Independent expert engineering review launched following Mount Polley dam breach

VANCOUVER – The Government of British Columbia, with the support of the Soda Creek Indian Band (Xats'ull First Nation) and Williams Lake Indian Band, has ordered an independent engineering investigation and inquiry into the Mount Polley tailings pond breach, and independent third-party reviews of all 2014 Dam Safety Inspections for every tailings pond at a permitted mine in the province.

The independent engineering investigation and inquiry is authorized under the Mount Polley Investigation and Inquiry Regulation, issued pursuant to section 8 of the Ministry of Energy and Mines Act. The investigation will be conducted by a panel of experts that will investigate the cause of the Mount Polley Mine Tailings Storage Facility failure, including geotechnical standards, design of the dam, maintenance, regulations, inspections regimes and other matters the panel deems appropriate. This section also provides the panel with the ability to compel evidence and authorizes the Minister to require the company to cover costs of the inquiry.

The independent engineering investigation and inquiry is step one of a two-step process.

First, the independent panel will conduct an investigation and provide recommendations through a final report by Jan. 31, 2015, that will determine why the tailings dam failed.

Second, the panel’s recommendations will be received by government and the Soda Creek Indian Band and Williams Lake Indian Band and then shared with the public, and implemented by government as needed and where appropriate to ensure such an incident never happens again.

The panel members have been appointed by government with the support of the Soda Creek and Williams Lake Indian Bands. The panel members are experienced geotechnical experts with expertise in tailings management facilities. They are:

- Norbert Morgenstern, advisor to consulting engineers
- Steven Vick, geotechnical engineer (Colorado)
- Dirk Van Zyl, professor, University of British Columbia (UBC) Normal B. Keevil Institute of Mining Engineering

The Soda Creek and Williams Lake Indian Bands were consulted on the terms of reference for the engineering investigation and will have a liaison to the panel. The Association of Professional Engineers and Geoscientists of British Columbia (APEGBC), and the Institute of Mining Engineering at the University of British Columbia also provided input on the panel members.

The chief inspector of mines has also issued an order to all mining companies to conduct a Dam...
Safety Inspection for every tailings storage facility at a permitted mine by Dec. 1, 2014. Under the order, those inspections must be reviewed by an independent, qualified, third-party, professional engineer from a firm not associated with the tailings facility. All information obtained under this order will be provided to First Nations and made public.

Under the Health, Safety and Reclamation Code for Mines in British Columbia, the deadline for annual Dam Safety Inspections would have been March 31, 2015, and would not have required an independent third-party review. The order accelerates the deadline and establishes the requirement for an independent review.

The order also includes a requirement for a third-party review of the dam consequence classifications by Dec. 1, 2014. A dam’s consequence classification is based on the potential impact to population, the environment, cultural values and infrastructure should it fail, and is set according to the Canadian Dam Association Dam Safety Guidelines. Under the order, mines with high, very high or extreme consequence classifications will be required to have their Emergency Preparedness and Response Plans reviewed by an independent third-party.

There are currently 98 permitted tailings impoundments at 60 operating and closed metal and coal mines in B.C.

Quotes:

**Bill Bennett, Minister of Energy and Mines and Responsible for Core Review** –

“We have a responsibility, as the jurisdiction where this failure took place, to find out exactly why it happened, ensure it never happens again and take a leadership role internationally in learning from this serious incident.”

“Mining is a critical industry in British Columbia, supporting dozens of communities and thousands of families. The independent engineering investigation and third-party reviews of Dam Safety Inspections for every permitted tailings facility in the province will get the answers necessary to provide public confidence following this serious incident.”

**Chief Bev Sellars, Soda Creek Indian Band** –

“There is no doubt in anyone’s minds that this is the worst mining disaster to ever occur in this province. Our nations and all British Columbians have raised questions as to how such a disaster could occur. With this independent investigation, we will all get the answers we need and deserve. We look forward to receiving the results of the investigation and taking action to ensure an accident like this this never happens again.”

**Chief Ann Louie, Williams Lake Indian Band** –

“An independent engineering investigation is a crucial process required to understand the cause of this breach. However, it is merely a first step in understanding the broader implications of this disaster. Many questions will remain regarding the long-term impacts to our communities and environment.”

**Dirk Van Zyl, professor, UBC, Norman B. Keevil Institute of Mining Engineering, member of independent engineering investigation panel** –
“The failure of the tailings facility at Mount Polley was a dark day for the mining industry not only here in British Columbia, but worldwide. It’s extremely important for us to understand how this breach happened and why so that we can move forward with the best possible practices in ongoing and future mining operations.”

Ann English, P.Eng., CEO, Association of Professional Engineers and Geoscientists of BC –

"As the regulator for engineering and geoscience in B.C., we expect resource development projects to be conducted safely and professionally. We are committed to upholding high standards of professional practice for B.C. engineers and geoscientists as they undertake their work. The public has a right to know what happened at Mt. Polley, and it is our hope that the inquiry will bring all the facts to light so we can ensure an accident like this never happens again."

Al Richmond, chair, Cariboo Regional District –

“Our communities, the various agencies, and the Province have responded to this serious incident and are doing everything necessary to protect our residents and return to a sense of normalcy.” We need to get the bottom of why this occurred and ensure it doesn’t happen again. Minister Bennett’s decision to order an independent engineering investigation will find those answers and give all parties confidence in the results.”

Learn More:

For a collection of documents from government and partners surrounding the Mount Polley breach, visit: http://www.env.gov.bc.ca/eemp/incidents/2014/mount-polley.htm

Four backgrounders follow.

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Mount Polley Inspections

• Early in the morning of Aug. 4, 2014, the tailings pond dam at the Mount Polley Mine site breached and released an estimated 10 million cubic metres of water and 4.5 million cubic metres of fine sand into Polley Lake. Hazeltine Creek flows out of Polley Lake and the flow of contaminated water continued into Quesnel Lake.

• The Mount Polley mine has a valid Mines Act permit and the company has been generally compliant with the Health, Safety and Reclamation Code and their Mines Act permit conditions.

• Following reports of a previous breach at the mine, Ministry of Energy and Mines (MEM) officials investigated an incident on May 24, 2014, and determined this was not a breach. Rather, the height of the tailings pond was above regulation. This occurred in a different area of the tailings pond than the Aug. 4, 2014, dam failure.

• At the time of the advisory, the distance between the water elevation and the crest of the dam (freeboard) was less than one meter. The tailings pond level returned to authorized levels and freeboard was approximately 2.4 meters when last measured. Mine records show that the operation was carrying out visual dam inspections and measuring freeboard at an acceptable frequency, including daily measurements following the incident.

• The MEM conducted a geotechnical inspection at the mine in September 2013, which resulted in no inspection orders related to the tailings facility.

• Here is a list of recent advisories to Mount Polley from the Ministry of Environment (MoE), only one of which was related to height of the tailings pond. The MoE is responsible to ensure no unauthorized effluent discharge from the tailings pond structure:
  ◦ May 24, 2014: The ministry issued an advisory to Mount Polley Mining Corporation for exceedance of the height of effluent within the tailings impoundment. The effluent level returned to authorized levels commencing June 30, 2014.
  ◦ April 18, 2014: The ministry issued an advisory to Mount Polley Mining Corporation for bypass of authorized treatment works. The site experienced high flows due to spring freshet which caused the pump system to become blocked and resulted in an overflow of effluent to the long ditch. Flow did not reach the creek and was directed into Till Borrow Pit.
  ◦ January and April 2012: The ministry issued an advisory to Mount Polley Mining Corporation for not submitting monitoring data for one of the groundwater monitoring wells.
  ◦ Aug. 30, 2012: The ministry issued a warning to Mount Polley Mining Corporation for failure to report exceedance of the height of effluent for the perimeter pond. This perimeter pond overflowed, releasing approximately 150 cubic metres of effluent over 13 hours to ground.
• As required by the Health, Safety and Reclamation Code for Mines in British Columbia, companies must submit Annual Dam Safety Inspection reports to the Chief Inspector on an annual basis. Inspections of tailing pond dams by ministry geotechnical inspectors are conducted at a frequency informed by the dam consequence classification that is designated by the dam design engineers in accordance with the Canadian Dam Association Dam Safety Guidelines.

• Since the Mount Polley mine was permitted in 1995, there have been 16 geotechnical inspections conducted by ministry geotechnical inspectors. One inspection was conducted each year from 1995-2001 and in 2006, 2008 and 2013. Two inspections were conducted in each of 2005, 2007 and 2012.

• In summary, seven geotechnical inspections took place before the mine went into care and maintenance in 2001 and nine geotechnical inspections have taken place since it re-opened in March 2005. The last geotechnical inspection was conducted in September 2013 and resulted in no inspection orders related to the tailings facility.

• Here is a historical record of the number of all types of inspections (including geotechnical) each year from 1999 to 2014:
  - 1999 – 1
  - 2000 – 4
  - 2001 - 22 (care and maintenance started September 2001)
  - 2002 – 4
  - 2003 – 2
  - 2004 – 5
  - 2006 – 10
  - 2007 – 10
  - 2008 – 8
  - 2009 – 9
  - 2010 – 7
  - 2011 – 4
  - 2012 – 6
  - 2013 – 15
  - 2014 (to-date) – 8

• Monitoring devices, called piezometers, designed to measure the pressure of water in the dam, did not show any changes in the water pressure before the dam breach. The last piezometer readings were taken on Aug. 2, 2014. The investigation will determine if the piezometers were located correctly.

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Current investigations underway into the Mount Polley breach

Conservation Officer Service

An investigation into the cause of the Mount Polley tailings pond breach is underway, being led by British Columbia’s Conservation Officer Service (COS), and assisted by Environment Canada, Department of Fisheries and Oceans Canada and the RCMP.

The COS is an independent law enforcement body, and forwards recommendations for charges when warranted directly to provincial Crown Counsel.

The COS Major Investigations Unit (MIU) has been at the Mount Polley site since Aug. 4, performing tasks such as conducting interviews and collecting evidence.

MIU officers, trained in specialized investigative techniques, focus on cases that are complex, involve corporations, are international or are multi-jurisdictional in scope. As law enforcement officers, conservation officers in the MIU are highly trained in complex investigations including person interview practices and evidence gathering techniques that can secure criminal prosecution.

The COS uses the highest level of Major Case File Management techniques, as well as internationally recognized systems such as the incident command system. Major Case Management supports major investigations by efficiently processing, organizing, indexing, and ultimately disclosing the large quantities of information derived from these investigations.

The COS is the primary natural resource law enforcement agency in B.C. that specializes in commercial environmental and industrial investigations. The COS enforces over 33 pieces of provincial and federal legislation, including the Environmental Management Act and the Fisheries Act. Conservation Officers are also Special Provincial Constables under the Police Act with a wide suite of powers associated with that designation.

If the public has any information, they are asked to call the Report all Poachers and Polluters (RAPP) line at 1 877-952-7277 or online at www.env.gov.bc.ca/cos/rapp/form.htm.

Chief inspector of mines Investigation

B.C.’s chief inspector of mines is also conducting an investigation under the statutory authority of the Mines Act.

The Mines Act states:

An inspector may, and on the direction of the chief inspector must, make an investigation of and report about an accident that has caused serious personal injury, loss of life or property or
environmental damage.

Appointed by the Minister of Energy and Mines, the Chief Inspector of Mines is responsible for administering and enforcing the Mines Act and the Health, Safety and Reclamation Code for Mines in B.C.

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Inspections and independent reviews of tailings ponds at permitted mines

The Chief Inspector of Mines has issued an order to all mining companies to conduct a Dam Safety Inspection for every tailings storage facility at a permitted mine by December 1, 2014.

Under the order, those inspections must be reviewed by an independent qualified third-party professional engineer from a firm not associated with the tailings facility. All information obtained under this order will be provided to First Nations and made public.

Under the Health, Safety and Reclamation Code for Mines in British Columbia, the deadline for annual Dam Safety Inspections would have been March 31, 2015, and would not have required an independent third-party review. The order accelerates the deadline and establishes the requirement for an independent review.

The order also includes a requirement for a third party review of the dam consequence classifications. A dam’s consequence classification is based on the potential impact to population, the environment, cultural values and infrastructure should it fail, and is set according to the Canadian Dam Association Dam Safety Guidelines.

Under the order, mines with high, very high or extreme consequence classifications will be required to have their Emergency Preparedness and Response Plans reviewed by an independent third party.

Tailings ponds in British Columbia

There are a total of 98 tailings ponds at permitted mines in British Columbia. Thirty one of these ponds are at active mining operations and the remaining 67 belong to mines that have either closed permanently or are in care and maintenance, which means they may or may not reopen in the future.

Click the link below for a list of active and inactive tailings ponds in B.C.

http://www.newsroom.gov.bc.ca/downloads/Permitted_Metal_and_Coal_TSF.pdf

Dam Safety Inspections, Reviews and Consequence Classifications

Under the Health, Safety and Reclamation Code for Mines in British Columbia, mining companies are required to conduct annual Dam Safety Inspections and submit them to the Chief Mines Inspector. In addition, mines are required to conduct more comprehensive dam safety reviews on a periodic basis according to their dam consequence classification. The consequence classification is a five-step scale based on factors such as population at risk, potential loss of life, potential damage to environmental and cultural values and economic
In addition to annual Dam Safety Inspections and regular dam safety reviews conducted by mining companies as required by the Health, Safety and Reclamation Code for Mines in British Columbia, the Ministry of Energy and Mines also conducts regular geotechnical inspections.

Tailings impoundment structures are inspected by ministry geotechnical inspectors, based on dam consequence classification. The ministry conducted 31 geotechnical mine inspections in 2013.

For more information about dam safety reviews in B.C., check the link below.

https://www.apeg.bc.ca/getmedia/a373a764-1869-41b5-b07d-81d36a0698c3/APEGBC-Legislative-Dam-Safety-Reviews.pdf.aspx

Chief Inspector’s Order

The following is the full text of the Chief Inspector’s order:

Notification of Chief Inspector’s Orders

Tailings Dams – Independent Review of Dam Safety and Consequence Classification

As Chief Inspector of Mines, it is my responsibility to ensure that tailings dams in British Columbia are being designed, constructed, and operated in a safe manner. In light of the recent tailings dam failure at the Mount Polley mine on August 4, 2014, I am issuing the following orders for the purpose of reviewing the safety of tailings impoundment structures at mines throughout the province to establish where improvements may be required.

Owners, agents or managers responsible for tailings dams are being issued these orders pursuant to Section 18 of the Mines Act:

Orders:

Dam Safety Inspection and Independent Third Party Review of Dam Safety Inspection

1. You are required to conduct a Dam Safety Inspection (DSI) by Dec. 1, 2014. The DSI must cover all dam structures for all tailings storage facilities on your mine site. The DSI must
be conducted by a qualified professional engineer consistent with the BC Ministry of Energy and Mines Guidelines for Dam Safety Inspections.

http://www.empr.gov.bc.ca/Mining/Permitting-Reclamation/Geotech/Documents/Guidelines_for_Annual_Dam_Safety_Inspections(RevisedAug2013).pdf

1. The mine manager must have the DSI reviewed by an independent qualified third party professional engineer from a firm that has not been associated with the tailings dam. The Independent Third Party Review of the DSI must also include a review of the dam consequence classification.

2. Both the DSI and the Independent Third Party Review of the DSI must be sealed by the qualified licensed professional engineers who conducted the work.

3. Any recommendations made in the DSI or the Independent Third Party Review of the DSI must be summarized in an accompanying letter from the Mine Manager to the Chief Inspector outlining the commitments for completing the recommended work along with a schedule for implementing the recommended work.

4. The DSI, Independent Review of the DSI, and the mine manager’s letter to the Chief Inspector must be submitted to the Chief Inspector by December 1, 2014.

Emergency Preparedness and Response Plan and Dam Break Inundation Study

1. All tailings dams that have a failure consequence classification of high, very high or extreme (and taking into account any change in dam classification resulting from the Independent Third Party Review of the DSI under Orders 1 through 5), must have an Emergency Preparedness and Response Plan (EPRP) and a Dam Break Inundation Study.

2. The EPRP and Dam Break Inundation Study must be completed and tested consistent with the Canadian Dam Association, Dam Safety Guidelines (CDA Guidelines). If the tailings facility already has an existing EPRP, it must be reviewed and updated for consistency with the CDA Guidelines and with current standards of engineering practice.

3. The Dam Break Inundation Study must be prepared by a qualified licensed professional engineer. The EPRP must be informed by the Dam Break Inundation Study with input from the qualified licensed professional engineer.

4. The Dam Break Inundation Study, the EPRP, and a summary of the EPRP test including any identified gaps and lessons learned from the EPRP test, must be submitted to the Chief Inspector by December 1, 2014.

The Ministry of Energy and Mines will be placing reliance on the seal of the qualified professionals undertaking the above work. In addition, all submitted reports and reviews that are submitted to satisfy these orders will be subject to additional review by Ministry of Energy and Mines geotechnical engineers and/or their consultants. As well, in the interest of transparency and the public interest, all submitted documents related to these orders will be made available to the public.

Sincerely,

Al Hoffman, P.Eng.
Chief Inspector of Mines
Below are the Terms of Reference issued by Minister Bill Bennett with the support of the Soda Creek and Williams Lake Indian Bands:

Establishment of the Panel

Pursuant to the Mount Polley Investigation and Inquiry Regulation, issued pursuant to section 8 (2) of the Ministry of Energy and Mines Act, I direct that an independent expert engineering investigation and review Panel (the Panel) be established, in accordance with these Terms of Reference, to investigate into and report on the breach of the tailings storage facility (TSF) at the Mount Polley mine on August 4, 2014.

For the purposes of conducting the investigation into the breach of the tailings storage facility at the Mount Polley mine on Aug. 4, 2014, I confer upon the Panel members the powers and authorities as set out in section 8.2 and 8.4(1) of the Ministry of Energy and Mines Act.

I further confer upon the Panel members the protection set out in section 8.5 of the Ministry of Energy and Mines Act.

Purpose of the Panel

The purpose of the panel is to investigate into and report on the cause of the failure of the tailings storage facility that occurred on Aug. 4, 2014, at the Mount Polley mine in B.C.

The panel will report on the cause of the failure of the tailings storage facility at the Mount Polley mine. In addition, the panel may make recommendations to government on actions that could be taken to ensure that a similar failure does not occur at other mine sites in B.C.

The panel is authorized, as part of its investigation and report, to comment on what actions could have been taken to prevent this failure and to identify practices or successes in other jurisdictions that could be considered for implementation in B.C.

Scope of Review

In its report, it is expected the panel will:

1. identify any mechanism(s) of failure of the tailings storage facility;
2. identify any technical, management, or other practices that may have enabled or contributed to the mechanism(s) of failure. This may include an independent review of the design, construction, operation, maintenance, surveillance and regulation of the facility;
3. identify any changes that could be considered to reduce the potential for future such
In conducting its investigation and in order to prepare its report into the cause of the failure of the tailings storage facility at the Mount Polley mine, the Panel may, at its discretion, and as it deems necessary, examine some or all of the following in respect of the Mount Polley mine in B.C.:

- geotechnical designs of the dams and structures associated with the TSF, including both intact and breached embankments, and including both the original design and all lifts of the embankment structure;
- the adequacy of geotechnical investigations completed throughout design and operation of the facility;
- interpretation of results of geotechnical investigations and associated laboratory testing;
- patterns, trends, and relationships in instrumentation behaviour;
- interpretation of instrumentation and performance data in relation to dam behaviour;
- whether or not dam instrumentation and monitoring was consistent with standards of practice;
- appropriateness of methods and input parameters for geotechnical analyses;
- materials, methods, procedures, and quality assurance/quality control practices for dam construction and modification, and a determination with respect to whether or not construction was completed in general conformance with the design;
- water balance and water quality as they relate to the TSF breach;
- operational procedures and planning for tailings deposition and water management;
- inspection and surveillance procedures and implementation;
- the engineer of record’s field reviews to ensure that construction was in conformance with design;
- regulatory oversight by the Ministry of Energy and Mines and the Ministry of Environment; and
- other matters the Panel deems appropriate to be examined.

Panel Members

The panel members are:

- Norbert Morgenstern
- Steven G. Vick
- Dirk Van Zyl

The panel will be chaired by Norbert Morgenstern.

A liaison will be appointed in consultation with the Williams Lake Indian Band and the Soda Creek Indian Band.

Secretariat to the Panel

Administrative, technical and procedural support required by the Panel shall be provided by a secretariat.

Kevin Richter will manage the secretariat in support and under the direction of the Panel.

Information to be provided to the Panel
The Panel will be supplied with all available information necessary for achieving its purpose and performing its functions.

Timeline

The Panel will submit a final report to the Minister of Energy and Mines and the Williams Lake Indian Band and the Soda Creek Indian Band on or before January 31, 2015.

Limitations

The panel shall perform its duties without expressing any conclusions or recommendations regarding the potential civil or criminal liability of any person or organization. The panel shall further ensure that the conduct of the inquiry does not in any way impede or conflict with any other ongoing investigation or proceeding related to these matters. Specifically, the Panel’s review will not in any way impede investigations conducted by mines inspectors, Conservation Officers or other regulatory agencies and any related proceedings.

Independent Engineering Investigation and Inquiry Panel Members Biographies:

The panel members have been appointed by government with the support of the Soda Creek and Williams Lake Indian Bands.

The Association of Professional Engineers and Geoscientists of British Columbia (APEGBC), and the Institute of Mining Engineering at the University of British Columbia also provided input on the panel members.

The panel members are experienced geotechnical experts with expertise in tailings management facilities. They are:

**Norbert (Nordie) Morgenstern**

Norbert Morgenstern is a well-recognized leader in the field of geotechnical engineering and has extensive experience in dam engineering (having worked on over 140 dam projects worldwide). Nordie is recognized as a distinguished university professor (Emeritus) of civil engineering at the University of Alberta where he previously held the role of chair of the department of civil and environmental engineering. He has released over 330 publications in the field of engineering. He is heavily involved in the engineering community having held the role of Member, Chair, Vice President, or President on an extensive list of technical committees worldwide, and has received a plethora of honours and awards throughout his career.

**Dirk van Zyl**

Dirk J. A. Van Zyl has more than 30 years’ experience in research, teaching, and consulting in tailings and mined earth structures. During that period, he was a faculty member for 13 years at four universities in the U.S.A. and Canada. For the last ten years, much of his attention has been focused on mining and sustainable development. Dirk has been involved internationally in many mining projects which covered the whole mining life cycle, from exploration to closure and post-closure, in a large range of climactic and geographic environments. His present research is in the area of the contributions that mining makes to sustainable development, as well as the application of life cycle assessment to mined earth structures.
Steven G. Vick

A leader in the field of dam engineering, Steve Vick is a geotechnical engineer and internationally recognized review consultant who has worked with various engineering firms, project proponents and governments. In addition to extensive experience working on projects located in B.C., Vick has wide-ranging experience in both technical review and forensic investigations, including chairing the investigation of the Omai tailings dam failure for the government of Guyana and participating in the investigation of the New Orleans levee failures that occurred during Hurricane Katrina. Vick has written two books, including Planning, Design, and Analysis of Tailings Dams, which is the only text of its kind that has remained in print for over 30 years and is familiar to most experts in the field. Vick has released numerous other publications related to dam safety and various aspects of risk analyses throughout his career and also speaks on the subject frequently—his most recent keynote lecture was entitled “The Consequences of Tailings Dam Failure”. He holds undergraduate and graduate degrees from MIT.

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