetings, and other matters related to its mandate.

24. Mandate of the CLC

The purposes of the CLC shall include the following:

- (i) to serve as a liaison with constituencies (interests they represent) and generally the residents, groups and communities of the area, and the general public, through various forms of communication (formal and informal), including the publication of newsletters;
- (ii) to review and to make recommendations to the Owner and to the MOE (when appropriate) on key aspects: plans, programs, activities, decisions related to the undertaking, including:
  - Operations: landfill and site
  - Monitoring Programs: groundwater, surface water, leachate
  - Remedial Action and Contingency Plans
  - Financial Assurance Plan
  - Complaint Response Program
  - Changes to the Certificate of Approval
  - Reports on the foregoing, including the Annual Report;
- (iii) to assume an active role in developing and implementing a Complaint Response Program by
  - advising the Owner on a procedure for receiving and responding to complaints
  - receiving, hearing, and reporting on complaints to the Owner
  - making recommendations to the Owner with respect to unresolved complaints
  - monitoring actions taken by the Owner and results through the inspection of records kept by the Owner;
- (iv) to develop and sustain a learning program for CLC members on the environmental, scientific, technical and administrative aspects of the undertaking; and on group and community dynamics, including inter-cultural communication;
- (v) to serve as a clearing-house on information: studies, reports, data on the Adams Mine Landfill;

- (vi) to engage the services of professional expertise for Peer Review and on-going technical assistance with respect to (i) to (v) above;
- (vii) to hold meetings of the CLC and its sub-committees;
- (viii) to facilitate communication between the Owner, the Environmental Inspector, the MOE (Director) and members of the community;
- (ix) to maintain a small, but appropriate administration: staff, facilities, equipment to fulfil the foregoing purposes;
- (x) to establish and maintain a suitable permanent office, conveniently located with respect to the landfill site and the members of the CLC, appropriate for administering (i) to (ix) above.

25. Funding of the CLC

- (i) The Owner shall provide sufficient funding on an on-going annual basis to cover the costs of the CLC mandate as set out in Condition # 24 above, through a funding agreement between the Owner and the CLC, ensuring the continuity of the CLC mandate throughout all phases of the project.
- (ii) The CLC shall have full autonomy in the allocation of funds, as negotiated in 25(i) above, for the purposes of its mandate.
- (iii) The CLC shall provide to the Owner and the Director, on an annual basis, an audited financial statement of the receipts and expenses of the CLC.
- (iv) If the CLC and the Owner are unable to reach an agreement on funding, an arbitrator agreed to by both the CLC and the Owner may impose one. If the CLC and the Owner are unable to agree on an arbitrator, the Director may name one. The professional fee of the arbitrator shall be borne by the Owner during the first three years of operations; subsequently, the fee shall be shared by the Owner and the CLC on a 2/3 (Owner), 1/3 (CLC) basis. As an alternative, the CLC and the Owner may request that the Board perform this service.

26. Other Matters to Facilitate the Mandate of the CLC

- (i) The time available to the CLC to provide comments and recommendations on monitoring programs, remedial action/contingency plans and the Financial Assurance Plan, prior to their submission to the Director for approval, shall be at

least 45 days, or longer by agreement (note: 90 days for the perimeter collection system in Part A, #11 above) between the CLC and the Owner.

- (ii) The time available to the Owner (or the Director when considered appropriate) to respond to CLC comments and recommendations shall be at least 45 days, or longer by agreement between the Owner (or the Director) and the CLC.
- (iii) The Owner shall provide the Peer Reviewer with access to the technical experts conducting monitoring (or other technical work) and to the monitoring results, in accordance with protocols agreed to between the Owner and the Peer Reviewer acting through the CLC.
- (iv) The Owner shall allow reasonable access to the site by CLC members and their technical advisors to observe site operations, subject to all applicable safety regulations.
- (v) The Owner's Annual Report on the operation, development, and monitoring of the Site shall be submitted annually to the CLC, as well as to the officials of MOE.