



**MINISTRY OF ENERGY AND MINES**  
Mines and Mineral Resources Division

**REPORT OF GEOTECHNICAL INSPECTOR**

(Issued pursuant to Section 15 of the Mines Act)

**Name of Property:** New Afton Mine **Permit No.:** M-229

**Mine Manager:** Sean Masse

**Company:** New Gold Inc  
**Address:** Box 948 Station Main  
Kamloops, BC  
V2C 5N4

**Persons Contacted:** Kurt Keskimaki, Sean Masse, Andy Davies, Allan Chan,  
Corey Kamp, Martin Froehling, Clint Logue (BGC)

**Copies To:** Al Hoffman, Chief Inspector of Mines  
Diane Howe, Deputy Chief Inspector of Mines, MEM  
Stephen Rothman, Health & Safety Inspector, MEM  
George Warnock, Manager, Geotechnical Engineering, MEM  
Heather Narynski, Geotechnical Engineer, MEM

**Date of Inspection:** July 22, 2013

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**Introduction**

A Geotechnical inspection of the New Afton Mine was conducted on July 22, 2013 by Michael Cullen, P.Eng of Michael Cullen Geotechnical Ltd. accompanied by Steve Rothman. Mr. Cullen completed this inspection on behalf of the Ministry of Energy and Mines. The inspection included a field review, review of technical reports, technical presentations by Mine staff, and a close out meeting.

The purpose of this inspection was as follows:

- To assess if the Mine is meeting the intent of the geotechnical requirements of the Health Safety and Reclamation Code for Mines in B.C. (HSRC)
- To assess if the Mine is meeting the intent of geotechnical conditions in Permit M-229.
- To assess if geotechnical practices at the Mine are consistent with generally accepted engineering practices at mines in British Columbia.
- To identify potential ground stability hazards or concerns at the Mine.
- To provide general comment on geotechnical conditions at the mine.
- To review the conditions on Dam B where cracks have recently developed.

The following technical reports were reviewed:

- “Ground Control Management Plan ver 3” dated April 2013, New Gold
- “New Afton Project Tailings and Water Management Facilities Operation Maintenance and Surveillance Manual” dated July 2012, New Gold.
- “New Afton TSF Dam Audit Memorandum” dated November 2012, Geo-Logic Associates
- “Dam Raise for construction drawings” dated 2013, BGC
- “New Afton TSF-Review of Dam B Cracks - June 2013” dated July 10, 2013, BGC

The field inspection included Dams A, B, C, West, North, and Pothook on the surface, and the extraction level underground.

In a meeting following the site inspection Mine staff provided technical updates on the following:

- Underground mine performance including: excavation performance, support performance, instrumentation, numerical modeling, stress analysis, and rehabilitation program.
- Review of the revised Ground Control Management Plan.
- Cave and subsidence management including: progression to date, instrumentation results, modeling results, future work.
- Mudrush management program including monitoring and tracking, results to date.
- Pit dewatering program including work completed and current status.
- Review of proposed east cave addition, including preliminary plans, subsidence prediction and planned instrumentation.
- Underground water storage and pumping capacity.
- TSF construction including review of crack development on Dam B.

## **OBSERVATIONS COMMENTS AND INSPECTION ORDERS**

### **Location: Underground**

#### **Observations and Comments:**

The underground excavations are being designed, managed and supported to appropriate engineering standards, the requirements of the HSCR, and Permit M-299. No hazardous, unusual, or areas of geotechnical concern were noted.

The ground support being installed meets or exceeds the Mines minimum standards as set out in the Ground Control Management Plan (GCMP). Areas of the extraction drift are subject to high stress which are causing deterioration of the rockmass and some support failure; these are being quickly identified and dealt with by the Mine. Somewhat novel methods of support are being trialed at the mine in an effort to increase draw point pillar strength.

The revised GCMP (rev 3 April 2013) was reviewed. The document meets the requirements of Permit M-229, the HSRC, and good engineering practices. New Afton is commended on preparing and following a well-conceived document.

The cave has recently propagated to the bedrock surface. The observed surface subsidence to date is consistent with expectations. The full extent of subsidence is not expected to occur for many months such that it is not yet possible to compare actual maximum values with those predicted. It is understood that the Mine and its consultants are calibrating the caving and subsidence models using the information collected from surveys and other instrumentation.

It is understood that water inflows into the mine to date have been of the order of 20 m<sup>3</sup>/hr, and that there has been little seasonal change through the year. Now that the cave has propagated through to surface inflows are expected to increase; however, the extent of the possible increase is not known. Sumps in the bottom of the mine have a capacity of 560m<sup>3</sup>. Pumping capacity is 180m<sup>3</sup>/hr, and the system has 100% backup.

The Mine has recently instituted a mudrush management program. A simple matrix relating moisture content and fines content is used to assess if a potential hazard exists. It is understood that, to date, draw points are only very occasionally damp or wet, and that the moisture is only present for a short period of time.

No geotechnical issues have been identified that would preclude extending Block 2 to the east. The proposed east cave addition is not expected to result in any significant changes to geotechnical conditions or practices compared to existing conditions. Based on the present subsidence prediction model the east cave will not adversely affect any critical infrastructure or impact on the New Afton or old Teck TSF.

**Inspection Orders:**

*none*

**Location: Afton Pit**

**Observations and Comments:**

It is understood that most of the mud and water has been removed from the pit bottom. Two deep wells have been installed in the bottom of the pit; these continue to extract a small amount of water believed to be derived from bedrock fractures.

The pit walls continue to be monitored; some instability is expected now that the cave has propagated to surface.

**Inspection Orders:**

*none*

**Location: Tailings Storage Facility**

**Observations and Comments:**

It is understood that BGC Engineering Inc. have now been retained as the Engineers of Record for the TSF. BGC have issued for construction drawings for the upcoming dam raise. In 2013 upstream and downstream Phase 1 (including cyclone sand and downstream Fine and Coarse Filter) will be completed. Phase 1 will be completed to the Starter Dam elevation of 735 m. In 2014, starter dams A, B and C will be raised to 744.5 m. The for construction documents have been reviewed and are consistent with the requirements of the HSRC, Permit M-229 and accepted engineering practice.

The document “New Afton TSF Dam Audit Memorandum” by Geo-Logic was submitted as the Dam Safety Inspection (DSI) for 2013. This document is not consistent with MEM requirements for DSI reporting; however, since tailings deposition only started in 2012 MEM does not consider it necessary to re-submit. For future reference we have attached the MEM document “Guidelines for Annual Dam Safety Inspection Reports”.

The document “New Afton Project Tailings and Water Management Facilities Operation Maintenance and Surveillance Manual” dated July 2012, was found to have the following deficiencies:

- Some inconsistencies with regards to the dam consequence rating occur in the document.
- The ERP included in the OMS does not adequately address inundation as per the Mine Permit conditions and the CDA guidelines.
- Details of instrumentation trigger levels /response action are not provided.

At the time of inspection work was underway to strip the till blanket to expose the underlying waste rock on the downstream side of Dam C; the purpose of this is to provide an under drain for subsequent dam raises. The inspection around the dams revealed no indicators of instability or areas of geotechnical concern with the exception of the cracks located in Dam B.

At the time of our inspection the cracks in Dam B had been worked over and were no longer visible. The cracks are believed to be the result of differential settlement within the waste rock beneath the dam. Mine records indicate that the waste rock below Dam B ranges from 0 to 60m thick. In the vicinity of the cracks the waste rock ranges from 5 to 15m thick. Waste rock is also present below Dam C. Dam design documents identified that there was potential for settlement under the TSF as such a layer of low permeability till and 1.5mm LLDPE liner was placed over the waste rock. The LLDPE extends up the upstream face of the dams to create the impoundment, this is backed up by the till core in the center of the dams. BGC considers that the settlement and cracking that occurred in June is consistent with the design and operating conditions of the dam. It is anticipated that greater settlement (total and differential) may occur as the weight of the dam increases and where the thickness of the underlying waste rock increases. At this time there is no instrumentation installed that would readily detect if the liner, or till core/blanket ruptured. It is not evident what the consequences of such a failure would be.

### **Inspection Orders:**

*As per section 10.5.3 of the Code and Permit M-229: The Manager shall submit an annual dam safety inspection report prepared by a professional engineer on the operation, maintenance and surveillance of the tailings and water management facilities and associated dams. The report shall be submitted to MEM by March 31 2014 and every year thereafter. The submitted report will include the information outlined in the MEM document “Guidelines for Annual Dam Safety Inspection Reports”.*

*As per section 10.5.2 of the Code and Permit M-229: The Manager shall revise the OMS manual to reflect administrative responsibility changes, correct CDA consequence ratings, and include instrumentation trigger levels/response information. The OMS, or a separate document, shall include an ERP that considers the results from an inundation study as per the current Canadian Dam Association Safety Guidelines for all dams with high or greater consequence rating. The report(s) shall be submitted to MEM by March 31 2014*

*The Mine shall submit a report to MEM prior to March 31, 2014 that addresses the following:*

- *Potential for differential settlement under the TSF.*
- *Potential for rupture of the LLDPE liner in the dam and under the TSF as a result of differential settlement.*
- *Potential for rupture of the till core and/or till liner as a result of differential settlement.*
- *Consequence of rupture of the liner and/or till core.*
- *How liner rupture and seepage into the waste rock will be detected (if consequence is not acceptable).*
- *What contingency plans will be implemented if the liner fails to perform as intended (if consequence is not acceptable).*

## **CLOSURE**

Under Section 15 (6) of the Mines Act, a written response is required from the Mine Manager within 15 days of the receipt of this Inspection Report. Please address response to undersigned with copies to Steve Rothman, George Warnock, and Heather Narynski. In addition, Section 30 (1) of the Mines Act requires this Inspection Report to be posted in a conspicuous location at the mine site for 30 days.

Please feel free to contact the undersigned with any questions or comments.

*Michael Cullen* 

*Michael Cullen, P. Eng.*  
*for*  
*Ministry of Energy, Mines and Natural Gas*

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*Signature*

Dated: July 29, 2013



## Ministry of Energy, Mines and Natural Gas

### GUIDELINES FOR ANNUAL DAM SAFETY INSPECTION REPORTS

#### Reference:

Health, Safety and Reclamation Code for Mines in British Columbia (Code) Section 10.5.3: *The manager shall submit an annual dam safety inspection report prepared by a professional engineer on the operation, maintenance and surveillance of the tailings and water management facilities and associated dams to the chief inspector.*

This Code reference applies to every operating and closed mine in BC.

The report shall provide the following information:

1. Executive Summary
  - (a) Classification of the dam(s) in terms of Consequence of Failure in accordance with Table 2-1 of the CDA Dam Safety Guidelines (2007).
  - (b) Significant changes in instrumentation and/or visual monitoring records.
  - (c) Significant changes to dam stability and/or surface water control.
  - (d) For major impoundments, as defined in Part 10 of the Code, a current Operation, Maintenance and Surveillance (OMS) Manual is required. The annual report shall indicate the latest revision date of the OMS manual.
  - (e) For tailings dams classified as High, Very High, or Extreme Consequence, an Emergency Preparedness Plan (EPP) is required. The annual report shall indicate the latest revision date of the EPP document.
  - (f) Scheduled date for the next formal Dam Safety Review in accordance with Table 5-1 of the CDA Dam Safety Guidelines (2007). Formal Dam Safety Reviews are required every 5 to 10 years (depending on consequence classification) and differ from annual dam safety inspections. The requirements for Dam Safety Reviews are included in Section 5 of the CDA Dam Safety Guidelines. Dam Safety Reviews may be conducted by the Engineer of Record with third party review, or by an independent third party with involvement of the Engineer of Record.

2. Summary of past years' construction (if any) with a description of any problems and stabilization.
3. Plan and representative cross sections.
4. Site photographs.
5. Review of climate data.
6. Water balance review.
7. Freeboard and storage availability (in excess of the design flood).
8. Water discharge system, volumes, and quality.
9. Seepage occurrence and water quality.
10. Surface water control and surface erosion.
11. Instrumentation review including:
  - (a) Phreatic surfaces and piezometric data.
  - (b) Settlement.
  - (c) Lateral movement.

The report shall be submitted by a qualified geotechnical engineer registered as a Professional Engineer (P.Eng.) in British Columbia. The professional engineer will be deemed the Engineer of Record for the facility.