

MEMORANDUM

To: CS Mining File, Permit No, UGW010014

From: Mark Novak

Date: July 21, 2016

Subject: July 20, 2016 Inspection

I inspected the CS Mining mill site and tailings disposal facility on July 20, 2016, accompanied by Woodrow Campbell and Mike George of DWQ, Peter Brinton of DOGM, Ed Ginouves of BLM, Robert Bayer, consultant to CS Mining, and David McMullin, John Moyo, Stacey Riggs and Tyler Pollock of CS Mining.

CS Mining is having financial difficulties and is currently not mining or milling ore. During the short time it was in production earlier this year, it turned out that the ore it was processing did not have the acid neutralizing capacity that was anticipated when it applied for its ground water discharge permit in 2014. Mill facilities and the Intermediate Tailings Disposal Facility (ITDF) have been constructed, and tailings and process water have been discharged to the ITDF. The ITDF with the current process water level and tailings "beach" is shown in Photo 1. The lining of the ITDF is constructed of 40-mil HDPE flexible membrane liner (Photo 2). Because of the unanticipated ore characteristics, the process water that has been discharged to the ITDF is highly acidic, has high levels of total dissolved solids and is not of the quality approved to be discharged to the ITDF under current permit conditions.

CS Mining is currently taking process water from the ITDF in order to extract copper from solution. The company has also developed a process for neutralizing the water discharged to the ITDF, for eventual use when ore processing resumes. Process water from the ITDF will be pumped into leaching tanks (Photo 3) and mixed with lime kiln dust. From there the mixture will be piped to thickener tanks (Photo 4) where solids settle. The neutralized process water will be used for copper extraction, and neutralized process water with about 50% solids will be pumped from the thickener tank to a booster tank (Photo 5), where it will be mixed with incoming process water from the ITDF and sent back into the neutralization circuit. This process should gradually raise the pH of the process water in the ITDF. CS Mining reports that it may cause a decrease in the dissolved solids content of the process water, as metals and sulfate precipitate from solution.

CS Mining would like to continue to use the existing ITDF when and if ore processing resumes. Because actual operating conditions and quality of the waste are different from what was anticipated in their permit application, at the very least, further use of the ITDF should require modification of the ground water discharge permit and statement of basis. In a meeting with CS Mining personnel, I advised them that they should submit a revised permit application to DWQ to reflect these changes. This revised application should include the following categories of additional information:

- An estimate of the quality of wastewater to be discharged to the ITDF, and how that quality may vary as ore from different sources is processed.
- A description of the neutralization process to be used in the event that ore processing is resumed

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using ore with low acid neutralizing capacity.

- A review of the original 2014 permit application and notification of any changes to that information that may result from current knowledge of ore characteristics and ore processing.
- Information which shows that the discharge can be controlled and will not migrate into or adversely affect the quality of any other waters of the state, as per R317-6-6.3G.

This last point should include any proposed changes to the monitoring plan or a proposed contingency plan to compensate for the existing ITDF liner. DWQ would have never approved a liner of 40 mil thickness to contain process water with significantly lower pH and higher TDS than the underlying ground water, and CS Mining does not want to reconstruct the existing liner. Under these new, unanticipated conditions, additional safeguards will be needed in the permit conditions to assure that ground water pollution is not taking place.

Under the current permit conditions, the ITDF has one monitor well located at the toe of the tailings dam at the bottom of the drainage in which the ITDF was constructed. If the subsurface underneath the impoundment was unconsolidated sediments over impermeable bedrock, this location would be where any leakage from the ITDF would report to. However, logs from this well and outcrops of bedrock in the area of the ITDF show that it is highly fractured and mineralized granodiorite (Photo 6). Under these conditions, it is possible that leakage from the impoundment from a location distant from the monitor well could bypass the well and affect an aquifer or saturated zone directly underneath the impoundment or even downgradient from the monitor well. The ground water flow system under the ITDF is not known well enough to rule out this possibility.

CS Mining proposes that if ground water contamination is detected in the one existing monitor well, the well could be pumped, with the water returned to the ITDF. However, this plan assumes that any leakage from the ITDF would report to the monitor well, and it could be removed from the ground water system by pumping that well. With the current state of knowledge about the fracture-flow ground water system under the ITDF, it is not certain that these assumptions are true.

At the very least, CS Mining should propose a contingency plan in the event that leakage from the ITDF is detected at the downgradient monitor well. A confirmed detection of leakage should trigger additional site investigations and installation of monitoring points to assure that the requirements of R317-6-6.3G will be met. These investigations should estimate flow directions and potential contaminant migration pathways that would be followed by leakage originating from any point within the footprint of the ITDF, and assure that any such leakage can be monitored and remediated if necessary. Ideally, these investigations should be done as soon as possible, but other factors, such as the site's isolation and the likelihood that there is not a productive aquifer under the ITDF, suggest that further investigation and installation of additional monitor points could be held off until monitoring the existing well indicates there actually is a problem with leakage.

If ore similar to that encountered when the mine was operating earlier this year is processed over the lifetime of the ITDF, a large amount of soluble constituents will remain in it after final closure. In its revised permit application, CS Mining should propose a conceptual closure plan, appropriate for site conditions, to insure that these constituents will not be mobilized by precipitation and discharged to ground water.

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The construction permit for the ITDF may also need to be modified. As the impoundment fills with tailings, current plans call for raising the level of the tailings dam, and installing additional lining in the higher parts of the drainage where the ITDF has been built. The original plans call for these higher levels to be lined with a geocomposite (clay) liner. This proposed design may not perform as planned because water with lower pH and higher TDS than anticipated may affect the clay used in the geocomposite and increase its permeability. Some of these higher areas are steep (Photo 7), and CS Mining does not feel these areas are suitable for installation of a flexible membrane liner. Any further raises and liner installation should be done under a modified construction permit that resolves these issues.

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Photo 7.