POLICY BRIEF

June 2021
The WRC operates in terms of the Water Research Act (Act 34 of 1971) and its mandate is to support water research and development as well as the building of a sustainable water research capacity in South Africa.

Attaining regulatory approval for the sustainable use of mine-water for irrigation

A Water Research Commission (WRC) study has developed comprehensive guidelines for attaining regulatory approval of irrigation as a large-scale, sustainable use of mine-water. The study reviewed the policy and regulatory framework to provide guidance for the establishment of irrigation of agricultural land as a large scale, sustainable use of mine-water, during mine operation and post-closure, with a goal to ensure that this water is viewed as a national agricultural asset for beneficial use, thereby creating an enabling environment to get regulatory approval.

Background

The beneficial reuse of treated mine-impacted water is not currently a priority in South Africa. Although the discharge of effluent to water resources should be the option of last resort, it is often the first choice of many in the mining industry due to its simplicity and low cost. Unfortunately, the discharge option in many instances requires the use of high-quality water to dilute the treated effluent to within allowable discharge limits, thereby unnecessarily wasting high-quality or potable water.

The WRC has completed several research projects investigating the productive use of mine-impacted waters for agriculture from both the coal and gold fields, with a number of opportunities identified including using gypsiferous mine-impacted waters for irrigation to enable dry season production as well as stabilising dryland crop production. Currently, mine land post-closure is rehabilitated, but usually not to the advantage of the local communities.

Mines in South Africa tend to be located in water-scarce areas, and use of the land for agricultural purposes would require freshwater to be provided from further afield, which is not economically viable. However, the mine-impacted water provides a water source on site or nearby, which then allows agriculture on the mine land to become a realistic opportunity for the surrounding communities.
The current regulations surrounding mine closure certification and water use licence applications do not prevent irrigation with mine-impacted waters, but there is an absence of guidance to inform both mining companies and regulators sufficiently for informed decisions regarding irrigation in the post-mining landscape to be made. In this regard, this study aimed to review the policy and regulatory framework to provide guidance for the establishment of irrigation of agricultural land as a large scale, sustainable use of mine water, during mine operation and post-closure. The goal is to ensure that this water is viewed as a national agricultural asset for beneficial use, and not a problematic wastewater requiring disposal, in an enabling regulatory environment with clear guidelines as to the process to follow to get regulatory approvals.

Main study outcomes

The research approach included a review of the policy and regulatory framework to provide guidance for the establishment of irrigation of agricultural land as a large scale, sustainable use of mine water, during mine operation and post-closure.

Guideline

The major outcome of this project is a comprehensive guideline for the relevant stakeholders engaged in a decision-making process regarding whether or not a specific mine water source can be applied for irrigation, as well as what ongoing monitoring would be required to maintain the applicable licenses and approvals once implemented, considering community and environmental safety. The guide informs which legislation is applicable to the decision-making process, what applications need to be made to the Department of Water and Sanitation, the Department of Agriculture, Land Reform and Rural Development (DALLRD),

the Department of Environment, Forestry and Fisheries (DEFF) and the Department of Mineral Resources (DMR), and how to manage these procedures within the framework of the necessary legislation and guidelines governing mine-impacted water management activities.

Considerations for applicant prior to engaging in water use licencing process

Optimise plan for water re-use and reclamation

Before mine-water can be considered for irrigation, the mine must first illustrate that there is excess water that cannot be reused within the process, even after treatment, as per the precautionary principles of the National Water Act, as set out in the Regulations on Use of Water for Mining and Related Activities, Government Notice 704 of 4 June 1999.

A series of Best Practice Guidelines (BPGs), developed by DWAF (now DWS) are aimed at assisting mines to meet the requirements of pollution prevention and impact minimization as required by GN704, and set the following order of priority for mine-impacted water and waste management decisions and/or actions (BPG H3):

- **Prevent or minimise** pollution/contamination of water used by implementing necessary management measures or strategies
- **Reuse or reclaim** contaminated water in cases where complete pollution prevention was not possible (water use inventory)
- **Treat** water that cannot be reused or reclaimed
- **Reuse** treated water
- **Discharge or disposal** of excess water

All new and existing mines are therefore required to optimise water reuse and reclamation, and must have in place a water reuse and reclamation plan (WRRP) which should form part of a larger integrated water and waste management plan (IWWMP), as presented in BPG H3. As water reclamation refers to the operational use of water, BPG H3 will not have application to closed mines. Where desired, the reuse and reclamation of water decanting from closed mines could be considered on a case-by-case or site-specific basis.

Determining fitness for use or establishing water quality requirements

The revision of the 1996 Irrigation Water Quality Guidelines has been completed as part of the response to the promulgation of the National Water Act (No. 36 of 1998), and to address the need to consider local site-specific conditions, which was identified as a shortcoming in the 1996 guidelines. The new guidelines include a software-based Decision Support System (DSS) for a revised suite of risk based, site specific water quality guidelines.

This DSS is the primary tool for determining fitness for use or establishing water quality requirements for irrigation of mine water, providing a three-tiered model for estimating the impact of mine water irrigation on the crop, soil and groundwater, including site specific variables. This allows the user to try different management options (such as different crops or soil or irrigation management strategies) to reduce or overcome the problems which were associated with mine-impacted water irrigation.

The diagram in Figure 1 depicts the overall structure of the DSS. At the highest level, a user has to decide whether he or she wants to use the DSS to assist with:

- assessing the fitness of a water for irrigation use, or
- setting water quality requirements for irrigation users, or
- obtaining additional information, as indicated in the diagram.

It is assumed in the DSS, that the fitness for use of a specific water can be categorised into different levels of acceptability and implied risk. The classification system is based on a DHSWS system which describes four suitability categories to which water quality can be assigned. When applied to the irrigation of mine-impacted water, this DSS will be valuable for the determination the fitness for use under different conditions.

The inclusion of site-specific conditions greatly enhances the decision-making process when determining whether a specific mine water quality can be applied to a specific piece of land and what crops may be suitable, together with the highlighting of associated risks. Assessing the fitness for use of a particular mine water is recommended as the first step in the process to be followed to attain regulatory approval of irrigation with mine water and this has been comprehensively addressed in the technical guidelines for irrigation with mine-impacted waters. The DSS will indicate the suitability of the soil and water quality for crop irrigation.

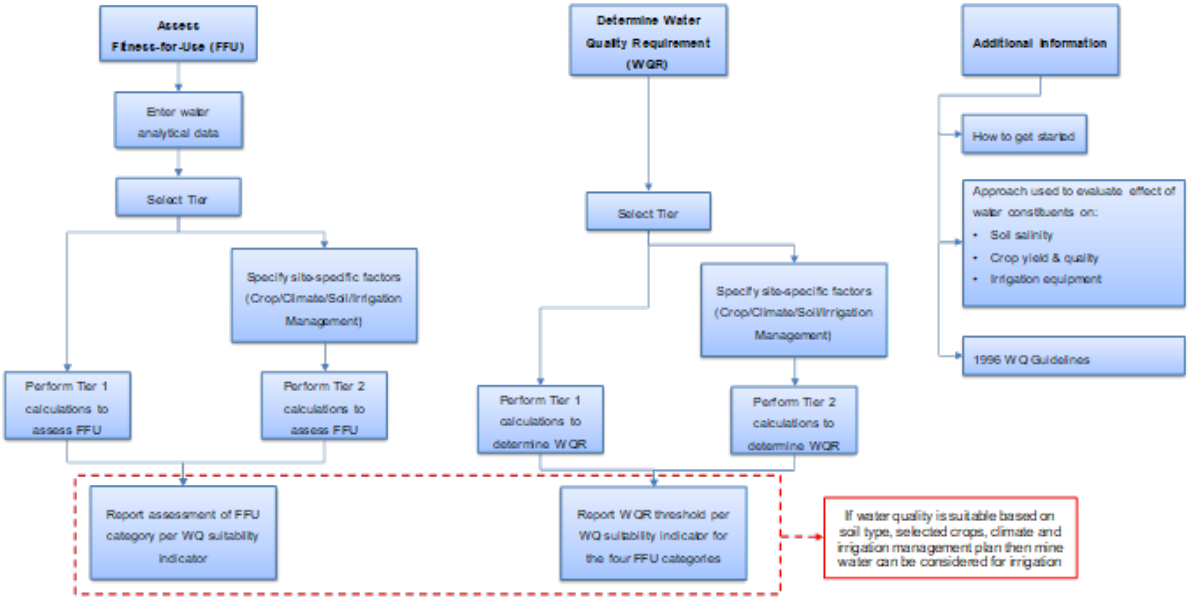

Figure 1: Decision Support System structure

Engagement with government departments

If the mine plans to irrigate using excess water as the means for beneficial use, there must first be approval from both the Department of Agriculture, Land Reform and Rural Development (DALRRD) and Department of Environmental Affairs, Forestry and Fisheries (DEFF).

Before land can be cultivated, a ploughing certificate is required from DALRRD. If the land intended to be irrigated with mine-impacted water is privately owned, already being cultivated, and has been ploughed in the past 10 years, the existing ploughing certificate will remain in place, with only a requirement for a change in the water use license (WUL) in terms of the water use. If, however, the land is virgin land, that is, has not ever been cultivated, or has not been ploughed within the past 10 years, then written permission is required from DALRRD. The relevant Regulations of the Conservation of Agricultural resources Act (CARA), Regulation 2: Cultivation of virgin soil and Regulation 3: Cultivation of land with slope, will apply.

A Soil Suitability Report for irrigation from DALRRD is a prerequisite for a Water Use Licence application in terms of Section 21(a): Taking water from a water resource and Section 21 (e) (Engaging in a controlled activity) applications.

When clearing of the natural vegetation of an area larger than 1 ha approval from DEFF is required. Approval can only be granted following an Environmental Impact Assessment (EIA), according to the Environmental Impact Assessment Regulations (GN 982 of 2014, as amended in 2017) in terms of the National Environmental Management Act, 1998. If the area is smaller than 20 ha, a basic EIA is required, while areas larger than 20 ha require a full EIA. Even though the EIA takes much longer than the ploughing certificate, it is recommended that the soil investigation is done first. The reason is that soil is often the definitive factor which determines whether or not the license will be approved or not. The EIA process can be initiated at the same time as the Water Use Licence application, and the processes can run in parallel.

Water use licence application process

Once the mine has established that there is excess water available which cannot be re-used internally and it has exhausted all other water management options, the mine may approach DHSWS for a licence to discharge or dispose of the excess water. Any other alternative uses should already be identified and evaluated prior to a water use licence application (WULA), which may include use by neighbouring industries or SMME's or beneficial use for irrigation.The application process is initiated by the person or entity that is planning to use the water as defined in Section 21 of the NWA.

A process flow diagram guiding the pre-application activities is presented in Figure 2.

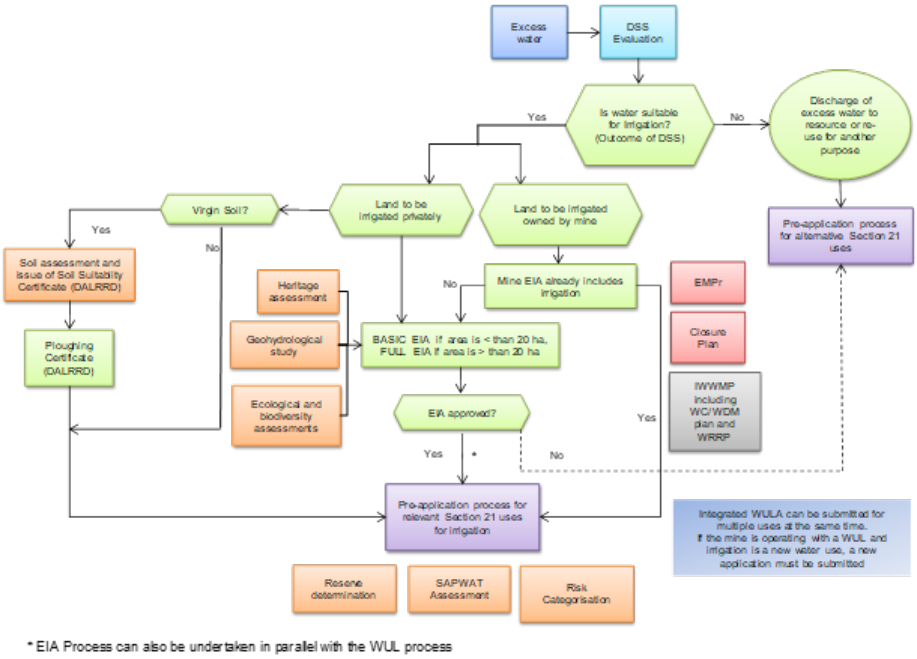

Figure 2: Process to inform the pre-application phase when the intention is irrigation with mine-impacted water as a beneficial use.

WULA content was standardised in March 2017 with promulgation of the Water Use Licence Application and Appeals Regulations, Government Notice R267. The purpose of these Regulations is to prescribe the procedure and requirements for water use licence applications as contemplated in sections 41 of the Act, as well as an appeal in terms of section 41(6) of the Act.

The inclusion of a 300-day WULA time frame in Regulation R267 aligns WULAs with the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) processes required for environmental authorisation of mines. Alignment of the WULA and EIA/EMP processes is schematically presented in Figure 3.

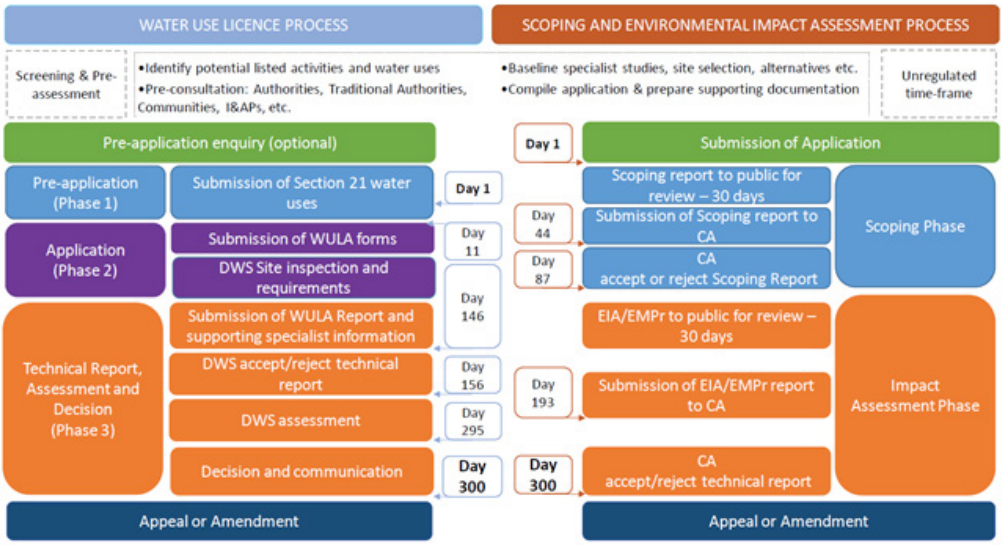

Figure 3: Alignment of the 300-day WULA and EIA/EMPr processes.

In his State of the Nation Address on 23 February 2020, President Cyril Ramaphosa made a declaration that water use licenses should be finalised within 90 days, with effect from 1 April 2020. While this change has not yet been Gazetted, since the President's declaration the DWS has revised the process to ensure that the water use license application is finalised within 90 days, including pre-application engagement with the applicant, compilation of the required technical reports, and public participation.

Implementation of water use license and monitoring requirements for ongoing irrigation

Water use License mandated monitoring

The implementation process will include ongoing monitoring of the process and quality of the effluent as well as implementation of the water management plan and water conservation practices. These monitoring requirements will likely be site specific and depend on the potential perceived risks associated with the site-specific conditions and water quality.

In order to fully comply with the resource quality related conditions in a WUL mines are required to extend managing water and water containing waste generated and consumed on site to managing the riparian zone and underlying aquifers, and all influences on these as stipulated in the WUL.

Monitoring requirements according to the CARA regulations

Where the land under irrigation is privately owned farmland, the Regulations of the CARA will be applicable for monitoring and maintenance of the ploughing certificate, and the landowner is responsible for this monitoring, although DALRRD will conduct audits to determine compliance with the regulations.

While the CARA does not apply to mine-owned land, it is strongly recommended that the monitoring requirements for rehabilitated mine land being cultivated under mine-impacted water irrigation also be guided by these regulations, as the Water Use License monitoring requirements typically deal only with water quality impacts and do not address potential soil impacts.

Ongoing assessment of biodiversity will be required as per the NEMBA, according to the Alien and Invasive Species Regulations and Lists, and Threatened or Protected Species Regulations and Lists.

Conclusion

Large portions of irrigated land are located near sources of mine water, which would limit the collection and distribution costs if mine-impacted water was utilised. The treatment and reuse of mine-impacted water could operate as a single financial initiative, with income from the mine-impacted water-irrigated crops funding the mine-impacted water treatment and/or creating jobs and food security for the local community.

The availability of water for irrigation may serve to drive the impetus that mine rehabilitation should serve to return mined land to a state where viable economic enterprises can be incentivised to stimulate job creation and economic reactivation, not merely return the land to a state of stability to ensure no net environmental impact, or to achieve a state that will meet the satisfaction of the Department of Mineral Resources. The creation of bioenergy crop farms on rehabilitated mine land for example will result in opportunities to employ and upskill people, thereby justifying the use of such land as a viable investment and further opening the door for emerging commercial farmers. Irrigation with mine water on conventional agricultural land is expected to be more difficult than with low salinity water, and rehabilitated land even more so due to the challenges associated with disturbed geology and poor topsoil quality and depth. Emerging commercial farmers should be supported with training and mentorship to increase the potential success of such projects.

The legislation and supporting guidelines relating to water re-use in South Africa exist and are readily accessible. However, they tend to be contradictory and confusing in many cases, which may have had the unintended consequence of negatively affecting the consideration of mine water as an agricultural resource in the past. The recent development of a Draft Mine Water Management Policy which seeks to align and clarify the responsibilities of the various government Departments in terms of mine water management is encouraging. It illustrates political will to strengthen a proactive mine water management approach, with an integrated departmental approach to mine water management. The Presidential proclamation that the timeframe for WUL authorisation should be reduced from 300 days to 90 days also indicates a strong political will to stimulate the economy and remove unnecessary red tape.

While the existing legislative framework does have some challenges, this Guideline has illustrated that the framework does allow for the beneficial use of mine water for irrigation under the right conditions. Where a surplus of water is

identified after all possible internal re-use possibilities have been exhausted, irrigation can be considered as a beneficial use. Tools such as the Decision Support System included in the amended Irrigation Water Quality Guidelines allow a thorough assessment of the fitness for use and water quality indicator, which, when combined with soil suitability testing and the rigorous specialist studies that accompany the required EIA process, support the licencing of mine water irrigation as a water use under the relevant Section 21 uses of the NWA, thus enabling the authorisation of the WUL.

The importance of thorough monitoring after the implementation of the licence must be emphasized, with all requirements of the WUL, the CARA regulations and the Regulations of the NEMBA being observed.

Related report:
Guidance for attaining regulatory approval of irrigation as a large-scale, sustainable use of mine-water
(**WRC Report no. TT 837/20**). For more information, contact WRC Research Manager, John Zvimba at Email: johnz@wrc.org.za