



COLORADO
Division of Reclamation,
Mining and Safety
Department of Natural Resources

1313 Sherman Street, Room 215
Denver, CO 80203

February 28, 2018

Amber Parmet
Climax Molybdenum Company
P.O. Box 68
Empire, CO 80436

**Re: Climax Molybdenum Company; Henderson Mine; File No. M-1977-342
Technical Revision No. 29 (TR-29) - 3 Dam Buttress Stage 1 Adequacy Review**

Mrs. Parmet,

The Division of Reclamation, Mining and Safety (Division/DRMS) with assistance from the Dam Safety Program has reviewed the content of technical revision (TR-29) for the Henderson Mine submitted on January 30, 2018 and submits the following comments. The Division is required to make an approval or denial decision no later than March 1, 2018 therefore; a response to the following adequacy review concerns should be submitted to the Division as soon as possible.

1. In the Stage 1 Buttress Design section of the technical revision letter, the Operator states an engineering analysis demonstrated excess material on 1 Dam does not offer any structural support to 1 Dam, making it an optimal borrow source. Please provide the Division with a copy of the engineering analysis report for review.
2. In the Seismic Hazard Update section of the AECOM report dated January 26, 2018, the Engineer states an updated site-specific seismic hazard analysis of the Henderson tailings dams was performed in 2015. Please provide the Division with a copy of the seismic hazard analysis report for review.
3. In the Loading Conditions section of the AECOM report dated January 26, 2018, the Engineer states pore pressure conditions at each of the modeled sections will improve with time since dissipation of the excess pore pressures in the foundation and tailings material will continue. Please provide evidence pore pressures have not yet stabilized and will continue to improve with time. Please demonstrate the drainage features are currently adequate and a long-term monitoring program is in place to ensure any future failures of the drainage features will be detected and addressed appropriately.



4. In the Results section of the AECOM report dated January 26, 2018, the Engineer states for Stage 4 with crest elevation of 8,900 feet the calculated displacements for the dam crest with final stage buttress using the selected median 10,000-year earth quake time history is less than 4.5 feet. The Division believes 4.5 feet of displacements is significant. Please explain why the Engineer believes this is acceptable displacement.
5. In the Results section of the AECOM report dated January 26, 2018, the Engineer states the contours indicate the failure mechanism engages the majority of the downstream slope, extending from the dam crest to the toe of stepback and original dam, and nearly to the left and right abutment contacts. Earlier in the report, the Engineer indirectly acknowledged the potential for transverse cracking due to differential movement near the embankment abutments, which was the Engineer's reasoning for the 3D analysis.

The 3D model results, Figures 20 and 26, appear to show a relatively rapid longitudinal transition from large displacement to very little displacement near the natural knob in the middle of 3-Dam. Please explain whether transverse cracking leading to internal erosion could occur in this location. If so, please explain what measures are required to prevent erosion at the location.

6. In the Results section of the AECOM report dated January 26, 2018, the Engineer states as shown in these figures the movement arrest and comes to equilibrium after motion. The stability analysis assumes an idealized uniform set of input parameters to represent variable conditions. Please perform a sensitivity analysis on the final closure conditions (Stage 4) to determine how much of a change it would take to generate a debris flow condition, if possible. Please include variable soil input parameters and variable phreatic level within a reasonable range to determine an actionable threshold during long-term monitoring.

Please be advised the technical revision for the Henderson Mine may be deemed inadequate, and the revision may be denied on March 1, 2018, unless the above mentioned adequacy review items are addressed to the satisfaction of the Division.

If you have any questions, please contact me at peter.hays@state.co.us or (303) 866-3567 Ext. 8124.

Sincerely,



Peter S. Hays
Environmental Protection Specialist

Ec: Wally Erickson; DRMS
Ryan Schoolmeesters; DNR Dam Safety Engineer