Routine Water Quality Monitoring Report

Steenberg Golf Club

∘ *Futureproofed Customer-Centric Sustainability in Water* ∘

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CONTEXT

Steenberg Golf Course receives treated municipal effluent from the Cape Flats Wastewater Treatment Work to be used for course irrigation during the drier months. There have periodically been issues with the quality of water received from the WWTW and this has resulted in aesthetic issues and negative impacts on the courses as a result of salt accumulation.

In August 2024 there was a significant fish mortality event in the dam surrounding the 7th green, so subsequently the routine monitoring has been extended to include this dam, in addition to the incoming treated effluent and the main irrigation dam.

At the time of the June sampling, no treated effluent had been pumped in for some time due to the winter rains, so only the irrigation dam and the 7th green dam were sampled.

SAMPLING

A sample was taken from the main irrigation dam on the left of the 18th tee and from the green surrounding the 7th green on 5 June 2025. The main irrigation dam was full and water was overflowing over the weir. The samples (500 ml) were placed in autoclaved glass bottles and transported to the laboratory for immediate analysis of microbiology and basic chemistry, while samples for ion chromatography for filtered and refrigerated.

Figure 1: Image showing the water level in the main irrigation dam at the time of sampling

ANALYSES

The water samples were analysed within 1 hour to determine pH, EC, redox potential, COD and hydrogen sulphide. A subsample of each was serially diluted under sterile conditions in a laminar flow hood and plated on differential agar to enumerate coliform bacteria and *E. coli*. A 50 ml subsample was filtered through a 0.22 µm nylon membrane filter for anion and cation analysis by ion chromatography. Light microscopy was performed on all samples and this confirmed there was significant algal growth in the water samples.

RESULTS

Table 1: Basic chemistry properties for the Irrigation dam and 7th green dam[1]

Parameter	Unit	Irrigation dam	7th dam
pH		7.04	8.30
EC	µS/cm	777	776
Redox potential	mV	112	107
COD	mg/l	28	35
Acidity	mg/l $CaCO_3$	18	0
Alkalinity	mg/l $CaCO_3$	118	120
Ammonium	mg/l	4.32	0.14
Sulphide	mg/l	0.00	0.00
Chloride	mg/l	126.5	132.2
Nitrate	mg/l	3.53	2.59
Sulphate	mg/l	27.44	37.37
Phosphate	mg/l	4.74	3.83
Fluoride	mg/l	0.16	0.11
Sodium	mg/l	72.03	82.93
Potassium	mg/l	9.63	14.55
Calcium	mg/l	34.33	41.89
Magnesium	mg/l	9.23	8.88
Coliforms	CFU/100 ml	24 000	24 000
E. coli	CFU/100 ml	40 000	12 000

The chemical composition of the water was similar to the May samples, but showed a significant reduction in some parameters from the March and April samples. These are most likely due to the influx of rainwater and the fact that no treated wastewater was pumped into the irrigation dam. The pH was marginally lower and the EC value decreased by over 10%. The acidity and alkalinity values were around half those measured in April. Surface water has substantially lower acidity and alkalinity than treated wastewater. The total alkalinity remained significantly higher than the total alkalinity so the water can be considered well buffered.

The ammonium value was also around 50% than in April, again most likely due to surface water inflow, rather than treated wastewater.

Phosphate, which also associated with the treated municipal wastewater, was about half the concentration measured in April. The nitrate concentration remained similar, but was still relatively low. No hydrogen sulphide was detected in the water and ambient air analysis also showed a zero value. This is consistent with the positive redox potential.

[1] Analytical laboratory: Disa Scientific (Pty) Ltd, Reg. No. 2016/130096/07.

The overall water chemistry between the irrigation dam and the dam around the 7th green was similar, despite the higher pH for the 7th green dam. This may be due to the water being shallower and slightly warmer, resulting in less dissolved carbon dioxide, and could also be influenced by certain algae that can obtain carbon dioxide from bicarbonate (alkalinity), which increases the pH.

The biggest change was in the microbial analysis, which showed that the coliform bacteria and *E. coli* counts had decreased dramatically since April. The coliform and *E. coli* counts were over 95% lower, suggesting that the majority of the bacteria measured previously came from the treated wastewater. There are still a large number of geese and other birds that use the dams and their faeces will introduce coliform bacteria and *E. coli* to the water.

The South African Water Quality Guidelines for Irrigation stipulate the following for water with an *E. coli* count above 1000 CFU/100 ml "Provided water treatment quality is equivalent to or better than primary and secondary treated waste water, and that no contact is allowed to take place with humans, water can be used in irrigation for the production of fodder, tree plantations, nurseries, parks, etc."

COMMENTS

The pH and EC values are acceptable and the redox potential of the dam water sample indicates that the water is not anaerobic. Hydrogen sulphide was not detected in the sample.

The ammonium and phosphate concentrations decreased significantly, while the nitrate concentration remained low. The chloride and sulphate concentrations are acceptable, although there is sufficient sulphate to support some bacterial sulphate reduction under anaerobic conditions.

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