

## **Bureau of Mining Regulation and Reclamation**

### STABILITY REQUIREMENTS FOR HEAP LEACH PADS

Heap leach pads are mining operation process components that provide for environmentally safe, fully contained, placement of ore to be leached with process solution, primarily cyanide. Information from the items listed below is required for the Bureau of Mining Regulation and Reclamation (BMRR) to adequately review the environmental concerns related to stability of heap leach pads. At a minimum, all stability analysis submittals shall include the following:

1. Identify the stability analysis computer model or equations used.
2. Submit all inputs and assumptions used in the derivation of the stability results. Provide a short justification for each of these values.
3. Identify the seismic region and Peak Ground Acceleration (PGA) values used in the pseudostatic model, and the reference from which they were taken, and provide a short justification for each. Generally, a PGA defined by a seismic event with a maximum 10% probability of exceedance in 50 years shall be used.
4. Provide heap leach pad design to include overall height, lift height, lift setback, and containment berm size, or reference this information contained in another report submitted to BMRR.
5. Evaluate the heap stability considering these modes of failure:
  - Infinite Slope Failure
  - Rotational Failure
  - Translational Failure (Block and/or Wedge)

These evaluations should consider sliding/rotating through ore only, sliding/rotating through foundation soils and/or a containment dike, sliding along a liner interface, and entire heap mass instability involving sliding entirely or mostly along a liner interface, or any appropriate combination of one or more of these scenarios.

6. Results shall be presented in terms of Factors of Safety for each evaluation. Minimum recommended Factors of Safety are 1.30 (static) and 1.05 (pseudostatic – using the PGA identified in step 3 above).
7. Pseudostatic analyses may use a reduced PGA (up to 50% reduction) if technical justification is provided. However, any pseudostatic analysis using a reduced PGA, or any analysis for which the pseudostatic factor of safety result is less than 1.05, shall be accompanied by a deformation analysis, based on the full PGA, to determine the maximum potential movement of heap material in a seismic event.
8. Analysis results shall be submitted by a Professional Engineer licensed in the State of Nevada in an appropriate discipline.

Although not required with the stability analysis submittal, the actions required by the Permittee if a failure occurs must be addressed in the operating plan. Additionally, when designing heap leach facilities, consideration should be given to the post-closure/reclamation slope stability, slope steepness, and heap configuration.