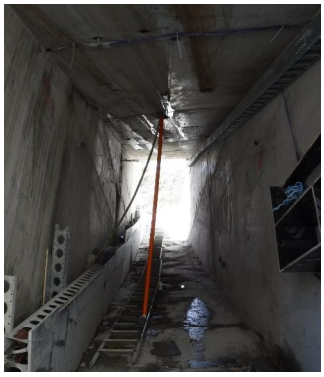
Padcal Mine, Philippines

Borehole drilling for extensometer installation

Automatic data acquisition system



Inclinometer casing being slid through the gallery

Padcal Spillway General View, Philippines

The Padcal mine, a gold and copper operation located in the Benguet province in the Philippines, has been in service for over 50 years. To complete the most recent life-extension, the owner has been upgrading the most recently built tailing dam. It is a concrete gravity dam, the largest of its kind in a tailings storage facility in the world.

The challenges of maintaining a large tailing system of this type in this landscape was abruptly brought to public attention in 2012. The mine was faced with significant challenges when an acid waste drainage tunnel under penstock 3 ruptured. The mine operator claims that this was a “force majeure” event caused by heavier than usual rainfalls. An estimated 20 million metric tons of tailings escaped through the punctured roof of the tunnel.

This ambitious project required a significant amount of instrumentation for close monitoring during construction, operation and for future maintenance. Instruments included in-place inclinometers to follow any deformation in the structure, joint meters across concrete blocks, piezometers within the dam and extensometers underneath. In-place inclinometers were installed in the already-built concrete structure between the spillway and a gallery. Multipoint extensometers were installed through the existing structure into the soil underneath the dam. Finally, piezometers were casted directly into the blocks as the concrete was poured.

Three-dimensions joint meters were installed to monitor any relative movement of the concrete blocks of the spillway.

This being an already-existing dam under expansion, retrofitting the existing structure with new instruments met significant hurdles. Installation of the multipoint extensometers required drilling in difficult conditions: drilling was performed from the top of the dam, through the gallery and into the soil, going past workers in the gallery. Furthermore, the combination of a sandy supporting soil and the high pressure created by the dam and water head made installation of these instruments unusually complex as the boreholes would collapse instantly. However, the fact that the dam was still under expansion allowed for creative and novel instrumentation installations.

GKM Consultants scope of work offered a turnkey solution with his partner Geokon by supplying and installing all instruments, implementing an automatic monitoring system and provide onsite training for the local engineering team. We are proud to successfully commission the instrumentation system that will facilitate the long-term monitoring of the largest dam in a tailing facility in the world.