

# Toxic acid mine water still rising

The situation on the East Rand is frightening, says an anonymous source who used to work at the department of water and sanitation

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**A**cid mine water continues to rise underground on Gauteng's East Rand, threatening the integrity of groundwater, a former senior government official has warned.

Acid mine drainage (AMD) is harmful to humans, plants and animals because it is acidic, and it carries heavy metals, atoms that emit radiation and salts in hazardous concentrations.

In 2022, the *Mail & Guardian* reported that all three deep-level abstraction pumps at the government's R1 billion Eastern Basin acid mine drainage treatment plant in Springs were no longer operational because of the scaling of the motors of the pumps, which ultimately breached the environmental critical level (ECL).

The ECL is defined as the highest water level in the mine void where no AMD flows out of the mine workings into the surrounding groundwater or surface water systems.

The Eastern Basin plant is supposed to pump between 70 and 100 million litres of the polluted water a day to maintain the ECL, and to protect dolomite and groundwater sources, before it is neutralised and discharged into the Vaal River system.

"What concerned me at the time is even when the water level was in the range of 70m to 80m, there was elevated sulphate in one of those boreholes from the farming community," according to the former senior official at the department of water and sanitation who requested anonymity.

While this might or might not be related to the AMD, it is "frightening" that the current water level is about 65m, when the ideal was to have kept it at about 90m below the surface, he said.

"We were actually quite conservative because I remember that, at the time, the deliberations were to keep it at 120m below the surface," the source said.

"But with all the operational failures [at the plant], they could not just manage to keep it at that level and we thought that 90m may be reasonable ... That was not achievable or managed altogether. And now, it's about 65m below the surface."

The current water level is "very risky". There is a chance it could touch aquifers, he said.

"Potentially, it could be making some contact with the aquifers and maybe the contact could be possibly so minimal that the aquifer, in this case, sits above that mine water level so it's effectively almost diluting it."

If the AMD gets to the point where it rises to 30m or 40m below the surface, "it's almost a head of water from the mine void that's going to push



into the aquifer and, obviously, with that, it will have a pollution impact into the aquifer".

Acid mine drainage is the toxic legacy of more than a century of gold mining on the Witwatersrand. During underground operations, water was pumped to the surface to enable the mining to take place.

As mining stopped, the pumping of underground water ceased and the mine voids started filling with water. The sulphide minerals in the rocks were exposed to water and oxygen, which resulted in the formation of AMD. The voids were progressively filled with acidic water.

In April 2011, the department of water affairs instructed the Trans Caledon Tunnel Authority (TCTA) to act as the agent for the design and implementation of short-term measures to manage and control AMD in the western, central and eastern basins of the Witwatersrand goldfields.

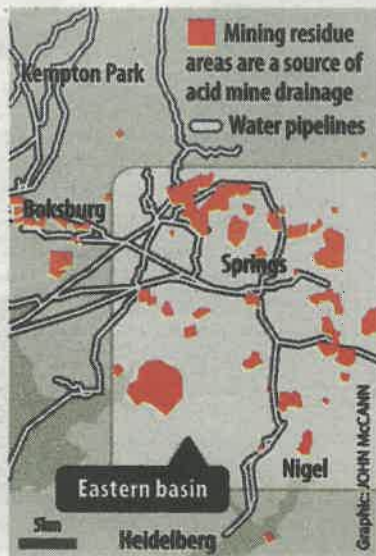
The department did not respond to the M&G's inquiries.

**W**anda Mkutshulwa, spokesperson for the TCTA, said because of the previous pump challenges experienced at the eastern basin facility, and the excessive rain in 2022 and last year, the water levels continue to be below the targeted ECL of 106m below the surface.

A figure of 67.7m below the surface was recorded on Sunday.

"It is important to note that we have not seen any environmental impact thus far and we continue to monitor," she said.

There are no plant or operational failures at present, Mkutshulwa said, adding that the TCTA is adopting a proactive approach and doing preventative maintenance instead of



**Polluting:** Levels of acid water from old gold mines on the East Rand in Gauteng are escalating, threatening to pollute the groundwater in the area. Photo: James Puttick

waiting for breakdowns or failures.

"We also ensure we have a critical spare list for any equipment prone to failure. We are currently operating with three pumps and they are functioning as planned.

"We have also ensured that we have a spare pump available for flexibility, in case one pump fails or malfunctions," she said.

According to the source, while the possibility of a decant of AMD — when the flooded system "daylights" and flows into the environment — remains remote, there needs to be significant effort to ramp up pumping on the three pumps and to keep them going at maximum capacity.

"You can see the rate of the level of mine water. You've got to bear in mind that there's extraneous water coming in from the upstream region and, on top of that, you've got the dolomitic contribution," he said.

These are all "saturated sponges" that are squeezing themselves gradually and losing this water into the mine void.

"The sort of displacement that these pumps have to deal with — it's almost like blowing against thunder."

The decant of AMD must never be perceived as only trickling out on the surface and flowing into a river or the natural environment.

"When it makes contact with groundwater systems, intercepting boreholes of whoever may be pumping in that region, effectively, it's as good as a decant, it's just that it's not visible."

This would affect water quality

from a farming perspective and for landowners who could potentially be using groundwater for their domestic consumption and daily needs.

"Effectively, the moment you pick up that sulphate, it's going to take that water into a specification which is out of the SANS 241 specification [drinking-water quality standard], which means it is not fit for human consumption."

As the mining voids flood, it's almost a foregone conclusion that "you may never be able to dewater back to your predetermined level", the source said.

"Hypothetically speaking, if it's come to 60m and you realise that the cutoff would have been 80m or 90m, it's basically swimming against the tide. You may never be able to commission infrastructure to pump it to get it back onto that desired level."

**B**ut, Mkutshulwa said, it is possible to get the water to the desired ECL.

"According to our projections, we should be able to reach our target by the end of this financial year. In our calculations, we predicted that, if we operate at 80 megalitres per day, we will reach ECL by February 2026, but, if we operate at 99 megalitres per day, we should reach it by May 2025.

"However, our target is to operate at an average of 106 megalitres per day and this will ensure we reach ECL earlier.

"The predictions are based on historical plant performance, which considers scheduled maintenance.

Of course, this is also based on the assumption the water ingress will not increase beyond what is known."

The water quality has improved and the pH is near neutral. "We have not seen any negative impact on the aquifer/groundwater, nor received complaints from nearby users.

"Based on our monitoring, we have not observed any elevated sulphates. However, the plant is currently discharging a concentration of 1155mg/l (well below our limit of <3000mg/l), and it would require the implementation of desalination technology to bring the concentration lower."

Mariette Liefferink, the chief executive of the Federation for a Sustainable Environment, noted that there was a slow uptake of alternative and appropriate technologies regarding AMD.

"The current treatment of AMD contributes an average Total Dissolved Solids load of 362 tons per day to the Vaal Barrage Catchment. If 150 million litres of neutralised AMD (in terms of the short-term treatment) are released in the Vaal Barrage, 60 million litres of clean water will have to be released from the Vaal Dam to dilute the salinity."

The disposal of the high-density metal sludge, too, presents challenges since there is no successful treatment of the sludge for beneficial use, she added.

The scaling of the motors of the pumps in the eastern, western and central basins had also resulted in the breach of the ECL and the high risk of the acidic water decanting onto the surface.