

Innovative Water Monitoring System

The Constitution of South Africa specifies that everyone has the right to have access to sufficient food and water and to this end the National Water Act stipulates a certain amount of water to meet each person's basic needs. In the town of eManguze and the rural surrounds of Kwangwanase the water supply is no longer meeting the basic needs of the community and this has led to the implementation of the Enkhanyezini and Kwangwanase water supply schemes.

The populations of eManguze town and the rural surrounds of Kwangwanase have grown significantly, attributable to some degree to the tarring of the road from eManguze to the Kosi Bay border post at the Mozambique border, and water demand has outstripped supply. The Umkhanyakhude District Municipality of northern KwaZulu-Natal accordingly prioritised the Enkhanyezini and Kwangwanase water supply schemes designed to reticulate water to the town and the large rural population that has limited or no access to potable water.

J&G was appointed as the design and construction supervision engineer for both schemes.

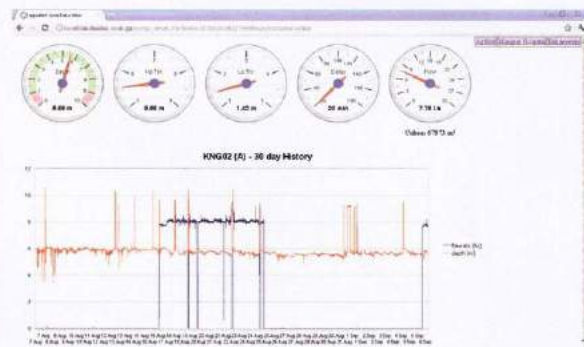
The greater Kwangwanase area is situated to the west of the Kosi lakes and is a pristine and environmentally sensitive ecosystem. Water supply before the implementation of the two schemes was derived from river systems feeding into the lake system, as well as from Lake Shangase, a freshwater groundwater-fed lake. These resources proved inadequate for sustained water supply to the proposed supply area, and consequently groundwater was investigated as a source to augment the water supply network. Two predominant aquifers have been identified and targeted for the implementation of well fields, one being in the shallow cover sands derived from dune migration (the airfield well field pictured below), and the other a moderately deep calcareous aquifer (the Uloa Formation).

A groundwater monitoring system was initially developed in order to model,

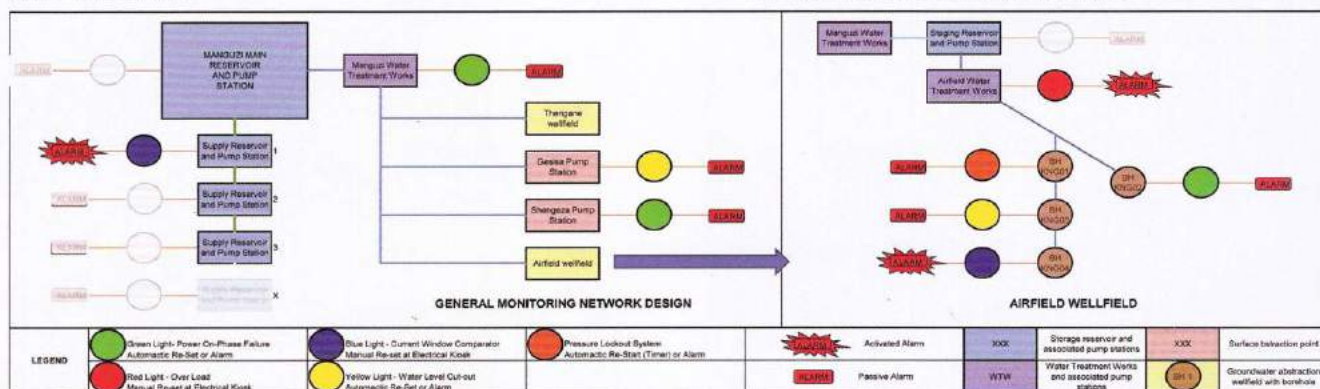
manage and maintain the aquifers and to address issues such as the interaction between the two aquifers, interaction with the groundwater-fed Lake Shangase, and the potential for the Kosi lakes to act as a potential source of saltwater intrusion. An "off-the-shelf system" using pressure transducers to measure water levels was not feasible, due to the limited annulus between the casing and the columns of the positive displacement line-shaft type pump, and thus research and development was required to develop an accurate water level monitoring system that would fit in. In addition, the monitoring network design, which was originally for the pumping and monitoring wells, became a small yet intricate portion of the whole monitoring network from the engineer's perspective. The reticulated network is essentially a series of pumping points with water levels and flow rates, and the same system for the monitoring of reservoirs, pump stations and treatment works was applicable. ■



Airfield well field aquifer.



Borehole monitoring dashboard via telemetry system.



Telemetry diagram.