January 2014

TECHNICAL BRIEF

Groundwater

Development of a Blue Drop type scoring system for groundwater

A completed WRC-funded project developed the Silver Drop – a scoring system for improved groundwater management.

Background

A Groundwater Management Framework developed under a previous WRC-funded project outlines the activities required by different authorities to ensure integrated and sustainable groundwater management. Although this framework still needs to be rolled out to municipalities for implementation, most municipalities that utilise groundwater as a water resource already undertake some of the activities described in the framework.

Scoring system

A scoring system was developed based on the structure of the Blue Drop certification system for drinking water quality. The scoring system, known as the Silver Drop, contains a number of criteria, indicators and requirements that are linked to the different aspects of the Groundwater Management Framework and promote sustainable groundwater management at municipal level.

The criteria of the proposed scoring system are:

- Aquifer management plan
- Integration of groundwater into municipal planning
- Monitoring protocol
- Operation and maintenance plan
- Institutional arrangements
- Authorisation of water use

Aquifer management plan

It is recommended that groundwater management be developed for all relevant aquifers in the jurisdiction of the water service authority (WSA) to facilitate the sustainable management of the aquifers from an aquifer protection and aquifer utilisation perspective. Such an 'aquifer management plan' must entail the vision for the aquifer management, which should be linked to the catchment management strategy and/or the water resource classification/Reserve determination, and clearly defined actions to ensure sustainable management or improve performance, where needed.

Integration of groundwater into municipal planning

To ensure that the aquifer management plan is utilised and supported by all relevant municipal departments, groundwater aspects need to be integrated into the municipal planning. This relates mainly to the regular process to develop an Integrated Development Plan, which also encompasses the water services development plan, the spatial development framework and the integrated water resource development plan. Groundwater must be considered in all of these municipal planning documents.

Other relevant documents to promote or enforce sustainable groundwater management are the water conservation and water demand management strategy and water services bylaws. For all actions identified in these plans, budget must be assigned and evidence provided for their implementation.

Monitoring protocol

It is only possible to manage something, if changes, whether intentionally or not, are measured and analysed. Hence, a monitoring protocol should be developed that describes the monitoring network, type and frequency of monitoring and responsibilities for data collection and data analysis. The monitoring network must cater for both groundwater quantity- and groundwater quality-related parameters and must be sufficient in its spatial distribution and applied technology to allow for establishing cause and effect relationships.

Monitoring data are only useful for this exercise, if the sampling and analysis is credible and reliable, and a strict data management protocol is followed to ensure consistency and accuracy in the data that are used for further analysis and decision-making. The results of the monitoring activities must be used for updating the aquifer management plan and/or any other relevant plan that supports the groundwater management.

Operation and maintenance plan

Where an aquifer is used for water supply, either for potable water or private agricultural use, the wellfield operation and maintenance plays a vital role in ensuring sustainable groundwater management and avoiding over-abstraction and/or detrimental impacts on other users or the environment. Hence, an operation and maintenance plan is required that describes the operational rules under different conditions (e.g. standard conditions, drought, equipment breakdown) and provides details for regular and ad-hoc maintenance actions for all relevant equipment.

The operational rules should be flexible enough to be adjusted as per the monitoring results. Hence, it is recommended to have an early warning system built into the monitoring network to allow for timeous adjustments to the wellfield operation. Both elements require sufficient budget to cater for ongoing supervision and ad-hoc interventions.

Institutional arrangements

Correct institutional arrangements and qualified staff are often seen as the most important aspects for ensuring sustainable groundwater management. The Water Services Act prescribes that WSA and water service provider (WSP) functions are clearly split within the municipality, if the WSP function is not outsourced. This allows for the planning and regulatory function of the WSA and strengthens the supervisory role with respect to water resource management.

Groundwater management is a highly complex issue and requires qualified staff at technical management and operational level. The WSA manager or technical director should have a relevant qualification or at least experience in groundwater management, while the operational staff must be sufficiently trained to understand the different technical challenges and adhere to the operation and maintenance plan.

Authorisation of water use

Any activity that could impact negatively on the groundwater resources should be authorised prior to commencing with such an activity. This refers to the required licence from the Department of Water Affairs (DWA) for groundwater abstraction, as well as environmental authorisation by the Department of Environmental Affairs (and permit by the DWA, if applicable) for potentially harmful land-use activities, such as wastewater treatment, waste deposits, irrigation with effluent water, industrial site development, significant chance of land-use etc.

Test application

A questionnaire was developed and sent to selected municipalities to test the applicability of the scoring system. The responses from the municipalities, additional documents and in-house knowledge of the status of the aquifer management and municipal planning documents were used to test the criteria and requirements, and to apply the scoring system.

Comparison with Blue Drop

Some elements of the proposed 'Silver Drop' are already captured during the Blue Drop certification assessment by DWA. In discussion with the DWA it became evident that the process of assessment for the different certification processes should be combined to better facilitate the interaction with the WSAs.

The groundwater management elements that are already included or could easily be inferred are:

- **Requirement 1.2 (Risk assessment)** – if the water supply comes from boreholes, the risk assessment should include a geohydrological assessment with respect to water quality and yield.
- **Requirement 1.3a (Operational monitoring)** – the requirement states the monitoring of raw water quality, which in the case of borehole supply refers to groundwater.
- **Requirement 1.4 (Credibility of DWQ data)** – this requirements should apply to all relevant chemical analysis.
- **Requirement 5.6 (Design capacity vs operational capacity)** – groundwater dependent system must have an acceptable plan which stipulates abstraction patterns that will prevent aquifer damage with scoring information evidence of verified plant capacity/aquifer utilisation plan.

The Green Drop assessment caters for groundwater monitoring in the vicinity of wastewater treatment plants with evaporation ponds, which covers only a small portion of the

required groundwater management with respect to land use and pollution prevention.

In addition to the above requirements, the existing Blue Drop assessment form could be further amended to cater for most or all of the Silver Drop assessment requirements. It is recommended to insert a new requirement under Criteria 1 – Water safety planning, which would cater for most aspects of groundwater management.

Conclusions

The draft scoring system was successfully tested and applied to two aquifers in the Overstrand Municipiality and a water-supply system in the Oudtshoorn Municipality. The scoring system can be used to highlight areas of concern and required improvements.

However, the application of the scoring system requires knowledge of the aquifer system, its potential and vulnerability that often goes beyond the current capacity of the average municipality. Furthermore, municipalities need assistance and guidance in incorporating groundwater-related issues into municipal planning instruments.

It is recommended to test the scoring system with data from other municipalities, as well as with data collated during the recent Blue Drop assessment. The current Blue Drop assessment form should be updated to allow for collecting all relevant data and information for the Silver Drop assessment. However, the Silver Drop assessment needs to be carried out by experienced groundwater experts.

It is further suggested to introduce a bonus and penalty system in addition to the scoring system to support the efforts some municipal display. Possible bonus and penalty scores could entail:

- Penalty for existing groundwater pollution in the municipal area
- Penalty for existing groundwater pollution close to municipal or private water-supply boreholes
- Penalty for non-compliance with licence or permit conditions
- Bonus for training of municipal staff in groundwater-related aspects.

Further reading:
To order the report, *Development of a 'Blue Drop' type scoring system for groundwater management at municipal level* (**Report No. KV 311/12)** contact Publications at Tel: (012) 330-0340, Email: orders@wrc.org.za or Visit: www.wrc.org.za to download a free copy.