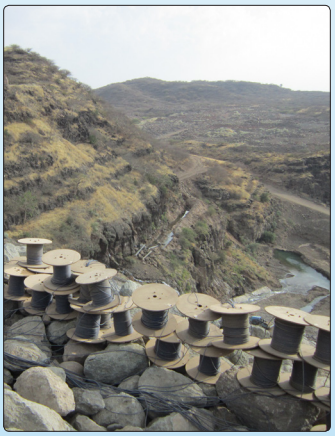
Kesem Dam, Ethiopia

Cofferdam view upstream and key trench and foundation footprint downstream

Fill extensometer array installation



Instrument cables prior wiring connection to data acquisition systems at observation room downstream

Intake Tower

The Kesem earth-filled dam is an irrigation project for sugarcane agriculture built by Ethiopian Water Work Construction Enterprise (WWCE). It is located on the Kesem River, in the southern part of the Afar regional state.

In 2011, GKM Consultants was mandated by WWCE to develop and implement a thorough instrumentation system involving the supply of sensors, technical staff training and data visualization software configuration.

Starting in early 2012, GKM helped plan and conduct the installation of multiple sensors to be wired to an automatic data acquisition system. Specifically, GKM provided sensors such as vibrating wire piezometers, with earth pressure cells for ground water and earth pressure, fill extensometers array as well as inclinometer casings and settlement anchors for lateral and vertical deformation measurements. A vibrating wire weir monitor was finally added at the base of the earthwork, on the downstream face. Ground water pressure became a major concern for the client when an unexpected hot spring was revealed during the key trench excavation stage. Resulting uplift pressures required an adapted installation procedure at the concrete key trench slab.

On-site specialized training was provided to the client's engineers and its design consultants. Initial training focused on the properties of the various sensors and the proper installation procedure. Special care was given to cable handling during the construction stage. Subsequent training sessions were targeted at the general operation of various reading probes, readouts, loggers and the setup of the visualization software interface.

Because vibrating wire instrument output remains stable over long distances, all cables were routed and gathered to a single observation room located on the downstream face of the dam. Such a feat was accomplished by carefully managing the cable placement through the various layers of the earthwork. The observation room contains Geokon data acquisition systems with multiplexers. Data gathered through this system is relayed, via a data cable, to a control room where a server has been installed for real-time monitoring. GKM uses Vista Data Vision's VDV to create and display custom project overviews and graphs for the client.

GKM Consultants is proud to help provide and develop custom solutions for instrumentation projects, both locally and worldwide. The Kesem project, as part of a large-scale governmental waterworks investment plan, has been a tremendously positive experience for GKM Consultants and bodes well for our future contractual relationships in the region.