



# **Mount Polley Mine Tailings Breach: Environmental Mitigation and Remediation Progress Report: End of Phase I July 2015**

## **1. Background**

On August 4, 2014, a tailings dam breach occurred at Mount Polley Mine in south-central B.C., near the town of Likely. The Ministry of Environment (Ministry) issued a Pollution Abatement Order (Order) on August 5, 2014 to the Mount Polley Mine Corporation (MPMC), and amended the Order on May 27, 2015 (see Appendix 1). The Order outlines the steps MPMC is required to take in order to monitor and assess the environmental impact of the breach, mitigate the impacts, and remediate the impacted area. The Ministry is overseeing the development and implementation of all the associated plans and actions under the Order. The Ministry is also overseeing the implementation of the responsible party's actions to ensure MPMC meets the Ministry's needs for assessing potential environmental impacts, monitoring ecosystem recovery, and remediating the impacted area.

This End of Phase I Progress Report provides an overview of the current approach to meeting the requirements under the Order, including the work done to date, and what remains outstanding at the end of Phase I. The Progress Report provides an update of the Ministry's regulatory actions and also summarizes monitoring data collected to date by the Ministry. The Progress Report includes background and materials related to the response and approach to Phase I of the Remediation and Restoration Plan, and also describes the Ministry's expectations for Phase II of the Remediation and Restoration Plan.

### **A. Ministry's Role**

The Ministry of Environment has various responsibilities in response to environmental remediation of the tailings breach. Most importantly, the Ministry is responsible for regulatory oversight, and for overseeing all remediation and restoration work. The Ministry is also responsible for ensuring a long-term environmental monitoring program is implemented by the company. The Ministry's regulatory oversight includes issuing Orders under the *Environmental Management Act*; issuing advisory or warning letters; amending orders under the *Environmental Management Act*; and, ensuring compliance with existing orders and permits under the *Environmental Management Act*.

The Ministry is also responsible for:

- Reviewing, providing input, and ensuring the plans and actions of the company related to impact assessment, monitoring, mitigation and remediation of the incident are acceptable.
- Coordinating regulatory actions and monitoring with other agencies such as Ministry of Forests, Lands and Natural Resource Operations, Interior Health Authority, Fisheries and Oceans Canada, and Cariboo Regional District and ensuring these agency needs are met.
- Reviewing, assessing and auditing the monitoring results from the company, the Ministry of Environment and other agencies as noted in appended *MOE Mt Polley Monitoring Plan* and providing feedback and interpretation on the information collected.
- Leading the Environmental Working Group to facilitate environmental technical discussions in response to the tailings breach as per the Letter of Understanding (LOU) between the Province and the Williams Lake Indian Band and the Soda Creek Indian Band, and the Science Advisory Panel. Also, participating in the Senior Officials Committee as per the LOU.
- Community outreach and support, including responding to enquiries from the public and holding information meetings.

**i. Ministry of Environment's Long Term Goal's for Environmental Mitigation and Remediation**

The Ministry's long-term goals for the Mount Polley tailings breach are that the Ministry, as the regulatory agency, will be satisfied with MPMC's final Remediation and Restoration Plan and that the Ministry, as the regulatory agency, will be satisfied that the area has been cleaned-up/remediated to an acceptable standard and all appropriate mitigation or offset measures have been agreed upon and/or completed.

To achieve these goals, an iterative process will be required, allowing planning to evolve as new information comes to light based on results of monitoring, research studies, and on-the-ground conditions to meet the requirements of the Order.

**ii. Phased Approach**

Given the need for an adaptive management approach and the span of work that needs to be completed to meet the requirements of the Order, a phased approach is being taken. It is important to understand that while these phases are given start and end dates, impact assessment, mitigation, and remediation activities all began immediately after the breach, are ongoing, and will continue past the summer of 2016. The following three phases are described in detail below:

The *Impact Assessment Phase* has been underway since August 2014, and will continue until August 2016 and beyond. The primary focus of this phase is to develop a comprehensive understanding of the impacts of the tailings breach on hydrology, water quality, soil quality, sediment quality, terrestrial wildlife and vegetation, and aquatic resources, in order to determine what the most effective remediation strategies will be. The information collected will

be used to update our understanding of the impacts, and be used to refine and update the long-term monitoring plan and final Remediation and Restoration Plan.

*Phase I*, from October 2014 to June 2015, focused on mitigating the impacts of the tailings breach with the goal of ensuring that no additional damage to the environment or human health and safety occurred. It involved implementing measures and contingency plans to ensure that the increased water flow from thawing snow (also known as spring freshet or spring breakup) did not result in additional environmental or human health impacts.

*Phase II*, from July 2015 to August 2016 and beyond, will focus on remediating the impacts of the breach. This phase is now commencing as the end of Phase I has passed. While Phase II, like the previous phases, will include ongoing impact assessment, monitoring, and mitigation activities, it will primarily focus on the remediation of the impact of the breach, and will include a human health and ecological risk assessment which will inform the final Remediation and Restoration Plan.

## 2. Progress Report for End of Phase I

The first phase of long-term remediation of the area impacted by the Mount Polley tailings breach focused on human health and environmental protection from October 2014, through the winter and spring, to June 2015. This Progress Report will provide a status update of MPMC's activities, a Ministry update of regulatory actions and environmental reporting, and an update of community outreach activities.

### A. Status Update

The findings of past reviews have been regularly relayed to Mount Polley Mining Corporation since the incident began in August 2014. What follows is a summary of activities that the Ministry has accepted as complete or suitably initiated to date, as well as those that require additional action and are still outstanding.

**The Ministry considers the following activities complete or suitably initiated:**

1. Safety:
  - Wood debris removal on Quesnel Lake.
  - Polley Lake outlet structure construction and related maintenance and operation.
2. Containment:
  - Tailings berm breach repaired to a capacity that could store 2015 freshet flows.
  - All mine contact water is being collected by a system of ditches sumps and pumps and stored in the Springer Pit. Plans are underway for treatment and discharge of mine effluent that will eventually be necessary.
  - A plan to mitigate and monitor windblown dust from the Tailings Storage Facility and along Hazeltine Creek this summer has been submitted and steps to implement undertaken. This plan has been accepted by the Ministry of Environment.

3. Monitoring:
  - MPMC's 2015 Monitoring Plans are in place and approved. Monitoring is ongoing throughout the area of the spill impact.
  - Plume modelling in Quesnel Lake is complete and results are included in the Post Event Environmental Impact Assessment Report.
  - Five monitoring buoys in Quesnel Lake provided plume monitoring data through the winter months. An assessment of the data is currently being undertaken.
  - A 2015 fish tissue collection plan is in place, approved, and will be carried out.
  - Biota monitoring for benthics, phytoplankton and zooplankton throughout the spill impact zone will be continued.
4. Protection of Archaeological resources:
  - Monitoring by First Nations members for First Nation archaeological values.
  - Complying with Archaeologist direction.
5. Protection of Fish resources:
  - Fish fences installed at Bootjack Creek entrance to Polley Lake and Hazeltine Creek outlet from Polley Lake, to be re-assessed for efficacy and additional barriers constructed as necessary.
6. Erosion mitigation:
  - Full length of Hazeltine creek protected against erosion by rock armouring and re-sloping has been completed in many areas. Lower reach of Edney creek needs additional erosion work. Work to be completed during low flow periods this summer.
  - Grass seeding is complete in some areas with additional seeding undertaken where necessary.
  - Over 30,000 trees and shrubs planted: 2 km of Willow wattles, over 900 square metres of willow matting, and planting of 8,350 willow stakes.
  - Wood chip and large woody debris ground cover installed in some areas of lower Hazeltine Creek and near bridge crossings.
  - Silt fencing and hay bale installation in use as needed.
  - Bridge re-construction outside flow channel is being implemented.
  - Subject to safety considerations, inflows from Polley Lake into Hazeltine Creek are decreased when possible to reduce the potential erosion and sediment loading.
  - Silt fence at mouth of Hazeltine Creek is still in place.
  - Dust control watering systems including water cannons, spray systems and a watering truck have been implemented to mitigate dust generation and a dustfall monitoring system has been initiated.
7. Treatment:
  - Sediment control ponds installed and maintained near mouth of Hazeltine Creek. Sediment to be utilized or hauled up to TSF depending on sampling results.
  - Water filters and bottled water supplied to residents drawing water from Quesnel Lake. As of end of May support for these programs withdrawn considering turbidity levels in Quesnel Lake have returned to typical low levels.
8. Reporting:
  - Weekly update reports submitted to MoE and the Environmental Working Group.

- Weekly update calls with MoE and other agencies updating the environmental protection and monitoring activities at the mine and in the impact zone.
- Ongoing monthly meetings with First Nations.
- Regular public meetings.
- Weekly posting of monitoring updates on the MPMC website.

**The Ministry considers the following activities as still required to continue through the Phase II remediation of the spill impacted area:**

MPMC's Rehabilitation Strategy Summary Table (dated March 18, 2015 and posted on MPMC's website) summarizes MPMC's rehabilitation actions underway and planned, and divides the impact zone from the tailings storage facility breach into nine subcomponent areas:

1. Tailings storage facility
2. Polley Lake plug
3. Polley Lake
4. Upper Hazeltine Creek
5. Hazeltine Canyon
6. Lower Hazeltine Creek
7. Edney Creek
8. Quesnel Lake
9. Quesnel River

Objectives, plans, monitoring, actions and contingencies have been developed for each sub-component. The following is a list of outstanding items requiring action for each subcomponent:

1. Tailings Storage Facility (TSF) subcomponent:
  - A long-term plan to mitigate windblown dust from the Tailings Storage Facility will be required. This plan will be informed by the results of the summer air monitoring program.
2. Polley Lake Plug subcomponent:
  - There is a need for ongoing operation and maintenance of structures to manage flows from Polley Lake to Hazeltine Creek to minimize erosion and enhance dilution.
3. Polley Lake subcomponent:
  - Complete bathymetric assessment in Polley Lake to determine extent of sediment distribution; and
  - An evaluation of physical, chemical and biological impacts of the tailings dam failure on the water, sediment and aquatic environment in Polley Lake including potential food chain impacts.
4. Upper Hazeltine Creek subcomponent:
  - Complete stream channel floodplain remediation works to protect against erosion. Installation of additional fish habitat is also still required.

5. Hazeltine Canyon subcomponent:
  - Determined to be low potential for further erosion, continue to monitor to confirm low level of erosion potential.
6. Lower Hazeltine Creek subcomponent:
  - Maintain sediment removal capacity of sediment treatment ponds through ongoing maintenance and clean out.
  - Complete stream channel floodplain remediation works to protect against further erosion impacts, restore fish habitat, and when appropriate, enable fish passage.
  - Ongoing active management and improvement of sediment control ponds to maximize sediment removal effectiveness.
7. Edney Creek subcomponent:
  - Complete stream remediation and erosion protection works in lower reach below point of diversion to Hazeltine creek during period of 2015 summer low flow to protect against further erosion impacts and enable fish passage.
  - Establish final channel location and future connection with Hazeltine Creek.
8. Quesnel Lake subcomponent:
  - Evaluate and consider subsurface flows into Quesnel Lake from Hazeltine Creek.
  - Achieve Provincial Aquatic Life and Drinking Water guideline levels at defined locations in Quesnel Lake.
  - Ensure benthic community in impacted sediment zones within Quesnel Lake are restored.
  - Continued evaluation on food chain/web interacts (i.e. nutrient and metal uptake, including olfactory, and zooplankton tissue metal concentrations transfer to fish tissue metal concentrations).
  - Evaluate fish and plankton population effects – migration, avoidance, and movement throughout the waterbody (Quesnel Lake) and within the water column.
  - Monitor and assess far field potential effects.
  - Redeployment and assessment of sediment traps in Quesnel Lake.
  - Redeployment and further assessment of lake moorings data.
9. Quesnel River subcomponent:
  - Continued support for the Federal-Provincial Water Quality Trend Monitoring Sites at Likely Bridge and Gravelle Ferry.
  - Ongoing collection and assessment of Quesnel River continuous water quality station at Quesnel River Research Centre.
  - Repeat of Canadian Aquatic Biomonitoring Network (CABIN) collection in Quesnel River, as well as benthic metals analysis; and,
  - Redeployment of sediment traps at Cedar Point.

It is expected that information relative to specific actions in each subcomponent area noted above will be provided to the Ministry of Environment for review prior to implementation and any remaining data limitations and data gaps will be identified. In addition, monitoring and contingency plans are needed for each of the above subcomponents as well as as-built drawings for works that are installed. It is also expected that MPMC will provide written updates of the Rehabilitation Strategy Summary Table.

In addition to the activities MPMC is required to undertake, several other studies and assessments are being conducted. Some of the activities are being supported indirectly by MPMC or are conducted independently by various other groups, government agencies, scientific centres or members of academia. The list of activities is as follows:

- Polley Lake plug area – Thompson Rivers University is conducting a sediment/vegetation regrowth study to look at potential affects.
- Hazeltine Creek – United Kingdom scientists are conducting a geochemical sediment study.
- Quesnel Lake at Hazeltine Creek – University of Toronto is conducting sediment coring in Quesnel Lake.
- Quesnel Lake – Fisheries and Oceans Canada is undertaking a limnological nutrient study.

**The Ministry considers the following information still outstanding and expects it to be provided during Phase II of the Remediation of the spill-impacted area:**

- Follow-up annual reporting of information collected in support of the Post Event Environmental Impact Assessment Report.
- Delineation of the extent of the mine affected materials and sediment in the environment.
- Quarterly submission of water quantity and quality data resulting from the annual monitoring plan.
- Consideration of the Ministry of Environment’s Environmental Mitigation Policy in mitigating and offsetting impacts to environmental values in the area downstream of the TSF Breach.
- A Human Health and Ecological Risk Assessment.
- Spill impact zone Remediation and Restoration Plans.
- *Mines Act and Environmental Management Act* permit applications and supporting information related to future development required to resolve issues related to the TSF breach and the need to discharge impacted water from the mine site.

This assessment outlining what actions have been completed/initiated to the Ministry’s satisfaction, and what actions and information is still required over the short-term has been provided to Mount Polley Mining Corporation in a status report letter dated June 18, 2015 (located in Appendix 2).

This letter, along with other supporting documents, can be found in the appendices to this Progress Report and can also be found online at the Ministry’s dedicated Mount Polley website at <http://www.env.gov.bc.ca/eemp/incidents/2014/mount-polley/>.

An effective response to the Mount Polley Tailings Storage Facility breach will rely on the continuing exchange of information between the Ministry and MPMC, as well as remaining adaptive to new information as it becomes available. In turn, an adaptive approach is the most effective and appropriate strategy for mitigating the impacts of the breach and meeting provincial clean-up requirements. The Ministry expects review and comment by September 12, 2015 on the Post Event Environmental Impact Assessment Report and as a result of these comments adaptations to the plans may be required.

It is also important to understand that beyond planning and activities for work through 2016, long-term monitoring, work plans, mitigation measures and a plan for the remediation of the tailings in the impact

zone is still required and that this work will continue over the course of years.

In response to the Order, MPMC has provided a number of planning documents, which have been reviewed by the Ministry, Environmental Working Group Members, First Nations, Ministry of Forests, Lands and Natural Resource Operations, and local community observers. The findings of these reviews have been regularly relayed to MPMC since the incident began in August 2014. The compilation and integration of all of these planning documents encompass the necessary planning for Phase I, and will help to inform further plans, actions and monitoring for Phase II and beyond.

#### **i. Related planning documents**

The planning documents that have been submitted and reviewed include:

1. Post-Event Environmental Impact Assessment Report – PEEAIR
  - *Under review until September 12, 2015.*
2. Fugitive Dust Management Plan
3. 2015 Post-TSF Breach Monitoring Plan
4. 2015 Fish Tissue Collection Plan

These planning documents have been developed by MPMC as a part of their response to the Order. They may be updated over time as more information becomes available. These documents are included in Appendices 4a to 4d.

#### **ii. Description of Planning Documents**

The following provides a brief description of each of the planning documents.

1. Post-Event Environmental Impact Assessment Report – PEEAIR
  - a. Submitted in response to Section 1 of the amended Order, requiring MPMC to submit a PEEAIR by June 5, 2015. This is a fairly large and comprehensive document providing an executive summary and including many studies undertaken by the company to evaluate the environmental impacts of the tailings breach. Includes information collected to date on the spill and defines the impacts of the spill. The report is divided into three sections: physical, chemical, and biological impacts.
  - b. The report does not fully delineate the extent of the spill impacted areas. The amended Order recognized the need for more definitive delineation of the mine affected materials and sediment in the receiving environment and this will be included in subsequent annual reporting. The amended Order also recognized that additional data is still being collected and that follow-up annual reports will be required with the first of these to be submitted by December 31, 2015.
  - c. Posted to the dedicated MOE Mount Polley Incident Website for public review and comment until September 12, 2015.
2. Fugitive Dust Management Plan
  - a. Submitted in response to Section 7 of the original Order, requiring MPMC to recover, manage and mitigate mine-affected materials and sediments in the receiving



environment and the Ministry's expectation that MPMC will control and mitigate dust, the plan describes measures to identify sources, mitigate and monitor dust.

- b. A plan to mitigate and monitor windblown dust from the Tailings Storage Facility and along Hazeltine Creek and steps to implement undertaken. Results of the monitoring will feed into the mitigation plan and future monitoring if required.
3. 2015 Post-TSF Breach Monitoring Plan
    - a. Submitted in response to Section 7 of the original Order, requiring MPMC to assess and monitor the impacts and risks posed by the mine-affected materials and sediments currently in the receiving environment.
    - b. The plan outlines the monitoring program for areas downstream of the tailings breach: Polley Lake, Hazeltine Creek, Quesnel Lake and upper Quesnel River for water chemistry, sediment chemistry, aquatic toxicity, biological monitoring, and terrestrial wildlife and vegetation.
  4. 2015 Fish Tissue Collection Plan
    - a. Supplements the 2015 Post-TSF Breach Monitoring Plan and describes, in greater detail, the specific plan to collect fish from Polley Lake and Quesnel Lake to supplement fish data collected in 2014, in order to assess potential biological impacts from the tailings breach. The Plan was developed in collaboration between MPMC, First Nations, Ministry of Environment, Ministry of Forests, Lands and Natural Resource Operations, and Fisheries and Oceans Canada. With different parties working together, the number of fish sampled will be reduced overall and the number of non-target species will be reduced.
    - b. The plan describes the type of fish to be collected and where, the sampling method and the timing.

## B. Ministry Update

### i. Regulatory Actions

On May 27, 2015, the Ministry amended the original Pollution Abatement Order 107461 issued on August 5, 2014 under the *Environmental Management Act*. The purpose of the amended Order is to ensure:

- Submission of the Post-Event Environmental Impact Assessment Report by June 5, 2015;
- Annual Progress Reports on additional impact assessments, first report by Dec 31, 2015;
- Delineation of mine affected material and sediment by Dec 31, 2015; and
- Quarterly reporting of water quality data, first report by August 15, 2015.

A copy of the amended Order is located in Appendix 1.

In addition to the amended Order, the Ministry issued a letter to MPMC clarifying some of the requirements of the original Order. The letter requires MPMC to:

- Provide an updated action plan to achieve drinking water and aquatic life guidelines at given locations in the receiving environment.

- Consider the Ministry's Environmental Mitigation Policy directives in regards to assessment and development of mitigation and offsets relative to the environmental impacts of the spill.
- Provide a schedule for the submission of plans to recover or manage the mine affected materials and sediment in the receiving environment.
- Complete a human health and ecological risk assessment containing a conceptual exposure model, and define when the risk assessments and conceptual model will be provided.

Through the amended Order and requirements letter, the Ministry has provided direction and clarification as we move into Phase II, the Remediation and Restoration phase. A copy of the requirements letter dated June 15, 2015 is located in Appendix 3.

## **ii. Environmental Monitoring**

### ***a. Overview***

Water samples continue to be collected from the Quesnel River at both the Likely Bridge and Gravelle Ferry Bridge sites. These sites are part of the Federal/Provincial trend monitoring program with samples collected by local community samplers. The Likely Bridge site is located just downstream of the outlet of Quesnel Lake, and represents water quality within Quesnel Lake itself. The Gravelle Ferry site is located about 75 km downstream from Quesnel Lake, and has different water quality characteristics than the upstream part of the river, nearer the lake. The river at the Gravelle Ferry site is much larger, is influenced by the input of the Cariboo River, other tributaries and the mainstem, has higher turbidity (suspended sediment or particulates), and has higher levels of total metals and phosphorus associated with that turbidity.

MoE reports out on these sample results on a monthly basis, available on the Mount Polley Incident Website: <http://www.env.gov.bc.ca/eemp/incidents/2014/mount-polley/>.

During the fall lake turnover period, it was evident that the sediment plume found at depth in Quesnel Lake during the summer mixed with the clearer surface waters. Turbidity levels in Quesnel River increased substantially between November 2014 and mid-January 2015. Since that time, the water turbidity levels have returned to near normal levels and have remained below the BC water quality guidelines for drinking water.

Although there was some sediment discharge resulting from early freshet flows down Hazeltine creek, sampling results show that water in Quesnel Lake continues to be safe to drink (subject to standard precautions around treating surface water), fishing and recreating on the lake is safe, and fish consumption is safe.

### ***b. Ministry's Mt Polley Monitoring Plan and Ministry's auditing role***

The Ministry has prepared a Monitoring Plan for 2015-2016; see Memo – Ministry of Environment Mt Polley Monitoring Plan for 2015/16, in Appendix 5a. The role of the Ministry with regards to receiving environment monitoring in Quesnel Lake, Polley Lake, Hazeltine Creek and the Quesnel River area is both as an auditor and regulator. Ministry monitoring and compliance staff will be collecting water, sediment and biological samples at periodic locations and frequencies to ensure quality control/quality

assurance with MPMC monitoring programs, compliance with both the Pollution Abatement Order and subsequent permit requirements, and to confirm that the receiving environment is being protected for human health, aquatic life and wildlife.

The Ministry monitoring program is co-ordinated with MPMC, Ministry of Forests, Lands, and Natural Resource Operations (FLNRO), Fisheries and Oceans Canada (DFO), Environment Canada (EC), Quesnel River Research Center (QRRC) and First Nations programs.

The Ministry program focusses on three main areas: Polley Lake, Hazeltine Creek and Quesnel Lake (including Quesnel River). Lake sampling focusses on three key periods: spring overturn prior to stratification, mid-summer when the lakes are stratified and late summer/early fall, prior to fall turnover. Sampling will include surface, mid lake and deep station sites for nutrients, turbidity, and metals, and depth profiles for temperature, dissolved oxygen, pH, conductivity and turbidity. Compliance sampling will occur monthly, from May-October, in Quesnel Lake at the mouth of Hazeltine (compliance point) and in Hazeltine Creek, including sediment pond discharge, for side-by-side sediment and water sampling (approximately 4-6 times).

Canadian Aquatic Biomonitoring Network (CABIN) will be repeated in September in Quesnel River at the Likely bridge and Gravelle Ferry sites as well as in the Cariboo River upstream of the confluence with the Quesnel River. At this time zooplankton, sediment and benthics in the lakes and fish sampling will be conducted by other parties. The Ministry may sample for phytoplankton in the lakes but this has not been confirmed.

The Ministry has also developed a contingency monitoring plan in case of unexpected turbidity events. This could involve additional sampling for drinking water concerns (i.e. 5 weekly samples collected over 30 days) near the community of Likely and potentially in Quesnel Lake. The Ministry may also be required to conduct additional fish tissue analysis if human consumption guidelines are exceeded, or upon the request of Interior Health Authority.

### *c. Summary of data collected at Likely Bridge and Gravelle Ferry Sites, August to April*

Ministry of Environment staff in cooperation with Environment Canada established a new federal-provincial sampling site on the Quesnel River off the Likely Bridge. Ministry staff have signed a Memorandum of Understanding with MPMC for the funding and sampling of this new long-term water quality monitoring site. Information has been and will continue to be collected by a lay sampler (resident of Likely) to assess potential impacts to human health (drinking water) and to the aquatic environment with respect to the tailings breach. This site has been sampled weekly since August 26, 2014. The Gravelle Ferry Bridge site on Quesnel River was established as a federal-provincial sampling site in June 2014 and has been sampled weekly since that time.

Summary tables of all exceedances in water parameters tested from January 13, 2015 until April 28, 2015, can be seen in Tables 1 and 2 below. It is important to note that Health Canada indicates there is no weight of evidence for adverse health effects of aluminum at levels above the guideline. In addition, iron and phosphorous drinking water guidelines are based on staining and taste, not direct health effects. While chemical parameters may not be of concern, residents should still follow Health Canada

protocols for treating raw drinking water. These include treating surface water for pathogens (germs) found naturally in surface water, boiling all water for one minute, or using an alternate potable water source for drinking, washing of fresh fruits and vegetables and making ice.

Table 1. BC Drinking Water Guideline Exceedances from January 13, 2015 – April 28, 2015 at the two Federal/Provincial sampling sites – Quesnel River at Likely Bridge and Quesnel River at Gravelle Ferry Bridge.

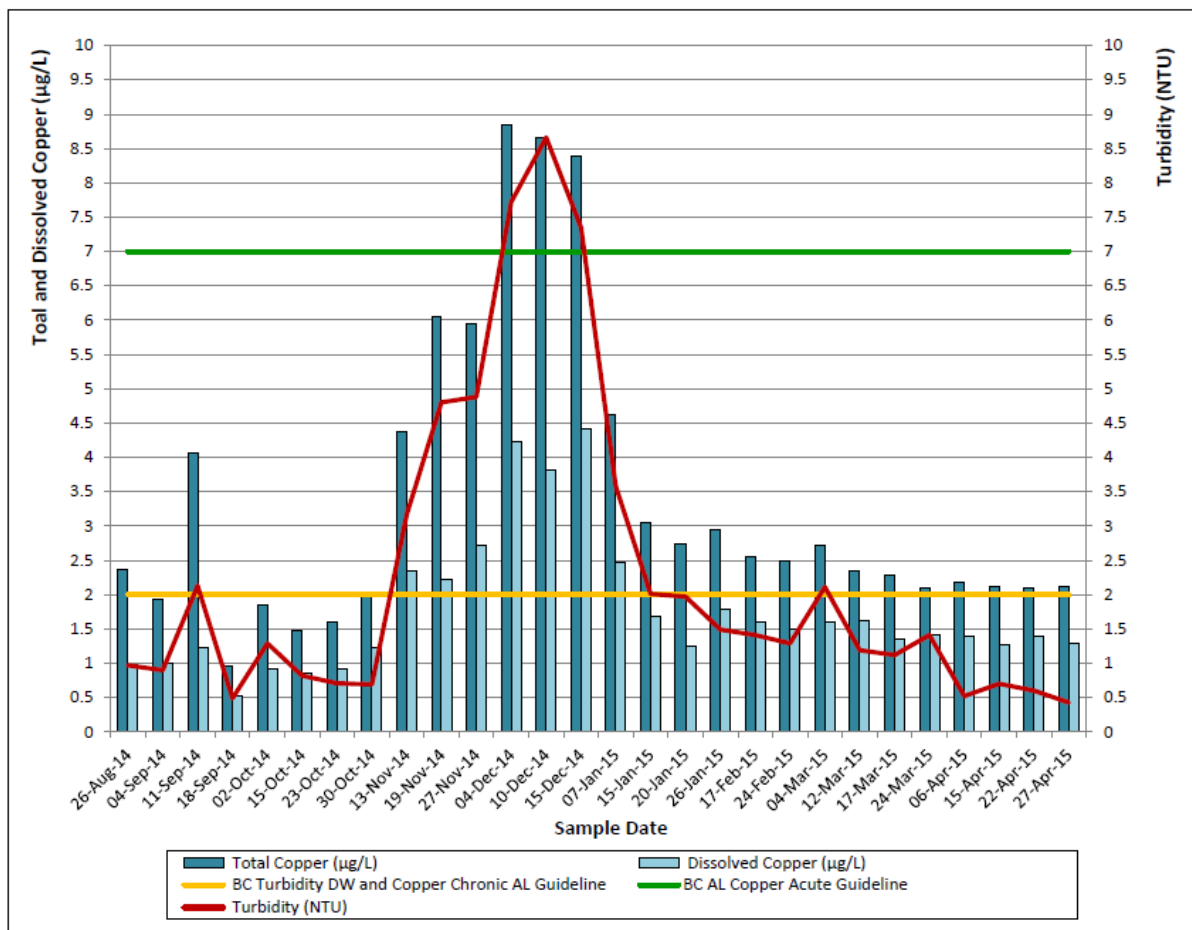
Dates	Location	BC Drinking Water Guideline-Exceedances
April: 7, 14, 21, 28	Quesnel River at Gravelle Ferry Bridge	-Turbidity (for raw untreated water) - Total aluminum - Total iron - Total phosphorus
April: 7	Quesnel River at Gravelle Ferry Bridge	-Total manganese
February: 17, 24 March: 2, 10, 17, 24	Quesnel River at Gravelle Ferry Bridge	- Turbidity (for raw untreated water) - Total aluminum - Total iron
February:24, March: 2, 17, 25	Quesnel River at Gravelle Ferry Bridge	-Total phosphorus
January: 15, 26	Quesnel River at Likely Bridge	-Total aluminum
January: 13, 20, 27 February: 3	Quesnel River at Gravelle Ferry Bridge	-Turbidity (for raw untreated water)
January: 13, 20	Quesnel River at Gravelle Ferry Bridge	-Total aluminum - Total iron

Table 2. Water Quality Guidelines for the protection of Aquatic Life Exceedances from January 13, 2015– April 28, 2015 at the two Federal/Provincial sampling sites – Quesnel River at Likely Bridge and Quesnel River at Gravelle Ferry Bridge.

Dates	Location	Water Quality Guidelines for the protection of Aquatic Life - Exceedances
April: 6, 15, 22, 27	Quesnel River at Likely Bridge	-Total copper - chronic
April: 7, 14, 21, 28	Quesnel River at Gravelle Ferry Bridge	- Turbidity - Total suspended solids (TSS) chronic
April: 7, 14, 28	Quesnel River at Gravelle Ferry Bridge	-Total suspended solids (TSS) acute
April: 7, 14, 21, 28	Quesnel River at Gravelle Ferry Bridge	-Total copper chronic
April: 7, 14, 21, 28	Quesnel River at Gravelle Ferry Bridge	-Total chromium acute
April: 7, 21, 28	Quesnel River at Gravelle Ferry Bridge	-Total iron
April: 7, 28	Quesnel River at Gravelle Ferry Bridge	-Dissolved aluminum chronic
February: 17, 24 March: 4, 12, 17, 24	Quesnel River at Likely Bridge	-Total copper chronic
February: 17, 24 March: 2, 10, 17, 24	Quesnel River at Gravelle Ferry Bridge	-Turbidity - Total suspended solids (TSS) chronic
February: 17 March: 10, 17	Quesnel River at Gravelle Ferry Bridge	-Total suspended solids (TSS) acute
February: 17, 24 March: 2, 10, 17, 24	Quesnel River at Gravelle Ferry Bridge	-Total copper chronic
February: 17	Quesnel River at Gravelle Ferry Bridge	-Total chromium acute

March: 10, 17, 24	Bridge	- Dissolved aluminum chronic
January: 15, 26	Quesnel River at Likely Bridge	-Total copper chronic
January: 26	Quesnel River at Likely Bridge	-Dissolved aluminum chronic
January: 13, 27	Quesnel River at Gravelle Ferry Bridge	-Turbidity
January: 13, 20, 27 February: 3	Quesnel River at Gravelle Ferry Bridge	-Total suspended solids (TSS) chronic
January: 13, 20	Quesnel River at Gravelle Ferry Bridge	-Total copper chronic

At the Likely Bridge sampling site, turbidity has been the main parameter of concern with respect to drinking water and potential effects to human health within the local community. It appears that turbidity has remained below the BC Drinking Water guideline since January 15, 2015 (Figure 1). There has been an overall decline in turbidity readings since January, with a few small peaks associated with snowmelt and rainfall events.



**Figure 1. Quesnel River at Likely Bridge – turbidity (NTU) and copper (µg/L) (total and dissolved) results from August 26, 2014 to April 27, 2015.**

The graph also captures the period when fall overturn (or lake mixing) occurred in Quesnel Lake in early November and began to flow out the Quesnel River. This coincided with the green cloudy water that

was visible in Quesnel River throughout November and December. The turbid water moved out of the lake in the winter and progressed down the Quesnel River. The concentrations of turbidity in the Quesnel and Fraser Rivers are not expected to be of concern due to dilution and the existing turbidity levels in the Cariboo and Fraser Rivers.

Based on these observations, the sampling frequency at the Likely Bridge site has been reduced to biweekly (every two weeks) as of June 1, 2015, alternating weeks with MPMC who also conduct biweekly sampling at the Quesnel River Research Center. In addition, the Gravelle Ferry site has returned to its normal sampling frequency (monthly) as of June 1, 2015. The few exceedances observed at the Gravelle Ferry site are reflective of conditions prior to the breach, especially with regards to turbidity. As noted above, the Gravelle Ferry site is downstream of the Cariboo River which is a potential contributor of turbid water, as are other tributaries and the main stem of Quesnel River itself. It is important to note that most metal exceedances are associated with total metal results and are thus more reflective of metals that are bound to sediment particles and are therefore not bioavailable (i.e. available for uptake by organisms).

#### *d. Summary of compilation of Ministry's water chemistry data (5 in 30 reporting)*

The Ministry collected water quality samples in Quesnel Lake following the tailings breach in August and September 2014. A subset of the Ministry's data was previously analyzed by Azimuth Consulting, under contract to DFO and posted to the MOE Mt Polley Website (Azimuth Report: Biological Effects of Metals on Salmonids and Freshwater Foodwebs). The Ministry contracted Azimuth Consulting for further analysis of the Ministry's data, from August 2014 to March 2015, including comparison to BC aquatic life average guidelines (based on five weekly samples collected over a 30-day period), and comparison of specific lake sampling sites to determine whether the lake sampling sites could be used as a surrogate for the river sampling site off the Likely Bridge. The average guidelines apply specifically to turbidity, total suspended solids (TSS), total copper, silver, vanadium, zinc, and dissolved aluminum.

The Azimuth report's findings included:

- A review of the 5 in 30 day averages for selected stations in Quesnel Lake. The findings concluded that surface water quality was entirely below long-term guidelines for all parameters with the exception of copper for the combined Hazeltine Creek at mouth sites. In addition, water quality around the thermocline and in the deep samples exceeded the long-term guidelines at stations around the Hazeltine Mouth locations and the highest mean concentrations for turbidity, TSS, phosphorus, copper, and zinc occurred in the deep samples collected at the deep station in Quesnel Lake near Hazeltine Creek.
- A review of the 5 in 30 day averages for Quesnel River at the Likely Bridge site. Results indicated that average guidelines were exceeded for turbidity, copper and dissolved aluminum during the winter period. Concentrations have decreased since January and the only average guideline that was exceeded in February and March 2015 was for total copper.
- A comparison of Quesnel Lake sites to Quesnel River at Likely Bridge site. It was determined that the data were inadequate in size to determine whether Quesnel River off Likely Bridge can be used as a surrogate for data in Quesnel Lake, or vice versa. However; the data used for

comparison was collected in August and September 2014 only, as it was not possible to collect lake data in the fall/winter.

The Azimuth Memo on Additional Analysis of MOE Water Quality Data is located in Appendix 5b.

#### ***e. Summary of Monitoring Buoy Data***

The Department of Fisheries and Oceans (DFO) deployed five moorings in November 2014 throughout Quesnel Lake to collect continuous data at varying depths. In Quesnel Lake the moorings are located in the North Arm, East Arm, West Arm and off Hazeltine Creek, and there is one in Quesnel River. These moorings accumulated data all winter; the data was downloaded in April 2015 by DFO, and the moorings were redeployed in April to continue assessing water quality. The moorings collected data such as water level, depth, temperature, chlorophyll A and turbidity. DFO has conducted a preliminary review of the data and provided the results/data to MPMC to include in the PEEAIR. DFO will conduct further assessment and analysis by early September 2015. The Ministry will post the data to the website once the assessment has been completed.

#### ***f. Spring Overturn Results***

The Ministry conducted spring overturn sampling in the Quesnel Watershed. The following locations were sampled for water chemistry and other parameters: two locations on Quesnel Lake, Cedar Creek, Hazeltine Creek, two locations on Polley Lake; and side-by-side samples with MPMC.

Sampling is typically conducted in the spring to assess water chemistry when the lake has turned over. Other lakes in the Cariboo, and province, were sampled at the same time. An analysis of these results has been reported out in memos, and these memos were posted to the Ministry's dedicated Mount Polley Incident website on July 9 at <http://www.env.gov.bc.ca/eemp/incidents/2014/mount-polley/>.

#### ***g. Summary of Conceptual Model***

In order to assist the Ministry and other agencies in understanding the potential impacts of the tailings breach, the Ministry hired Azimuth Consulting to develop a conceptual model for determining risk assessment. This tool has been completed (see Mount Polley Tailings Breach – Conceptual Site Models in Appendix 5c), and it outlines various exposure pathways for terrestrial species as well as amphibian species and fish species. Exposure pathways include water ingestion, direct contact, food consumption, ingestion, or contact with suspended sediment. The conceptual model will assist the Ministry in determining risks associated with the tailings breach and in adjudicating plans and actions by the company.

### **iii. Permit Review Process and the Ministry's Role**

The Ministry is participating in the permit review process through the Cariboo Mine Development Review Committee led by the Ministry of Energy and Mines. The process will be completed in three phases.

Phase I: Restricted mine restart and disposal of tailings into Springer Pit. Statutory decisions to issue permit amendments authorizing the restricted restart of operations at Mount Polley mine were made on July 9, 2015 for both the *Mines Act* permit and the *Environmental Management Act* permit. MPMC's

technical assessment report related to the short-term water management plan underwent a screening review for adequacy prior to any re-start decisions. The permit amendments, as well as each of the statutory decision makers' reasons for decision, have been posted to the dedicated Mount Polley website.

Phase II: Short-term water management plan and application to discharge into the receiving environment. MPMC submitted an application on July 16, 2015. Technical review will occur through the Cariboo Mine Development Review Committee. This review will continue into September 2015. During this time there will be a 30-day public review and comment period.

Phase II: Long-term water management plan and application to discharge into the receiving environment. This plan is required to be provided to the Ministry by June 30, 2016.

The Ministry's role in the permit review process is as a reviewer, to ensure there is proper consultation with First Nations, partner agencies, local governments, and the public. The Ministry also has a role as a Statutory Decision Maker for permits and/or permit amendments applied for under the *Environmental Management Act*.

#### **iv. Technical Review and Community Outreach**

The Ministry continues to jointly address aspects of the tailings breach with Soda Creek Indian Band and Williams Lake Indian Band through the Principals Table, Senior Officials Committee (SOC), and Environmental Working Group (EWG). The EWG continues to review and discuss plans and actions related to the impact assessment, monitoring and remediation of the breach through biweekly meetings. The EWG is currently conducting a technical review of the Post Event Environmental Impact Assessment Report to September 12, 2015. There have been 25 EWG meetings held to date.

A Lake Keepers Course was held on May 23 and 24, 2015 in Likely. The Ministry teamed up with the BC Lake Stewardship Society and offered a 2-day course so residents could learn more about natural lake processes; sampling techniques and how the community can become more involved in taking care of Quesnel Lake. About 20 people participated including local residents, First Nations and mine employees. Residents experienced valuable classroom components with experts, and gained hands on field practice using sampling equipment.

The Ministry continues to participate in community meetings, and hosted community meetings in Likely, Sugar Cane, Williams Lake and Quesnel from June 22 to 25, 2015 to engage community members on the amended Pollution Abatement Order, the company's impact assessment report, and to provide a summary of our environmental monitoring data collected to date (see Appendix 6 for a copy of the presentation).

### **C. Moving into Phase II: Remediation and Restoration Phase**

Throughout Phase II, the Ministry will continue to:

- Monitor the receiving environment, on a less frequent basis, and conduct audit sampling of the mine and their consultants.



- Monitor MPMC for compliance with the *Environmental Management Act*, the Pollution Abatement Order and any related amendments.
- Work with MPMC to ensure longer term mitigation strategies are developed and implemented to ensure the long term environmental integrity of Hazeltine Creek, and Polley and Quesnel Lakes. Examples would include development of a stable stream channel, development of spawning channels and fish habitat, development of sustainable riparian vegetation and habitat.
- Consider the findings of the sampling programs and determine what the most viable long term mitigation and remediation options are considering scientific knowledge, local knowledge and First Nations traditional knowledge of the area, and advice from Environmental Working Group and Science Advisory Panel.

Phase II of the long term plan covers the timeframe from July 2015 to August 2016 and beyond, and focuses on remediating the impacts of the breach. During this period, the Ministry will work with the company to implement longer term mitigation strategies ensuring the environmental restoration of Hazeltine Creek, and Quesnel and Polley Lakes, while continuing to monitor the company's compliance with the *Environmental Management Act* and the Pollution Abatement Order.

#### **D. Conclusion**

Responding effectively to the Mount Polley Tailings Storage Facility breach will rely on the constant interchange of information and adaptation to new information as it becomes available. This approach is the most effective and appropriate strategy for mitigating the impacts of the breach and successfully meeting provincial clean-up requirements.

The Ministry, the Environmental Working Group and the Technical Advisory Group with input from First Nations, and other ministries, agencies and levels of government will continue to provide feedback to MPMC on the most appropriate courses of action to resolve all issues.

The Ministry will continue to inspect and review the work of Mount Polley Mining Corporation to ensure they are complying with the Ministry's directions and achieving an acceptable level of environmental protection.

The Ministry will be conducting thorough assessments and consultation with regard to the proposed short and long term discharges proposed from the mine site.

The Ministry will continue to provide information to the public through our website and other venues on the findings of the investigations into the impacts of the spill and subsequent mitigation and remediation measures and require Mount Polley Mining Corporation to do the same.

It is also important to understand that beyond planning and activity for work through August 2016, long term monitoring, work plans and mitigation measures will need to be initiated and reviewed to address potential long term impacts to fish, wildlife and vegetation. This work will continue over the course of years.

### **3. Appendices (attached under separate cover)**

1. Pollution Abatement Order 107461 Amendment
2. Ministry's Pollution Abatement Order Requirements Letter to Mount Polley Mining Corporation
3. Ministry's Status Report Letter to Mount Polley Mining Corporation
4. Mount Polley Mining Corporation Planning Documents
  - a. Post-Event Environmental Impact Assessment Report
  - b. Fugitive Dust Management Plan
  - c. 2015 Post-TSF Breach Monitoring Plan
  - d. 2015 Fish Tissue Collection Plan
5. Ministry's Planning Documents
  - a. Memo – Ministry of Environment Mt Polley Monitoring Plan 2015-16
  - b. Azimuth Memo – Additional Analysis of MOE Water Quality Data
  - c. Mount Polley Tailings Breach – Conceptual Site Models
6. Ministry's Presentation to Communities June 22-25, 2015