10745-40/MTPO/01

Province of British Columbia
MINISTRY OF ENVIRONMENT, LANDS AND PARKS

BC Environment
WATER MANAGEMENT DIVISION

MEMORANDUM

MP00055

To:

Date: July 14, 1995
File: 76915-09/Tailings

George Headley, P. Eng.
Senior Geotechnical Engineer
Mine Review & Permitting Branch
4th Floor 1810 Blanshard Street
Victoria BC V8V 1X4

Re: Mt. Polley Project

Sorry to have missed you this morning. In discussing the project briefly with Tim Eaton, he suggested I put something in writing to you :

I have read the report by Knight Piesold entitled " Imperial Metals Corp. Mt. Polley Project Tailings Storage Facility Design Report (Ref. No. 1625/1) Volume I - Report. April 7, 1995".

My comments should be considered preliminary at this time. I want to discuss the project with Bob Bugslag before finalizing them.

In my review I wish to advise I found nothing significantly "wrong" or anything Water Management should be concerned with.

The overall concept plan seems well thought out. The fact that the waste rock/tailings will not be acid producing simplifies the reclamation effort in that there will not be any water retaining structures of significance, in perpetuity, to be concerned with. I do not consider the pond left at closure to be a significant hazard.

The fact that the TSF storage volume at all times through the operational life of the mining development is sized to absorb the PMF, also simplifies the project, in that no spillway is required.

The design of the tailings pond meets the guidelines of the Canadian Dam Safety Association, as near as I can determine, with respect to good design practice and earthquake criteria.

A concern could be with the construction supervision/inspection. The structure utilizes foundation drains, toe drains and chimney drains. Care will be required during construction to ensure these will actually function as designed. I couldn't find an analysis in the report which assesses dam stability should these drains plug

up. The borrow pit material proposed to be used to form the impervious zone fill appears to have a natural moisture content higher than desirable to achieve maximum compaction. I don't know the significance of this. I note the consultant proposes to place the material in 300 mm lifts and disc it to reduce the moisture content. In order for this to happen there needs to be properly trained technical people around during construction to ensure this is done. The fact that the TSF requires an embankment over 2 1/2 miles long draws attention to the importance of quality supervision/inspection during construction.

I would assume our Regional WM staff will assess the water licencing requirements.

I will provide you with our "final" comments when I have had the opportunity to review the project with Bob.

L.A. Bergman, P. Eng.
Senior Engineer
Water Resources Branch

14745-40/MTPO/0

DAM PLANS REVIEW

CHECK LIST
FOR
PROPOSED NEW DAMS

DAM NAME: Mount Polley REVIEW DATE: July 12 /95
DAM OWNER: Imperial Metal Corp LOCATION: NE Williams Lake 56 km
LICENCE STATUS: None REVIEWED BY: WAB
WATER RIGHTS FILE NUMBER: ?
ENGINEERING CONSULTANT: Knight Piesold

This checklist is intended only to assist the reviewer to consider all aspects of the proposed dam design and should be used in conjunction with approved guidelines and texts.

Dam Safety Policy Manual
Volume 6, Section &.07.01.00

I *Size Classification* -

Height - Crest to Lowest Point of Foundation: 960 - 915 = 45 m = 148'

Crest Length: 4.25 km = 2.64 miles

Maximum Spillway Discharge: No emergency spillway during op. PMF and 1:200 year return period

Reservoir Volume: water ≈ 2.55 x 10^6 m^3 ≈ 2000 ac-ft

Note: A Regional Water Management Office can request that any dam be designated as a "major" dam to be the responsibility of the Victoria Dam Safety Unit. See the Policy and Procedures Manual for the definitions of "major" and "minor" dams.

RESPONSIBILITY		
	A. DESIGN REVIEW	Victoria_____ Region_____
	B. CONSTRUCTION REVIEW	Victoria_____ Region_____
	C. LONG TERM AUDIT	Victoria_____ Region_____

II *Disaster Potential Classification* -

Extreme Event	Flood			Seismic		
Incremental Hazard Classification Factors	High	Sign.	Low	High	Sign.	Low
Loss of Life Expected			✓			✓
Economic Loss Expected			✓			✓
Social/Environmental Impact			✓			✓

OBE 1/475 year return period
(rec. NBC Standard)
$M = 6.5$ $A_{max} = 0.037$ g

Comments:

On closure, structure designed to HIGH consequence category; MDE = 50% MCE
- designed to accommodate the PMF event
- on peak 25 hour [illegible] pond designed to receive inflow from 24 hour PMP event on upstream drainage area, assuming 0.4 for C and 95% runoff coefficient; should have 1m freeboard left for spillway during operations.

1 per 20

design apparently based on advice from MEMPR - p. 19

III Hydrology

1. Design Flood (Return Period)

Inflow Design Flood Proposed	PMF
Inflow Design Flood Required	?
Probable Maximum Precipitation	?
Design Flood Outflow (spillway)	designed to absorb PMF without spilling
Design Flood Outflow (spillways & outlets)	N. a.

2. Freeboard

Dam Crest Elevation	960 m
Principle Spillway Sill Elevation	?
Design Flood Surcharge Elevation	?
Net Freeboard	1 m
Gross Freeboard	?
Spillway Width	?
Wave Run-Up Calculation	?

IV *Spillway Design*

Gates on Spillway Crest	No
Alternate Power for Gates	N a
Flashboard Provision	N F
Crest Type (Ogee, Drop, etc.)	N C
Energy Dissipation at toe	?
Erosion Control - Downstream Channel	?
Log Boom (see Section V Reservoir)	
Dam Embankment Protection from Spillway Flows	?
Concrete Design Specifications	N I

V *Reservoir*

Watershed Area		340 ha (TSF 230 ha area (10)
Storage Capacity;		Live ____ Dead 2×10^6 m^3 = 1620 ac-ft
Surface Area		
Clearing Required		230
Clearing Proposed		230
Debris Removal Proposed		—
Log Booms:	Reservoir	—
	Spillway Forebay	—
Logs:	Length	—
	Diameter	—
	Species	—
Connections:	Type	—
(chain, cable, etc.)	Size (dia.)	—

plus emergency storage = 0.55 m^3 = 445.5 ac-ft

Landslide Potential H____ M____ L____

Diversions into: / out of ✓

VI *Seismicity*

Seismic Zone (National Building Code) M: 6.5

Seismic Risk Calculation:

Peak Horizontal Ground Acceleration (PHGA)
with annual exceedence probability of .0021 (1/475)
(from Pacific Geoscience Centre, Energy, Mines and Resources Canada)
= Design Basis Earthquake (DBE) A_{max} = 0.037 g

Approximate Maximum Credible
Earthquake (MCE) = 2 x DBE A_{max} = 0.065 g

From Dam Design:

Maximum Credible Earthquake
Maximum Design Earthquake
Design Basis Earthquake

VII *Embankment*

- zoned

Type: (Earthfill, Rock-fill)	Staged, earth, rock and tailings
Crest Width	8 m
Crest Material	
Crest Elevation	
Impervious Core (or Membrane)	
Top Elevation	
Seepage Control Provisions	
(filter, drain pipes, etc.)	✓
Seepage Measurement (Weirs)	✓
Foundation Material	
Foundation Seepage Control	✓ (drains); toe drains
Wave Protection	necessary ?
Material Compaction Specified	95% Proctor; 300 mm lifts
Embankment Slopes: U/S & D/S	u/s = 2:1 to elev. 931m; 1.5:1 above
Embankment Liquefaction Potential	d/s = 2:1

- embankment will be raised by a combination of centreline and modified centreline methods

VIII *Concrete Dam*

Type	
Stability Analysis	
Uplift Pressures	
Drainage	
Ice Forces	
Overtopping Provisions	

IX *Foundations*

Investigation Undertaken	✓
Foundation Type	
Key Trench	None
Slopes of Trench	
Special Compaction Specifications	
Grouting Required	

IX *Foundations Cont'd*

Liquefaction Potential _____

Preparation

- Concrete Infilling _____
- Removing Over Hangs _____
- Special Compaction Specifications _____

X *Dam Construction*

Construction Supervision not stated

Engineering Supervision " "

As-built Plans to be sent to Dam Safety ?

Key Inspection Times Identified _____

Progress Reports - Weekly _____

XI *Outlet Sluice*

Location of control gate None

Pipe diameter - inspectability _____

Outlet pipe material _____

Pipe bedding or casement _____

Compaction around pipe _____

Seepage reduction measures _____

Trashracks _____

Venting required _____

XII *Outlet Sluice Gate Control*

Type of control None

Gate stem diameter _____

Gate stem guides _____

Anchoring for gate stem _____

XII Outlet Sluice Gate Control Cont'd

Secure from:

Vandalism _____

Wave Action _____

Ice Action _____

XIII Other Works

Penstocks _____

Sedimentation Pass Outlet _____

Riparian Outlet _____

Fisheries Outlet _____

- basin liner of low permeability till
- partial basin groundwater underdrain & seepage conveyor

XIV Instrumentation

Deformation Measurements:

Settlement _____

Transverse Horizontal _____

Longitudinal Horizontal _____

Reference Monuments _____

Piezometers:

Standpipe - groundwater monitoring wells for evaluating seepage

Pneumatic

Electric _____

Weirs & Relief Wells _____

Reservoir Level Indicator _____

Purpose of Instrumentation:

Purpose Identified? _____

Expected Results Identified _____

Acceptable Limits Identified _____

XIV *Instrumentation Cont'd*

Instrumentation Schedule:

Construction Schedule _____

Post-Construction Schedule _____

Long Term Goals _____

Instrumentation Termination _____

XV *Operation and Maintenance Manual*

report state will have one

Manual included with plans _____

Indepth review required _____

Emergency Plan included _____

Dam Break Study _____

Inundation Mapping _____

Completion Date For Draft Manual _____

Completion Date For Working Manual _____

"As-Constructed" Plans Required By..... _____

Province of
British Columbia

Ministry of
Energy, Mines and
Petroleum Resources
MINE REVIEW AND
PERMITTING BRANCH

Fourth Floor
1810 Blanshard Street
Victoria
British Columbia
V8V 1X4
Fax: (604) 952-0481

new file

June 5, 1995

14745-40/MTPO/01

Howard Plewes, P. Eng.
Klohn-Crippen
10200 Shellbridge Way
Richmond, B. C. V6X 2W7

Dear Howard:

Re: Mt. Polley Tailings Dam Inspection

Could you please submit a revised cost estimate for construction monitoring at Mt. Polley tailings facility project to Tim Eaton, Manager, Geotechnical Section.
Tim will handle the contract.

At present the project is awaiting confirmation of financing by the Japanese partner and which could occur about the end of June 1995. Therefore our contract award and timing will depend on the company proceeding with the project.

The scope of work would consist of site monitoring for 6 weeks starting about July 1 and possibly one week in late September. The object of the monitoring is to comment on conformance of the dam construction to design requirements, to communicate concerns about construction or design modifications and site conditions to MEMPR.

Please tabulate costs in detail and as a summary of fees and expenses by tasks. The budget is limited to a maximum of $25,000.

The following list of tasks is revised from our original discussion.

Task 1 - Site Monitoring by Junior Engineer: A total of 1 three day initial site visit and 5 or 6 two day site visits. The work would include visual monitoring, photography of activities, attendance at construction meetings, daily reporting to MEMPR of any concerns. If any concerns or questions occur the engineer would be expected to obtain advice from Senior Engineers.

Task 2 - Site Monitoring by Senior Engineer: A total of 2 two day site visits by Howard Plewes P. Eng. at critical points of dam construction. These would likely occur in July and would coincide with inspections by MEMPR staff.

Task 3 - Advice on Concerns or Questions During Construction: Please allow up to 8 hours for advice to the Junior Engineer or to MEMPR.

Task 4 - Reporting: Weekly reports including the daily reports, photographs, a listing of construction activities, concerns and observations would be submitted in triplicate to MEMPR. A summary report would include the conclusions on the conformance of the dam construction based on observations made. The report should be presented in a binder to allow inclusion of the weekly reports.

I will be available to meet you in Vancouver in late June to review the design and construction. We can arrange the details when I return or earlier by telephone.

Please contact Tim Eaton P. Eng. Manager, Geotechnical Section at 952-0485 if you have any questions.

Yours sincerely;

George S. Headley, M. Eng., P. Eng.
Senior Geotechnical Engineer

cc: T. Eaton
J. C. Errington
S. Van Zalingen

Attachment