

TITLE AND LOCATION (CITY AND STATE) <b>VOLCAN TAILINGS DAMS CENTRAL CORDILLERA OF PERU</b>		YEAR COMPLETED	
		PROFESSIONAL SVCS: <b>2007</b>	CONSTRUCTION (IF APPLICABLE)
PROJECT OWNER'S INFORMATION			
a. PROJECT OWNER <b>Volcán S.A.A. Mining Company</b>	b. POINT OF CONTACT NAME <b>Gerardo dalla Porta</b>	c. POINT OF CONTACT TELEPHONE NUMBER <b>+511.2194000</b>	

RIZZO Associates and Volcán S.A.A. Mining Company (VOLCAN) signed a major contract to provide a wide range of services including:

- 1) Technical Audits of Dams;
- 2) Stability Analysis of Dams;
- 3) Development of Operation and Maintenance Manuals; and
- 4) Planned Closure of the Tailings Dam.

The four services were applied to the activity that VOLCAN developed for some of its main production units in the Central Cordillera of Peru. VOLCAN is one of the largest mining companies in Peru and operates a complex system of underground mines and other facilities in the Province of Yauli, Department of Junin, in the central zone of Peru, an average altitude of between 4,000 and 5,000 m (2.5 – 3.1 miles).



The technical audits carried out by RIZZO at the VOLCAN facilities were designed to confirm that the operation was performed in accordance with the best practice available in the industry, review the acceptability of techniques used in the design, and recommend tasks and actions that should be implemented for this. During the audits, RIZZO staff analyzed the existing technical documentation in each of the units, including:

- Calculation and design of dams;
- Static stability analysis (pseudo-static, dynamic, and analysis of potential liquefaction);
- Instrumentation of dams (piezometers, inclinometers, etc.);
- Field and laboratory Test results (SPT, density, compaction, cutting, triaxial, size, humidity, etc.); and
- Seismic refraction studies.

RIZZO implemented specific Quality Control procedures, the minimum contents necessary to carry out an efficient tailings dam technical audit, which has been applied and tested with high-demand industries in the U.S.



RIZZO's work included preliminary review procedures for the stability of various VOLCAN tailings dams. During the audit phase, RIZZO identified positive and negative aspects of analyses performed to date, making it possible to develop an array of procedures and results for each of the structures. RIZZO made the revision of the parameters and values used for the definition of loads, including seismic demand of critical importance in the Andean area of Peru. The review provided the basis for planning of future field work (such as new piezometers in the dam) and/or any additional stability analysis. RIZZO developed an individualized analysis of liquefaction potential of Tail docks. The objective of this analysis was ruled out in cases, where possible.

RIZZO created O&M Manuals for VOLCAN tailings dams, including: Yauli Units (Mahr Tunel, Rumichaca and Andaychagua), Cerro de Pasco, and Chung. RIZZO also reviewed the Closure Plans for tailings dams No. 1, 2, 4 and 5 of the Mahr Tunel Relavera Unit Yauli. The review of closure plans included those dikes and technical aspects, the financial process, as well as adjustment to the legal / administrative applicable activity regulated by the Ministry of Energy and Mines of Peru.

