

MMI Engineering staff, on behalf of another consulting firm, performed a seismic stability evaluation of a multiple arch concrete tailings dam.

The Kennedy Mine dam was constructed in 1914 to impound gold ore tailings from the Kennedy Mine located just north of Jackson, California. The dam site is located in the Sierra Foothills between the Melones fault zone to the east and the Bear Mountain fault zone to the west.

The dam is approximately 50 foot high at mid span and has a crest length of 640 feet. The dam has 16 arches of equal width but varying height separated by vertical triangular buttresses. Adjacent buttresses are supported laterally by transverse horizontal struts. Each arch consists of a tipped-cone base and a half cylinder on top. The scope of work included a site visit to assess the as-built conditions and signs of visible damage or structural stress. Plans, specifications, construction data and previous reports on past performance of the dam were not available. Dam geometry for the analysis was created using field measurements. Significant effort was required to create a sophisticated three dimensional (3D) geometry of the dam using a limited set of field data.

A 3D finite element analysis of the dam was performed for three conditions that included: empty reservoir, full reservoir, and partial reservoir combined with extreme earthquake loading under a Maximum Credible Earthquake (MCE). The controlling MCE was defined by a Magnitude 6.5 earthquake on the Poorman's Gulch segment of the Malones fault, located approximately 8 miles from the dam. The peak ground acceleration of 0.3g was computed for this scenario event and was used in the analysis. Previous studies, construction details, specifications and design or as-built drawings were not available for the dam. Despite this, MMI Engineering still managed to develop a sophisticated 3D finite element analysis model, using a limited set of field data and geometric relationships to define the intersection between a cylinder and a tipped truncated cone.

