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February 4, 2019

David Bowen, Water Quality Section Manager
Donna Smith, Water Quality Enforcement
Central Regional Office
Washington State Department of Ecology
1250 West Alder Street
Union Gap, WA 98903

RE: Regulatory Enforcement of Buckhorn Mine Repeated and Continual Water Quality Violations

Dear Mr. Bowen,

To put regulatory enforcement on hold waiting for every possible court review of the 2014 NPDES permit while the discharge of pollutants continues unabated is unacceptable. The Okanogan Highlands Alliance continues to be aggrieved by Washington State Department of Ecology's lack of action in addressing the repeated and continual water quality violations at Buckhorn Mine.

While issuing a Notice of Violation (NOV) for NPDES permit violations is a step in the right direction, limiting the required response to RCW 98.48.120(1) and not requiring action under RCW 98.48.120(2) when there are actions that could lead to controlling the pollution is unreasonable.

The attached memorandum addresses Crown/Kinross response to the questions; what steps *have and are being taken* to control pollution, but it also addresses the next logical question; *what steps should be taken* to control the pollution. These answers are not new to Ecology.

The possibility of pollution from the mine was anticipated, with direction outlined in the Adaptive Management Plan (AMP). Even the outdated AMP provides the direction for actions to address the continual capture zone failure at the mine.

For example, in April 2009, Ecology issued Administrative Order (AO) # 6674 for failure to maintain the capture zone and cited the required actions in the AMP for water quality. Ecology ordered additional dewatering wells and piezometers with monitoring and reporting to demonstrate the extent of the capture zone and highlight progress in meeting permit compliance; increased frequency of water quality monitoring; and preparation of a trend analysis explaining water quality trends including recommendations for additional monitoring to identify the extent of the release of contaminants.

Back in July 2016 Ecology issued AO #13638 which required that the effectiveness of the mitigation measures implemented as part of the 2013 penalty settlement agreement be critically investigated, including the projected vs. actual improvements from the actions. This was never done and there was no follow-up by Ecology. This information is needed because it would help guide future actions.

The pollution emanating from the Buckhorn Mine should be addressed under the permit regardless of the company's appeal, which is dragging through the court system. In fact, the pollution at the mine violates not only the NPDES permit limits but Washington State water quality standards as well.

If Ecology simply insists that the company do what Ecology has previously ordered them to do, it would be a good start. However, additional actions could and should be taken that would greatly improve the understanding of contaminant transport and lead to improved remediation of the site.

Ecology was on the right track in 2009 when it ordered actions to address the pollution problem. Many provisions of AO #6674 could be applied in 2019. It is a common and necessary process to evaluate the success of actions to make sure they are effective. This has not been done at the Buckhorn Mine. In 2016 Ecology tried to remedy this oversight and ordered evaluation of the effectiveness of the mitigation measures, but Crown/Kinross failed to submit the required analysis. Is Ecology going to simply let it fall through the cracks?

The memorandum following this letter looks closer at Crown's almost identically repetitive wording in responses to the NOVs and suggests actions that could be taken to control it.

We appeal to Ecology to utilize RCW 98.48.120(2) to take immediate action that will address the inadequate responses Ecology has received from 2017-2018 NOVs # 15562, 15764, 15958, and 16079.

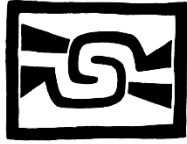
Your attention and response to this issue is appreciated.

Thank you,

A handwritten signature in black ink, appearing to read "David Kliegman". The signature is fluid and cursive, with a large initial "D" and "K".

David Kliegman, Executive Director

Cc: Maia Bellon, Director, Washington State Department of Ecology
Heather Bartlett, Water Quality Section Manager
Sage Park, Regional Director, Central Regional Office



BUKA ENVIRONMENTAL

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MEMORANDUM

To: David Kliegman, Executive Director; Okanogan Highlands Alliance
From: Ann Maest, PhD; Buka Environmental
Date: 4 February 2019
Re: Buckhorn Mine Water Quality Violations in 2017 and 2018: Evaluation of Golder's Responses

Summary Points

- Crown repeats the same causes for the violations and the mitigation measures taken in each of the four 2018 Notice of Violation response documents.
- The mitigation measures taken are all at least four years old and do not respond to the specific NOVs issued by Ecology. The effectiveness of the measures has not been evaluated by Crown or its consultants. Ecology should require more than simply the steps that have been and are being taken to control the pollution: the steps that should be taken to curtail the pollution must also be identified and implemented.
- OHA recommends actions that, if implemented, would help understand the sources and pathways of pollution and curtail future violations.

1. Introduction

This memorandum addresses the four Notices of Violation (NOVs) issued by The Washington State Department of Ecology (Ecology) to Crown Resources regarding the Buckhorn Mine during closure (3rd and 4th quarters 2017 and 1st, 2nd, and 3rd quarters 2018: NOVs # 15562, 15764, 15958, and 16079). The NOVs were issued based on the presence of pollutants in groundwater and surface water outside the capture zone in excess of permit limits.

Crown is required to submit a full report to Ecology stating "What steps HAVE BEEN taken to control the pollution and what steps ARE BEING taken to control the pollution." The stated causes of the violations and the mitigations measures taken are repeated nearly verbatim in each Golder document (Golder Associates, 2018 a, b, c, d). As this memorandum explains, Crown's repetition of the same responses to these questions does not lead to identifying the sources and pathways of the pollution so it can be curtailed. The actions that have been and are being taken are not enough.

Over the life of the mine, steps have been taken to control the mine-related pollution, but a serious evaluation of the effectiveness of the actions has not been conducted, despite a specific requirement in Administrative Order #13638 to do so (State of Washington Department of

Ecology, 2016a and b). This memorandum will look closer at Crown’s responses and provide actions that could be taken to control it.

2. Mitigation Measures Employed and their Effectiveness

Nearly all the mitigation measures included in the NOV responses were installed at least four years ago. New measures are needed, and a review of their effectiveness has never been done. Table 1 shows the mitigation measures listed in the NOV responses, the dates they were installed, and comments on their effectiveness.

Mitigation Measure Employed	Date	Effectiveness/Comments
New mine water treatment system	Changed to reverse osmosis in 2009; additional upgrades completed in 2012	Quickly decreased effluent chloride, nitrate, and sulfate concentrations to near zero; some nitrate increases from 2011 - 2014
Mine site stormwater management: removed development rock and other stockpiles and backfilled	2013: Removed Upper Portal development rock stockpile; Main Portal stockpile removed or lined by 2015; all removed in 2017	Not evaluated
Applied shotcrete	2011 – 2017 for potentially acid-generating (PAG) rock passivation	Shotcrete not applied to PAG ore headings in the Southwest Zone
Interim improvements to drainage from DA-10/11 and DA-4	DA-10/11 lined in 2012; DA-4 lined in 2013 and removed in 2015	Not evaluated
Haul road stormwater management	Stopped applying magnesium chloride to upper haul road in 2013; road reclaimed in 2017	Chloride continuing to increase in monitoring points up- and down-gradient of haul road
Construction fill management: source removal, collection and treatment of “perched” water	Removed suspect construction rock fill in 2012. Installed construction fill/ shallow stormwater trenches and dewatering well IW-12 in 2013	Not enough monitoring to properly evaluate: need water quality data from stormwater trenches and additional shallow monitoring wells
Ongoing management and monitoring measures	Recirculation of treated effluent in underground mine (response to NOVs 15958 and 16079)	No improvement in underground mine water quality to date
Future “potential opportunities”	Continued evaluation of NLF-3 fault system northern flank for other alternatives	No approvable ideas presented

Sources: Mitigation measures employed - Golder Associates, 2018a, b, c, d. Dates – Annual AMP reports and other sources. Effectiveness – Ongoing OHA evaluations based on water quality data and review of Golder and other reports.

The NOV's issued by Ecology in 2018 require, pursuant to RCW 90.48.120(1),¹ that Crown submit a report stating the steps that have been and are being taken to control the pollution identified. This requirement does not address whether the steps that have or will be taken are effective at stopping the pollution and further does not include an examination of why the pollution exists in the first place. As implied in each NOV issued in 2018, the pollution was caused by contaminants escaping the capture zone, but what are the sources and what pathways are the pollutants taking from the sources to the monitoring points? Golder's responses do not evaluate the effectiveness of their mitigation measures and do not provide evidence to support the imputed sources. If the most important pollutant sources and pathways are not identified, an effective action plan cannot be developed. Ecology should require that Crown submit more information about the current and ongoing violations to improve outcomes.

Past administrative orders required steps that would be more likely to help stop the ongoing spread of pollution. For example, Administrative Order 6674 (2009) required, among other actions:

- Installation of additional mine dewatering wells and piezometers to create, maintain, and demonstrate the extent of the capture zone
- More frequent sampling and reporting
- Preparation of a Trend Report that explains the increasing trends in water quality monitoring results.

AO 6674 also referenced the Adaptive Management Plan (AMP) for Water Quality and its requirements for reporting related to permit violations – and the NPDES permit requires that the actions of the AMP for Water Quality be implemented (Section S6).

As another example, Administrative Order 13638 (and amended AO 13638), issued in 2016, requires many actions that are specified in the AMP for Water Quality, and an update of the AMP, including:

- Develop an action plan to capture and treat mine-influenced water escaping the capture zone and that identifies the extent of the plume and a method of capture and treatment.
- Critically evaluate the effectiveness of the mitigation measures or best management practices implemented as part of the 2013 Settlement Agreement.
- Prepare a report on the effectiveness of each measure and discuss projected vs. actual improvement in environmental conditions, the effectiveness of monitoring, gaps in knowledge about the effectiveness, and 2-, 5-, and 10-year projections for improvement.
- Develop a conceptual model of contaminant transport to better understand how to intercept contaminants.

¹ <https://app.leg.wa.gov/rcw/default.aspx?cite=90.48.120>

- Revise the AMP for Water Quality (July 2014) to add “Whether the mine generated contaminated groundwater and industrial stormwater is captured inside the Capture Zone perimeter as identified in Appendix B of the renewed NPDES permit so that surface and groundwater outside the Capture Zone does not exceed the permit limits” and submit the revised AMP to Ecology by August 31, 2016 (AO #13638, Corrective Action #5).

An updated AMP for Water Quality was submitted to Ecology in August 2016 (Golder Associates, 2016), but the only change made was adding the sentence from Corrective Action #5 of AO #13638 (last bullet above) to Section 1.2 Goals and Objectives of the AMP. A trend report and analysis has not been conducted for ten years, and a serious evaluation of the effectiveness of Crown’s mitigation measures has never been conducted.

3. OHA-Recommended Actions

OHA recommends that Ecology require Crown to take the following actions that would help curtail the ongoing violations at the Buckhorn Mine:

- Complete a current water quality trend analysis that evaluates changes in water quality over time, including during closure. The updated trend analysis should include a conceptual model of contaminant transport to better understand how to capture and limit the migration of contaminants and a map showing the extent of the plumes.
- Develop an action plan to capture and treat mine-influenced waters and curtail future violations.
- Revise the AMP for Water Quality to include action levels, thresholds, and required Crown/Agency actions for implementing Corrective Action #5 of AO #13638 to determine whether mine-contaminated groundwater and stormwater have been effectively captured.
- Evaluate the effectiveness of the mitigation measures implemented to date, including those required in AO #13638, July 19, 2016, Corrective Actions #2 and 3, but never completed.
- Supply water quality data for the shallow stormwater trenches.
- Add dewatering wells to capture mine-influenced water in the areas of the NLF-3 fault zone and Bolster Creek.
- Conduct additional geophysical investigations for identifying migrating mine water near MW-17, in Gold Bowl drainage downgradient from the mine, in the shallow stormwater trenches, and areas near the Roosevelt Adit. In addition, release reports on all prior geophysical investigations that have not been submitted to Ecology.
- Release water quality and hydrology data and evaluations for the following, including written reports related to any verbal presentations to Ecology:
 - MW-17 pump test data and analysis
 - MW-16 pump test report.

4. References Cited

Golder Associates. 2016. Adaptive Management Plan for Water Quality, Revision 2. August 15. 17pp.

Golder Associates. 2018a. Response to Washington Department of Ecology Notice of Violation #15562. To: Jacquelyn Nutt, Crown Resources Corporation. From Jay Pietraszek and David Banton. January 19. 9pp.

Golder Associates. 2018b. Response to Washington Department of Ecology Notice of Violation #15764. To: Jacquelyn Nutt, Crown Resources Corporation. From Jay Pietraszek and David Banton. May 10. 9pp.

Golder Associates. 2018c. Response to Washington Department of Ecology Notice of Violation #15958. To: Martin Litt, Crown Resources Corporation, cc Jacquelyn Nutt, Crown Resources Corporation. From Jay Pietraszek and David Banton. September 21. 9pp.

Golder Associates. 2018d. Response to Washington Department of Ecology Notice of Violation #16079. To: Martin Litt, Crown Resources Corporation, cc Jacquelyn Nutt, Crown Resources Corporation. From Jay Pietraszek and David Banton. December 4. 9pp.

State of Washington Department of Ecology. 2016a. Administrative Order #13638. July 19.

State of Washington Department of Ecology. 2016b. Amended Administrative Order #13713 (amended to AO #13638). August 9.