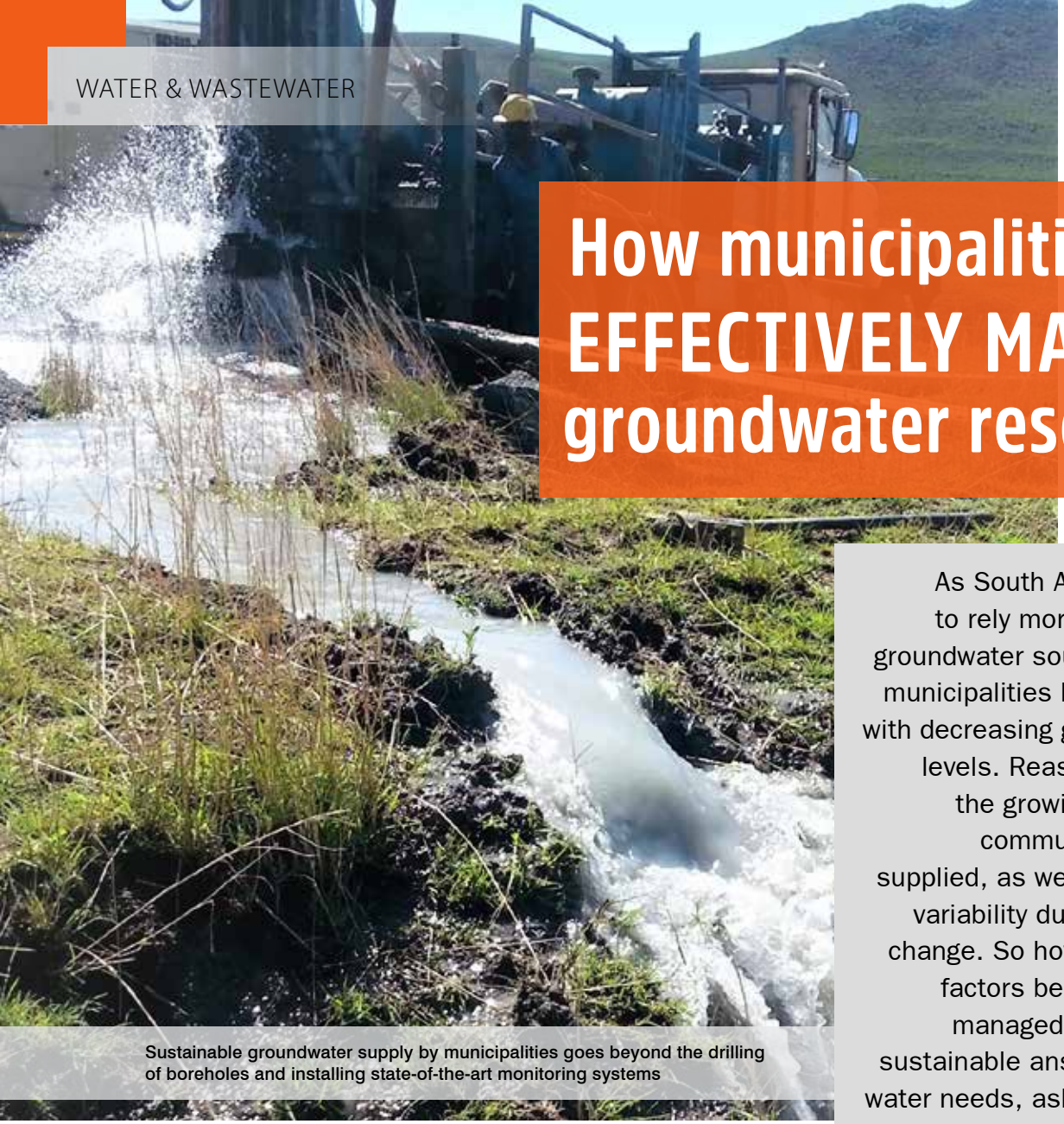
How municipalities can EFFECTIVELY MANAGE groundwater resources



Sustainable groundwater supply by municipalities goes beyond the drilling of boreholes and installing state-of-the-art monitoring systems

As South Africa comes to rely more heavily on groundwater sources, many municipalities have to deal with decreasing groundwater levels. Reasons include the growing needs of communities being supplied, as well as rainfall variability due to climate change. So how can these factors be responsibly managed as we seek sustainable answers to our water needs, asks **Gert Nel.**

The importance of groundwater supply has increased substantially over the past five years, as the impacts of global warming and associated droughts have been painfully felt across the country. Dams, rivers and other surface water resources have largely not been receiving the necessary recharge to sustain user demands.

In many municipalities where SRK Consulting is assisting with groundwater management interventions, we have seen a drop in water levels in recent years. The declining water levels are not just as a result of drought conditions, however; there is also an ever-increasing demand on available water, and municipalities face considerable pressure to increase their pumping rates to satisfy the increasing water demand. This contributes significantly to reducing groundwater levels.

Monitoring boreholes

A first step in managing groundwater resources is to put systems in place that can monitor water levels, ideally giving decision-makers real-time data that can be acted upon timeously. Telemetry technology, for instance, can be applied to groundwater management and monitoring, making it possible for town officials to control the pumps at all their production boreholes – and to do this from a single location. The municipality can therefore access data on each of their production boreholes with the press of a button.

> “Water levels in boreholes are not a clear reflection of how much groundwater is available for abstraction.”

In our experience of applying such systems, they prove invaluable by quickly delivering information on the water level in a borehole – as well as its pumping rate and total volume abstracted. Data can be sent wirelessly to a supervisory control and data acquisition system at the municipality, where it can be captured and stored. Officials can therefore see, in real time, which of the production boreholes present declining water levels, or are not pumping to their set capacity. Pumps can also be stopped and started from this central location.

Managing supply and demand

Through scientific pump testing, combined with the interpretation of data by a geohydrologist and the installation of telemetric groundwater monitoring systems, a well-field of boreholes can be accurately monitored. Of course,

the monitoring itself does not make groundwater supply sustainable. If water levels are low, restrictions need to be put in place, and the water users must be alerted. This can be done through social media, posters, radio broadcasts and other communication channels.

While the water level of a dam can be readily measured and communicated to consumers, it is not quite so simple to determine the percentage of groundwater left in an aquifer. Water levels in boreholes are not a clear reflection of how much groundwater is available for abstraction.

Complexity in measurement

If a borehole is 100 m deep, for example, and the water level drops to 50 m, it does not mean that there is still 50% capacity available. The ground below a water level is not always saturated up to the depth of the borehole. For this reason, there are scientific methods to determine, with reasonable confidence, the volume of groundwater available in an aquifer.

It also needs to be remembered that surface water is recharged immediately during and after rainfall, but recharge to groundwater can take months – and even years – depending on the aquifer's depth. There is no guarantee that a borehole will recover after the next rainfall season if it has been pumped dry. Indeed, it may never recover to its original production.

Many municipalities therefore struggle to manage their groundwater resources, even with the best technology. Telemetric systems will quickly inform officials if the borehole or well-field is in trouble, but not what they should do about it – and how much time remains before the borehole dries up. If a borehole is depleted, then drilling more boreholes will not be the answer.

Partnerships for sustainability

Sustainable groundwater supply by municipalities goes beyond the drilling of boreholes and installing state-of-the-art monitoring systems. It requires a partnership with a geohydrological company, or the appointment of a senior geohydrologist within the municipality. It is a process that starts with a geohydrologist identifying the available groundwater resources in and around a municipal area. These 'source areas' are then delineated and further investigated in terms of yield potential and water quality.

Monitoring of well-field boreholes starts with scientific pump testing

SRK Consulting conducts and facilitates geophysical drilling target selections

Within the source areas, existing groundwater use (such as private boreholes), recharge and potential contamination sources (like waste sites, fuel stations, cemeteries and abattoirs) must be taken into account when developing a groundwater management plan (GMP). SRK conducts and facilitates a range of related services: from groundwater feasibility assessments and geophysical drilling target selections, to water drilling, pump testing, environmental impacts and resource management.

Once the scientific assessment has been completed and the GMP compiled, the road to long-term groundwater sustainability begins. This sustainability journey also demands the full participation of the residents, local business, the agricultural sector and public sector (schools, clinics and hospitals). These users and stakeholders have the responsibility to use water sparingly and to play their part in protecting the source areas against over-abstraction and pollution. If users understand the resource limits and the impact of groundwater contamination, they will buy in to the plan more easily.

However, the municipality must also show its commitment towards water conservation by ensuring that source areas are protected, and that there are no leaks in the water distribution system. Further, it must keep the users informed on the status of the groundwater sources. Groundwater education and awareness building can start at school level, where learners and their science teachers are most open to new information. They can, in turn, connect with their parents and disseminate information, spreading awareness in a fun and open manner.

Perhaps this involvement in the science and management of groundwater can encourage learners to pursue a career in water, even returning to their hometowns as qualified water engineers or geohydrologists. With sustainable water management now a key requirement for our future, there is no reason not to plan actively for such a scenario. 3S

Gert Nel, partner and principal hydrogeologist, SRK Consulting