Water samples collected from the inland systems (rivers, vleis and wetlands) are analysed by City of Cape Town microbiology and chemistry laboratories for the following constituents:

Water quality constituent	What does this constituent indicate about water quality?	Guidelines[1]
Conductivity	This is an indirect measure of total dissolved salts. High conductivity may arise through natural weathering of certain sedimentary rocks or may have an anthropogenic source e.g. industrial and sewage effluent. Conductivity is naturally high in estuarine systems.	<u>Guideline for aquatic systems</u> Conductivity should not be changed by more than 15% of natural seasonal levels <u>Guideline for wastewater effluent</u> 75 mS/m
pH	pH is a measure of the acidity / alkalinity of the water. Waters in Cape mountain streams tend to be naturally acidic due to humic acids in Fynbos soils (ph ~ 4!). Lower down in the catchment, pH tends to be in the neutral range, while the pH of water bodies that contain a lot of algae can be quite high (pH ~ 9) due to photosynthetic activity. Excessively low or high pH levels can be detrimental to aquatic biota and can also affect the taste of water.	<u>Guideline for aquatic ecosystems</u> pH values should not vary by more than 5% (or 0.5 pH units) from the natural background levels <u>Guideline for aquaculture</u> 6.5 – 9.0 <u>Guideline for domestic use</u> 6.0 – 9.0
Dissolved oxygen	Dissolved oxygen is important for most	<u>Guideline for aquatic ecosystems</u>

[1] Guidelines from Department of Water Affairs and Forestry (1996) South African Water Quality Guidelines volumes 1-8.

Water quality constituent	What does this constituent indicate about water quality?	Guidelines[1]
or **Oxygen saturation**	aquatic life forms. It is produced during photosynthesis of aquatic plants and algae and when water movement causes aeration. Sustained low levels may lead to respiratory distress while excessively high levels (super saturation) can cause 'gas bubble' disease in fish (rare). High dissolved oxygen levels tend to inhibit photosynthesis of Green algae but may favour Blue-green algae. Oxygen may be depleted by re-suspension of anoxic sediments (e.g. during flooding and dredging) and by the presence of oxidisable organic matter (e.g. detritus and other organic waste).	80 – 120 % saturation Minimum Allowable Value 40 % <u>Guideline for aquaculture</u> 5 – 8 mg/l
Chemical oxygen demand (COD)	COD is used as a routine measurement for effluents, and is a measure of the amount of oxygen likely to be used in the break down of organic waste.	<u>General effluent standard</u> 75 mg/l No aquatic ecosystems guideline
Total suspended solids (TSS)	TSS is a measure of the amount of material suspended in the water. Many aquatic systems in South Africa are naturally turbid. The removal of riparian vegetation, over-grazing and non-contour ploughing leads to	<u>Guideline for aquatic ecosystems</u> Background TSS should be < 100mg/l Any increase in TSS should not be

Water quality constituent	What does this constituent indicate about water quality?	Guidelines[1]
	erosion, which tends to increase suspended solids loading to rivers (especially after rainfall events). Domestic sewage and industrial effluents may also contribute to high TSS levels. These can impair the aesthetics of the water body and affect aquatic ecology, for example, by smothering invertebrate habitats, reducing light penetration for photosynthesis, clogging gills, impairing foraging activities of fish and the efficiency of filter feeding organisms).	more than 10% of the background level for a specific system.
Faecal coliforms ***Escherichia coli***	These are indicators of faecal pollution. High levels of these organisms indicate a higher risk to human health. *Escherichia coli* is a particular species within the group of faecal coliform organisms. *E.coli* are specific to humans and warm-blooded animals and birds.	Drinking water guideline Zero per 100 ml Inland Waters Recreational guideline Intermediate contact: 0 – 1 000 counts/100 ml Full contact: 0 – 130 counts/100ml
Nitrogen	Inorganic nitrogen measurements include the following components:	Average summer inorganic

Water quality constituent	What does this constituent indicate about water quality?	Guidelines[1]
	NH3, NH_4^+, NO_2^- and NO_3^+. Inorganic nitrogen is seldom present in high concentrations in un-impacted systems. Surface runoff, treated sewage discharges, agricultural fertilizers and organic industrial wastes are the primary anthropogenic sources of nitrogen. Inorganic nitrogen is of concern due to its stimulatory effect on the growth of aquatic plants and algae.	<u>nitrogen concentration</u> < 0.5 mg/l indicate Oligotrophic conditions 0.5 – 2.5 mg/l Mesotrophic conditions 2.5 – 10 mg/l Eutrophic conditions > 10 mg/l Hypertrophic conditions <u>Guideline for aquatic ecosystems</u> Concentration should not change by more than 15% of the background natural levels for a specified system. Decreases in trophic status are permissible
Total ammonia	Ammonia exists in both ionised (the ammonium ion, NH_4^+) and un-ionised (ammonia, NH_3) forms and is generally measured as "Total Ammonia". Ammonia measurements give an indirect indication of faecal pollution and other forms of organic waste. The	<u>General effluent standard</u> 10 mg/l

Water quality constituent	What does this constituent indicate about water quality?	Guidelines[1]
	potential toxicity of ammonia is related to the concentration of the un-ionised form (see below). Sources of ammonia include fish farm and sewage effluents, industries using ammonia / ammonia salts, explosive and fertiliser manufacturers	
Un-ionised ammonia	The relative percentage of potentially toxic un-ionised ammonia (NH_3) in total ammonia increases with increasing pH and temperature. 90% of all measurements should be within the guideline and all should be less than the CEV.	<u>Guideline for aquatic ecosystems</u> 7 mg un-ionised ammonia per litre Chronic Effect Value (CEV) = 15 mg/l Acute Effect Value (AEV) = 100 mg/l
Phosphorus	Phosphorus occurs in a number of organic and inorganic forms. Soluble reactive phosphorus (SRP), inorganic phosphorus or orthophosphate is the form of phosphorus that can be directly used by aquatic biota. Phosphorus is an essential plant nutrient and plays an important role in determining the degree of eutrophication in a water body. It is seldom present in high concentrations	<u>Average summer inorganic phosphorus concentration</u> < 5 mg/l indicate Oligotrophic conditions 5 – 25 mg/l Mesotrophic conditions 25 – 250 mg/l Eutrophic conditions > 250 mg/l Hypertrophic

Water quality constituent	What does this constituent indicate about water quality?	Guidelines[1]
	in un-impacted systems. Natural sources include weathering of rocks and subsequent leaching of phosphate salts and from decomposing organic matter. Anthropogenic sources include domestic and industrial effluents and runoff from urban and agricultural areas.	conditions <u>Guideline for aquatic ecosystems</u> Concentration should not change by more than 15% of the background natural levels for a specified system. Decreases in trophic status are permissible
Chlorophyll-*a* (mg/l)	Chlorophyll-*a* measurements give an indication of algae biomass and trophic status of the water body. It is generally only measured in vleis and dams in the Cape Town area.	<u>Guidelines for recreational use</u> 1 – 15 mg/l (full contact)
Cyanobacterial toxins	Cyanobacteria (Blue-green algae) may produce a variety of toxins under certain conditions. These can be detected in the algae cells or in the water (i.e. intra- or extracellular). Common species are *Microcystis* and *Anabaena*.	<u>WHO Recreational guideline</u> 10 mg microcystin / l