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28 November 2014

Province of British Columbia
Ministry of Energy and Mines
1810 Blanshard Street
Victoria, BC V8W 9N3

Attn: Diane Howe, P.Geo.
Deputy Chief Inspector, Reclamation and Permitting

Re: Red Mountain Mine Tailings Dams
Independent Third Party Review of Dam Safety Inspection

1. INTRODUCTION

This letter presents the observations and conclusions of a third party review of the dam safety inspection (DSI) of the Red Mountain Mine Good Friday and Jumbo tailings dams. The review was carried out in accordance with Klohn Crippen Berger (KCB) Subconsultant Agreement dated November 24, 2014. The third party review was mandated by the British Columbia Ministry of Energy and Mines (MEM), Chief Inspector's Orders, dated August 18, 2014, which stipulated that a DSI be carried out to cover all dam structures for all tailings storage facilities in British Columbia, and that the DSI must be reviewed by an independent qualified engineer from a firm that has not been associated with the tailings dam. The Independent Third Party Review must include a review of the dam consequence classification.

The DSI of the Red Mountain tailings dams was carried out by KCB, dated November 2014 (Klohn Crippen Berger, 2014). This third party review is based on that DSI. No site visit was made for the third party review.

2. BACKGROUND

Red Mountain Mine was an open pit molybdenum mine, located about 4 km northwest of Rossland, BC. The mine operated from 1966 to 1972. Tailings from the milling operations were disposed in two tailings storage facilities (TSFs), Good Friday and Jumbo.

Good Friday TSF was constructed in the early 1960's. No final design or as-built records are available. The TSF is a side valley impoundment. The dam is about 430m long and a maximum of 20m high. The dam was reported to be constructed of compacted glacial till with the downstream slope covered by coarse rockfill.

Jumbo TSF was constructed in the late 1960's. It was created by an embankment 125m long and 28m high. The dam is a rockfill structure with upstream fine and coarse filters and a basal blanket drain.

Reclamation of the tailings dams was undertaken in 2002 and 2003. Drainage channels and spillways were constructed to remove water from the tailings surfaces, tailings surfaces were capped with growth

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media and other stabilising measures were implemented. The reclamation works were directed by INCO Technical Services. KCB provided design and construction monitoring services for the reclamation works. No other works have been undertaken on site since 2004. The last Dam Safety Inspection was carried out by KCB in 2004. KCB prepared an OMS manual in 2005. No maintenance, monitoring or surveillance activities have been reported since that time.

The Good Friday and Jumbo dams were assigned consequence classifications of Low under CDA 1994 guidelines. A Dam Safety Review (DSR) had been recommended for 2011, but was not conducted.

3. 2014 DAM SAFETY INSPECTION

Chris Gräpel, P.Eng. visited the site on November 11, 2014 to undertake the Dam Safety Inspection. There was a covering of snow at that time of the site visit so not all conditions could be fully assessed.

Significant findings of the 2014 site inspection included:

Good Friday TSF

- V-notch seepage weirs were clogged with vegetation.
- Trees and shrubs are growing in the spillway channel beyond the downstream toe of the dam, and a small surficial slope instability was noted adjacent to the channel downstream of the dam.

Jumbo TSF

- A shallow depression was noted in the tailings surface above the location of the Little Sheep Creek diversion culvert that had failed in 1999 with release of tailings at the toe of the dam. Some deposited red silt was noted at the toe of the dam near the former outlet of the culvert, indicating that there may be some periodic release of tailings ongoing.
- A rockfall of about $5m^3$ was noted adjacent to the spillway channel near the crest of the dam.
- The riprap Sediment Control weir downstream of the stilling basin has been damaged by discharge flows with a channel being eroded through the weir.

Conclusion of the 2014 DSI were as follows:

- The snow cover at the time of the inspection hindered assessment of the physical state of the dams and reclaimed tailings surfaces. KCB concluded that the structures appeared in good condition, with the exception of potential tailings release at the Jumbo TSF via the buried diversion culvert.
- The current state of stability of the dams cannot be assessed due to an absence of piezometer data.
- There is no data to assess whether the quality of water being released from the site meets discharge requirements.
- The lack of annual inspections and instrumentation readings since 2004 makes dam safety assessment difficult.

Recommended action items were the following:

- Conduct annual inspections.
- Complete a Dam Safety Review. The classification should be reviewed and safety assessed under Inflow Design Flood and Earthquake Design Ground Motion conditions
- Update the OMS Manual and Emergency Preparedness and Response Plan, including adding detail on meaning of weir and piezometer trigger levels
- Resume monitoring instrumentation and water quality according to OMS Manual
- Assess the natural slope instability adjacent to Good Friday spillway during annual inspectinos and assess if sloe repair is needed
- Clear trees and shrubs growing in Good Friday spillway channel, as per OMS Manual.
- Assess seeage beyond downstream toe of Good Friday South Limb of dam and determine if additional drainage and riprap armouring is needed.
- Clear organic material from V-notch weirs below West Limb of Good Friday dam.
- Assess if the red material at toe of dam is tailings. Note the depression in tailings surface above former Little Sheep Creek Diversion CMP and silt deposit in stilling basin of Jumbo spillway at toe of dam.
- Remove rockfill debris adjacent to spillway at dam crest and assess stability of rock slope.
- Assess need for sediment control weir. If required, asses if weir repair or in-stream remedial work to key riprap into creek bed is more appropriate.

4. CONCLUSIONS AND RECOMMENDATIONS OF 3RD PARTY REVIEW

4.1 The 2014 DSI appears to provide a good summary of the status of the Good Friday and Jumbo TSFs, within the limitations of the site conditions at the time of inspection. Confirmation of site conditions should be carried out in 2015 after snow is gone. The DSI addressed the key issues as per the Ministry of Energy and Mines Guidelines for Annual Dam Safety Inspection Reports. Recommendations provided in the 2014 DSI are considered appropriate and should be followed.

4.2 The Red Mountain TSFs are currently assigned a CDA consequence category of Low, based on CDA 1994 dam safety guidelines. Insufficient information was provided in KCB (2014) to judge the downstream consequences of failure of either of the embankments. A DSR should be undertaken in 2015 to assess the consequences and to re-evaluate the classification under CDA (2007).

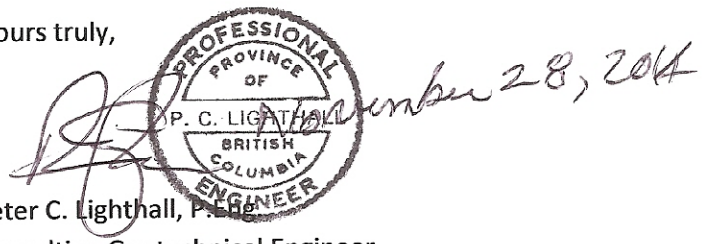
4.3 The embankments as described by KCB are apparently in unchanged condition and there appears to be a low risk of failure.

4.4 Annual inspection and monitoring should be carried out in future years, in accordance with the OMS Manual. It may be possible in future to reduce the inspection frequency to every two or three years, but any reduction in inspection frequency should only be done with the agreement of MEM.

5. CLOSURE

Thank you for the opportunity to undertake this 3rd party review of the Good Friday and Jumbo DSI. I would be pleased to provide any additional information or clarification you may require.

Yours truly,



November 28, 2014

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c. Heather Narynski, P.Eng. (MEM)
Neil Singh, P.Eng. (KCB)

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