CITY OF CAPE TOWN
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INLAND WATER QUALITY REPORT

Focus period 1 October 2024 to 30 September 2025
(2025 reporting period)

Making progress possible. Together.

ACKNOWLEDGEMENTS

This summary report was developed from the detailed Technical Report on the City of Cape Town's Inland Water Quality, focusing on the period 1 October 2024 to 30 September 2025 (reporting period 2025).

The report was contracted by the City to Lukhozi Consulting Engineers, who in turn subcontracted the project to Liz Day Consulting (LDC). LDC is a private consulting company, specialising in river and wetland assessment, management and rehabilitation.

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FOREWORD

The City of Cape Town is pleased to present its fifth annual Inland Water Quality Report, demonstrating its commitment to transparency by providing residents with accurate information and data on the state of the City's inland water resources.

The effective management and monitoring of our water resources is a key function of the City's services, requiring collaboration across multiple departments and branches. Through coordinated efforts, the City continues to implement programmes and projects aimed at restoring and enhancing the health of Cape Town's urban waterways for the benefit of current and future generations.

Water quality data form the foundation of informed water resource management. Understanding the condition of our rivers, wetlands, canals, dams and vleis enables the City to identify key challenges, prioritise interventions, and direct resources where they are most needed. The City's Inland Water Quality Monitoring Programme currently monitors 247 routine sampling points across its catchments for a range of bacteriological, chemical and algal parameters. The data are used to assess trends in both human and ecological health, to identify pollution hotspots, and to guide planning and management interventions.

This report has been structured as a rapid assessment of water quality data and, unlike previous reports, has been published as a standalone report titled "City of Cape Town Inland Water Quality Report: Focus 1 October 2024 to 30 September 2025 (2025 reporting

periods)". The report highlights water quality data trends, identifies the major contributors of pollution within the City's catchments, and outlines proposed interventions. Many of these interventions, particularly infrastructure upgrades within the Water and Sanitation Directorate, are long-term initiatives that are already under way.

Under the City's draft 2026/27 budget, significant investment has been allocated towards achieving dignified water and sanitation services and cleaner waterways. A capital budget of R5,4 billion has been earmarked to support these objectives. Recognising the value of Cape Town's unique natural environment, the City continues to prioritise projects that protect inland waters and sustain the vital ecosystem services they provide.

Key projects planned for implementation include the following:

- **Sand/Langvlei Canal Wetland Rehabilitation Project** – Budget allocations of R114 438 in 2026/27, R16,6 million in 2027/28, and R23,8 million in 2028/29 have been made for this project. The works include around 300 m of upgraded canal and the creation of 6 100 m² of new bioremediation

wetland treatment area.

- **Vygekraal River Bank Upgrade: Phase 2** – Budget allocations of R120 000 in 2026/27, R45 million in 2027/28, and R56,9 million in 2028/29 have been provided. This project will deliver flood alleviation benefits while incorporating liveable urban waterways principles to optimise the river corridor and enhance ecological and social value along approximately 3,4 km of river.
- **The Diep River–Doornbach Diversions Project** – Budget allocations of R1,9 million in 2026/27, R40,5 million in 2027/28 and R24 million in 2028/29 have been made for this initiative. This project seeks to improve stormwater management and water quality improvement through end-of-line treatment interventions, including five waste stabilisation ponds and low-flow diversions, such as the diversion of the Kleine Stink River. These measures will enhance stormwater management system capacity and reduce the chronic water quality impacts affecting the Diep River catchment.

In addition to this report, the City's **Public Inland Water Quality Dashboard (arcgis.com)** and **Open Data Portal (arcgis.com)** provide access to recent water quality results, monitoring information, and guidance on the interpretation of inland water quality data. These publicly accessible platforms further demonstrate the City's commitment to transparency and accountability by making environmental information readily available to all citizens.

The successful management of inland water resources requires a shared commitment from government, businesses, communities and individuals. Improving inland water quality, preventing environmental degradation, restoring aquatic ecosystems, and ensuring their sustainable use can only be achieved through collective action. Cape Town's unique and diverse natural environment provides residents with valuable ecosystem goods and services. Protecting and restoring our inland waters are therefore essential for strengthening resilience, supporting biodiversity, and safeguarding communities against the growing impacts of climate change and other environmental pressures.

Together, we can ensure that Cape Town's inland water resources remain healthy, resilient and productive assets for generations to come.



Leonardo Manus
Executive director: Water and Sanitation
City of Cape Town

EXECUTIVE SUMMARY

E1 BACKGROUND AND CONTEXT

This executive summary covers the findings of the fifth annual Inland Water Quality Report for the City of Cape Town ('the City'). The report has been produced by Liz Day Consulting (LDC) on behalf of Lukhozi Consulting Engineers ('Lukhozi') for the City's Catchment, Stormwater and River Management (CSRM) Branch. It covers the 2025 reporting period (October 2024 to September 2025), with data from this period benchmarked against the prior 2024 reporting period.

Unlike previous reports, this edition has been structured as a rapid assessment of water quality data across the City's monitored watercourses, presenting water quality findings by catchment, rather than by water quality variable. Data from 247 monitoring points across 17 major catchments have been assessed, representing an expansion of 66 sites compared with the 2024 reporting period.

A detailed methodological background for the analyses undertaken is contained in Day et al. (2025) and will be revisited in full on an approximately five-yearly cycle. The current report does, however, include appendices that provide summary information regarding key assumptions, limitations and approaches to data analysis and interpretation; tables listing summary water quality data for key water quality variables by both catchment and site; rainfall data across the city; and data summarising effluent quality from the City's wastewater treatment works (WWTW), sewer pump station performance, and the number and locations of reported sewage spills across the city.

E2 THE CITY'S INLAND WATER QUALITY MONITORING PROGRAMME

E2.1 CITY CATCHMENTS AND THEIR GOVERNANCE

Cape Town's watercourses drain 17 major catchment areas, which are managed through four stormwater planning regions (Northern, Southern, Eastern and Central regions). The regional management boundaries unfortunately cut across river sub-catchments in many cases, complicating catchment-level water quality management.

Seven of the catchments (or sub-catchments within catchments) have been identified by the City for focused interventions intended to improve river and wetland ecosystem function and, through this, bring about an improvement in water quality. These priority catchments are:

- The lower Diep River (upstream of Milnerton Lagoon)
- The Soet River
- The lower Salt River
- The Kuils River/Eerste River
- The Hout Bay River

- The Big and Little Lotus rivers (within the Zeekoe catchment)
- The Sand catchment (upstream of Zandvlei).

The above catchments also form the focus of two major City programmes, namely the Liveable Urban Waterways (LUW) Programme, and Workstream (WS)4 of the Mayor's Priority Programme (MPP) on Sanitation and inland water quality. The (lower) Diep, Soet, Black (lower Salt) and Zeekoe catchments are also priority catchments in the more recently formed WS6 of the MPP ('Reducing pollution and solid waste in catchments and rivers').

E2.2 KEY WATER QUALITY VARIABLES ASSESSED

This rapid assessment report focuses on the following six primary water quality indicators:

- *Escherichia coli* – an indicator of raw sewage contamination and human health risk;
- Orthophosphate phosphorus (PO_4-P) – a primary driver of eutrophication in inland watercourses;
- Un-ionised (free) ammonia (NH_3) – toxic to aquatic fauna and flora;
- Dissolved oxygen (DO) – critical for aquatic ecosystem health and essential for basic chemical processes, including nutrient decomposition;
- Chlorophyll-a – a surrogate measure of algal concentration (and by implication, productivity); and
- Microcystin toxins – released at times under bloom conditions by microcystis algae.

E3 WATER QUALITY OVERVIEW

E3.1 RAINFALL CONTEXT

Rainfall in the 2025 reporting period was lower than in the previous two years, and reflected a particularly dry winter. A single significant rainfall event in June 2025 contributed between one-third and one-half of that month's total rainfall, causing widespread erosion, sedimentation, and sewer overflows through stormwater system surcharging.

E3.2 KEY POLLUTION SOURCES

The three dominant pollution sources that drove poor water quality across Cape Town's catchments in the 2025 reporting period comprised:

- **WWTW effluent:** Sixteen of the City's 25 wastewater treatment works (WWTW) discharge approximately 546 Mℓ/day of treated effluent into inland aquatic ecosystems. These works collectively contribute ~1 747 kg of phosphorus per day to Cape Town's watercourses. 95% of Cape Town's wastewater is discharged into inland systems before reaching the sea.

- **Sewer pump station overflows:** A total of 694 overflows from 204 of the City's sewage pump stations were recorded during the 2025 reporting period. Of these, 47 pump stations overflowed five or more times during the year, suggesting repeated and possible systemic problems either in that part of the catchment or in the sewerage system itself. The Koeberg Road pump station (Diep River catchment) was the worst-offending, with 45 overflows over this period, followed by West Beach (also Diep River catchment) (25 overflows), Nooiensfontein (Kuils River catchment) (16 overflows), Philippi Phase 4 (Zeekoe catchment) (15 overflows) and Summer Greens (Diep River catchment) (also 15 overflows). Prioritisation of repairs to, or redesigns of, these 13 pump stations should be an item for urgent consideration by the City. With regard to the levels of pump station failure, one 'catastrophic failure' was reported from the Table View East pump station in the Diep River catchment, just north of the Potsdam WWTW. This failure lasted three days and took place in early April 2025. This pump station also gave way to a catastrophic failure in the 2024 reporting period (Day et al., 2025).
- **Discharges and runoff from inadequately serviced informal settlements:** Raw sewage and greywater entering stormwater systems from informal settlements and backyard dwellings affected almost all catchments. Only the Atlantis, Lourens, Muizenberg, Sout and Silvermine catchments are considered relatively unimpacted by this pollution source. In some areas (e.g. upper Big Lotus River sub-catchment), these waste streams constitute a significant portion of river flows.

E3.3 WWTW FINAL EFFLUENT PERFORMANCE

Key findings from the 2025 WWTW assessment include:

- Athlone and Macassar WWTW were 100% non-compliant with general effluent limits for total suspended solids (TSS), chemical oxygen demand (COD), total ammoniacal nitrogen and *E. coli*. Since Athlone's effluent, along with that of the smaller Borcherds Quarry WWTW, virtually constitutes the entire summer flow of the Black River (lower Salt sub-catchment), this river is highly compromised with regard to its water quality.
- The Cape Flats WWTW also performed extremely poorly; its maturation ponds form part of the False Bay Nature Reserve Ramsar wetland, creating direct knock-on impacts to this protected site.
- Potsdam WWTW (the City's fourth-largest WWTW, currently being upgraded) recorded high COD, TSS and ammoniacal nitrogen, contributing to the ongoing deterioration of Milnerton Lagoon. UV disinfection has been inactive for over three years at this WWTW, which instead relies on chlorination. Chlorination is considered environmentally more hazardous than UV disinfection, because of its potential to form toxic chloramines and other compounds, when combined with ammonium-rich waters.
- Zandvliet WWTW (the City's second-largest WWTW, which has been recently upgraded) performed best across all assessed variables, achieving 95–100% compliance, and demonstrating the effectiveness of this infrastructure investment.

- Although all WWTW met general effluent limits for orthophosphate in > 90% of samples, these limits are set almost two orders of magnitude above the hypertrophic threshold for aquatic ecosystems. This means that even fully compliant discharges could still cause major watercourse eutrophication.

E3.4 *ESCHERICHIA COLI* (RAW SEWAGE CONTAMINATION)

54% of all river samples in the 2025 period were rated unacceptable for *E. coli*. The most severely affected catchments were:

- Mitchells Plain – 100% unacceptable level 3 (note, however, that this catchment included only four monitoring sites, all in detention ponds);
- Lower Salt sub-catchment of the Salt River;
- Soet catchment – 86% of samples were rated as unacceptable; and
- Kuils and Eerste sub-catchments of the Eerste River.

Catchments such as the Zeekoe and the Diep, known to be gravely affected by raw sewage inflows, had 60% and 57% (respectively) compliance. These data, however, include several samples from major wetlands in the catchments (Rondevlei, Zeekoevlei, Princess Vlei and Rietvlei) in which *E. coli* levels are usually reduced through exposure to sunlight and dilution.

Catchments in relatively better condition from the perspective of *E. coli* contamination included the Sout, South Peninsula, Sand and Noordhoek catchments, while the best-performing areas comprised the upstream South Peninsula rivers, the City Bowl/Atlantic Seaboard rivers, the Else and Silvermine rivers, and the Lourens and upper Sir Lowry's Pass river catchments.

E3.5 PHOSPHORUS ENRICHMENT

Phosphorus enrichment remains the most critical water quality issue in Cape Town's inland watercourses. It drives major expenditure on alien aquatic plant removal, reed control and management of algal blooms. Key findings highlighted in this report include:

- 59% of all river samples were rated as unacceptable for orthophosphate phosphorus.
- The most severely affected catchments (> 90% of samples rated as unacceptable/hypertrophic) comprised the Mitchells Plain, Sout, Mosselbank, Kuils and Diep River catchments.
- Mean annual chlorophyll-a concentrations exceeded the unacceptable threshold in all assessed wetlands/vleis, except Die Oog. Zeekoevlei showed a mean annual concentration of 588,9 µg/ℓ (compared with the 30 µg/ℓ threshold indicating hypertrophic conditions); Princess Vlei was 1 036 µg/ℓ; and Rondevlei was 95,6 µg/ℓ.
- Zeekoevlei was the only water body where microcystin toxin levels exceeded acceptable risk thresholds, triggering vlei closure (in December 2024/January 2025, and again at the time of writing this report (December 2025 through to April 2026, ongoing)).

An important data limitation noted in the report was that equipment failure at the City's Scientific Services Branch (SSB) since December 2022 has raised the limit of detection for orthophosphate from < 0,01 mg P/ℓ to < 0,1 mg P/ℓ – resulting in a tenfold reduction in sensitivity in analyses for this variable. As a result, all samples now register at best as 'poor', regardless of actual phosphorus levels. Total phosphorus analysis has also ceased. This severely limits the ability to detect improvements in cleaner systems or to track trends over time.

E3.6 AMMONIA AND DISSOLVED OXYGEN

Un-ionised ammonia and dissolved oxygen are strongly linked to sewage inflows and organic loading:

- Catchments with the highest proportions of acutely toxic ammonia concentrations (> 62% of samples) comprised the Mitchells Plain and Kuils sub-catchments. Sustained pollution levels in these systems suggest few remaining sensitive aquatic fauna.
- All catchments recorded some samples with unacceptable dissolved oxygen levels. The worst-affected were the Soet, Kuils, lower Salt, Mosselbank and Mitchells Plain catchments.
- All sites with unacceptable DO concentrations showed a deteriorating trajectory over the 2025 period.
- Milnerton Lagoon consistently recorded unacceptable DO levels, driven by polluted inflows from Potsdam WWTW and the Koeberg pump station (now both being upgraded).

E3.7 OVERALL TRAJECTORY

The overall picture for inland water quality in Cape Town's monitored waterbodies for the 2025 reporting period is one of **persistent, pervasive water quality impairment** across most of the city's urban catchments, driven by the following main pollution sources:

- WWTW inflows;
- Runoff from informal settlements;
- Periodic overflows from sewers and/or sewage pump stations; and
- High levels of solid waste, which blocks infrastructure, resulting in more frequent leaks and overflows.

Generally, water quality data assessed in this report suggest that Cape Town's **rivers** are impacted much more than its monitored **standing water systems** (vleis and other wetlands). This is in part an artefact of the fact that most water samples from standing waterbodies are taken from those used

for recreational purposes or in parks and wetlands, and only a few are from detention ponds from areas close to informal settlements on the Cape Flats, for example, subject to dire levels of sewage and other pollution. Nevertheless, standing water systems should generally have greater resilience to polluted flows than rivers, at least up to ecosystem 'tipping-point' thresholds. That is because they should allow dilution of inflows, promote uptake of nutrients by plants, and expose bacteria such as *E. coli* to sunlight over an extended period, breaking these pathogens down. Unlike rivers, however, many wetlands accumulate pollutants and their products (e.g. organic sediments from algal growth) and these impacts may persist long after upstream inflows have been addressed. Rivers, by contrast, have more limited capacity for nutrient uptake and dilution, but arguably their water quality would recover quickly if upstream pollution sources are addressed. This is encouraging for systems such as Milnerton Lagoon, where future natural flushing by flood flows, under conditions of improved inflows, could allow that system to be reset.

On a more positive note, the inclusion of new catchments and sample points across a wider part of Cape Town's extent in this 2025 Inland Water Quality Report has highlighted the fact that there are several river systems and indeed catchments in relatively good condition, including some small river catchments within the City Bowl along the Atlantic Seaboard, the Modder River in the Atlantis catchment, tributaries in the south-eastern part of the Eerste catchment and in the South Peninsula. Other systems that remain in a good condition, albeit all subject to occasional sewage inflows and other sources of pollution, include the Lourens and Silvermine catchments and the upper Hout Bay catchment.

E4 KEY RECOMMENDATIONS

The report made the following key recommendations.

E4.1 ADDRESS WWTW, SEWER AND SOLID WASTE IMPACTS

The report is unequivocal that, until the pervasive issues of WWTW pollution, raw sewage and greywater inflows from informal settlements and solid waste impacts are addressed, no significant turnaround in water quality is likely to be achievable in many parts of the city. This requires serious problem solving at executive director level, between the departments of Water and Sanitation, Urban Waste Management, City stormwater district managers and other directorates such as Human Settlements.

Short-term measures must be implemented to redirect existing raw sewage flows from watercourses into areas with adequate sewage treatment capacity. Small informal settlements in relatively unimpacted catchments (e.g. the Modder (Atlantis catchments), Donkergat (Sout catchment) and Perde (South Peninsula catchments)) should be prioritised for such measures, and closely watched so that they are not overwhelmed by the impacts of unplanned informal settlement.

E4.2 PROTECT THE LEAST-IMPACTED CATCHMENTS

The City's better-performing river systems should be actively conserved and managed, with any deterioration rigorously investigated. These are also better candidates for ecological rehabilitation than severely polluted catchments. Priority systems identified include the:

- Lourens and Silvermine catchments;
- Upper Hout Bay catchment;
- City Bowl Atlantic Seaboard rivers (newly included in reporting);
- Modder River in the Atlantis catchment;
- South Peninsula rivers; and
- South-eastern Eerste River tributaries.

E4.3 CONSIDER INTERIM WATER QUALITY IMPROVEMENT TECHNOLOGIES

While systemic solutions are pursued, interim technologies should also be considered for the worst-affected pollution hotspots, including nano-bubbler aeration (showing apparent effectiveness in the lower Soet catchment); modular sewage treatment package plants; and other appropriate measures. Priority areas for such interventions include Zeekoevlei, the Big Lotus River, the Soet River and parts of the Diep sub-catchment.

E4.4 RESTORE LABORATORY CAPACITY FOR EFFECTIVE PHOSPHORUS ANALYSIS

The report strongly recommends that the SSB must urgently be resourced to restore orthophosphate detection limits to < 0,01 mg P/ℓ and to resume total phosphorus analysis. Alternatively, these analyses should be outsourced to accredited external laboratories. Without this, meaningful tracking of phosphorus trends – the city's most critical water quality issue – is impossible.

E4.5 DIFFERENTIATE ROUTINE FROM POLLUTION-EVENT SAMPLING DATA

The SSB database currently combines routine monitoring samples with additional pollution-event samples, without flagging the difference between these. This creates significant data analysis challenges. It is strongly recommended that SSB introduce dataset codes to identify routine versus emergency/pollution-tracking samples.

E4.6 RIVER FLOW MONITORING

Water quality concentration data alone cannot determine pollution loading. It is recommended that flow measurement be implemented on at least Cape Town's major mainstem rivers and compromised stormwater outflows, particularly in polluted areas, to enable loading calculations and appropriately sized pollution-control interventions.

E4.7 DEVELOP AN INLAND WATER QUALITY INDEX

At the time of this report, the City had initiated an RFQ for a new Inland Water Quality Index. This initiative is supported by this report. A well-designed index would substantially simplify annual reporting and communication of water quality status to stakeholders.

E4.8 SOLID WASTE INTERCEPTION

In the absence of more effective terrestrial waste clearing by the Urban Waste Directorate, CSRM should invest in the strategic placement and regular (in some areas, daily) clearing of waste interceptor fences along the most affected of its watercourses. Physical access restrictions (bollards, turnstiles) at known dumping points should also be implemented.

E4.9 PUBLIC AWARENESS AND EDUCATION

Awareness campaigns should target:

- Promotion of the C3 pollution reporting platform for citizen reporting of overflowing manholes, pump stations and dry-weather stormwater flows; and
- Public education on the ecological impacts of phosphorus-based detergents and promotion of phosphorus-free alternatives.

ACRONYMS

BMB	Biodiversity Management Branch
CBD	central business district
CCPOA	Century City Property Owners' Association
CFF	C40 Cities Finance Facility
cfu	colony-forming units
Chl-a	chlorophyll-a
City	City of Cape Town Metropolitan Municipality
city	The urban environment – in most cases, this refers to Cape Town
COD	chemical oxygen demand
CSRM	Catchment, Stormwater and River Management Branch (of the City)
CWQC	City water quality categories
DEA	Department of Environmental Affairs
DEADP	(Western Cape) Department of Environmental Affairs and Development Planning
DO	dissolved oxygen
DWAF	Department of Water Affairs and Forestry (now DWS)
DWS	Department of Water and Sanitation
EC	electrical conductivity
E. coli	*Escherichia coli*
EFZ	estuarine functional zone
FBNR	False Bay Nature Reserve
FLR	Friends of the Liesbeek River
FOZR	Friends of Zeekoevlei and Rondevlei
GI	green infrastructure
GN	Government Notice
HBRCF	Hout Bay River Catchment Forum
IUA	integrated unit of analysis
LDC	Liz Day Consulting (Pty) Ltd
LUW	Liveable Urban Waterways (programme)
MAC	Milnerton Aquatic Club
mamsl	metres above mean sea level
MCC	Milnerton Canoe Club
MMP	Maintenance and Management Programme
M'Plain	Mitchells Plain
MPN	most probable number
MPP	Mayoral Priority Programme
mS/m	milli-Siemens per metre (unit of measurement for conductivity)
NbS	nature-based solution

NH_3	Abbreviation used in this report for free ammonia (NH_3)
NH_4-N	Abbreviation used in this report for nitrogen in total ammonia (NH_3 + NH_4+)N
NO_3-N	Abbreviation used in this report for nitrogen in nitrate salts
PASAP	Pollution Abatement Strategy and Action Plan
PES	present ecological state
pH	potential of hydrogen (a measure of how acidic or basic a substance is)
PM	project manager
PO_4-P	Abbreviation used in this report for phosphorus in orthophosphate
PPP	public-private partnership
RQO	resource quality objective
SABS	South African Bureau of Standards
SIWQP	sanitation and inland water quality
SLPass	Sir Lowry's Pass
SSB	Scientific Services Branch (of the City)
SUDS	sustainable urban drainage systems
TAP	Transversal Action Plan
TEC	target ecological category
TIN	total inorganic nitrogen
ToR	Terms of Reference
Tot P	total phosphorus
TSS	total suspended solids
UNESCO	United Nations Educational, Scientific and Cultural Organization
W&SD	Water and Sanitation Department (City)
WHO	World Health Organization
WQIP	Water Quality Improvement Programme
WQMR	water quality management region
WTP	water treatment plant
WWTW	waste water treatment works

1. INTRODUCTION

1.1 REPORT BACKGROUND

The City of Cape Town ('the City') is responsible for the management of numerous rivers and wetlands, including open water vlei systems, estuaries and coastal lakes, within its municipal boundaries. The City's Catchment, Stormwater and River Management Branch (CSRM) provides ongoing internal reporting on inland water quality to various City branches. In addition, independent assessments and overviews of all water quality data collected for the City's routine monitoring sites are undertaken on an annual basis. This is the fifth such report and focuses on the 2025 reporting period (October 2024 to September 2025). In order to give these data context, they are compared with data from the previous (2024) reporting period.

1.2 APPROACH TO THIS REPORT

Unlike previous reports, this Inland Water Quality Report has been compiled as a rapid assessment of water quality in Cape Town's monitored waterways. More detailed background and information around data assessment methodologies, assumptions and limitations can be sourced in Day et al. (2025) and will be provided in more detailed reporting on this project on an approximately five-year cycle going forwards.

Also different from previous reports, water quality data are presented in this report by catchment, rather than by variable, with water quality in Cape Town's recreational vleis being considered in their relevant catchment sections. For ease of reference and with a view to keeping the main body of the report as short as possible, general information relating to site locations; summary water quality data at a site and catchment level; citywide rainfall analyses; data for wastewater treatment works (WWTW) effluent water quality, sewer pump station breakdowns and sewer overflows; approaches to data manipulation and analysis; and summary data for chlorophyll-a and microcystin toxin data for assessed vleis and dams are provided in the appendices, and referenced in the main body of text where relevant.

Catchments are presented in alphabetical order, with a full report section devoted to each major catchment, and smaller catchments covered more briefly. Key recommendations are provided in section 21.

1.3 ASSUMPTIONS AND LIMITATIONS

The following limitations should be borne in mind when reading this report:

- Large amounts of water quality data are available in the City's database. Of necessity, this project needs to summarise these data to draw out significant patterns and highlight particular areas of interest. The report thus focuses on a few key variables only and does not consider data relating to every one of the water quality variables monitored by the City.

- Conversely, not all variables of concern are necessarily included in the City's monitoring programme either and are therefore not covered in this report. Heavy metals, for example, are not routinely analysed by the City, largely for budgetary reasons. Jackson et al. (2009), however, noted significant concentrations of various heavy metals in the Diep and Eerste River estuaries, and Gammon and Clark (2022) found some heavy metal accumulations at concentrations of concern in fish tissue in Zeekoevlei. On the basis of these studies, other catchments might well be subject to similar issues.
- Although the City routinely collects phytoplankton samples for enumeration and identification of algal species, these data were not included in this assessment.
- This report does not provide a synopsis of the ambient water quality in Cape Town's rivers, canals and open waterbodies, because the analyses presented here are based exclusively on the sampling sites of particular concern that are routinely monitored by the City's Scientific Services Branch (SSB). It is noted, however, that additional sites and catchments have been included in the 2025 reporting period data to include a more diverse range of watercourses and allow for better representation of Cape Town's different catchments.
- No responsibility is taken by LDC for the accuracy of raw water quality data, which have all been derived from samples collected and analysed at the City's SSB in Athlone.
- LDC distances itself from the implications of any future decisions taken to access any waterbodies for recreational purposes on the basis of the data and assessments outlined here, which all refer to the past condition of these waterbodies. No predictions around future water quality or risk to human health should be drawn from this report.

1.4 PROJECT TEAM

Lukhozi Consulting Engineers (Lukhozi) is a consulting engineering company, which has subcontracted the present project to Liz Day Consulting (LDC). LDC is a private consulting company, specialising in river and wetland assessment, management and rehabilitation.

The current project included the following team members:

- Lukhozi team:
  - Mr James Lochner
  - Mr Casey Beveridge
  - Ms Natalie Ritsch
- LDC team:
  - Dr Liz Day (LDC): Project manager and water quality consultant
  - Mr Jeremy Rose (Infinity Environmental): Input into water quality assessments
  - Mr Tom Smyth (Infinity Environmental): R analyses

- Mr Dean Ollis (Inland Waters Consultancy): Report review and general technical input
- Mr Ian Wilson (Spatial Mapping Solutions): GIS input and maps

For the purposes of this report, reference to LDC includes acknowledgement of the full team of consultants listed above.

1.5 CLIENT TEAM

Input into this report was also guided by the City's team from the Catchment Stormwater and River Management (CSRM) Branch comprising:

- Ms Nicole Garcia
- Mr Richard Nell
- Mr Fahad Aziz

1.6 REPORT STRUCTURE

The remaining sections of this report have been structured as follows:

- Section 2: Technical background to the monitoring programme, the data it produces, and which data are included in this report
- Section 3: Overview of the water quality of Cape Town's inland waterbodies, drawing on summary data analyses to draw broad conclusions about the condition of and trajectories of change in the City's inland waterbodies, as well as the main threats to water quality
- Sections 4 to 20: Brief assessment and discussion of water quality issues per catchment, presented alphabetically and including comment on recreational vleis as relevant:
    - Section 4: Water quality in the **Atlantis** catchment
    - Section 5: Water quality in the **City Bowl** and **Atlantic Seaboard** catchments (City CBD to Bakoven)
    - Section 6: Water quality in the **Diep River** catchment (Diep and Mosselbank River sub-catchments, including Rietvlei and Milnerton Lagoon)
    - Section 7: Water quality in the **Eerste River** catchment (Eerste and Kuils River sub-catchments)
    - Section 8: Water quality in the **Hout Bay River** catchment
    - Section 9: Water quality in the **Lourens River** catchment
    - Section 10: Water quality in the **Mitchells Plain** catchment
    - Section 11: Water quality in the **Muizenberg** catchment
    - Section 12: Water quality in the **Noordhoek** catchment

- Section 13: Water quality in the **Salt River** catchment (Elsieskraal and lower Salt River sub-catchments)
- Section 14: Water quality in the **Sand River** catchment (including Zandvlei)
- Section 15: Water quality in the **Silvermine River** catchment
- Section 16: Water quality in the **Sir Lowry's Pass River** catchment
- Section 17: Water quality in the **Soet River** catchment
- Section 18: Water quality in the **Sout River** catchment
- Section 19: Water quality in the **South Peninsula** catchments
- Section 20: Water quality in the **Zeekoe** catchment (including Zeekoevlei and Princess Vlei)

- Section 21: Conclusions and recommendations
- Section 22: References cited
- Appendices, providing background information and analyses:
  - Appendix A: List of water quality sites and their catchments
  - Appendix B: Rainfall data and analyses
  - Appendix C: WWTW performance in terms of water quality
  - Appendix D: Source of raw sewage into Cape Town's waterways – summary data and analyses of pump station overflows and C3 reporting on sewage spills
  - Appendix E: Summary data for water quality analysis – 2024 and 2025 reporting years – for sites and catchments
  - Appendix F: Treatment of data
  - Appendix G: Summary data for chlorophyll-a and microcystin toxins

2. TECHNICAL BACKGROUND OF THE PROGRAMME

2.1 CITY CATCHMENTS AND STORMWATER PLANNING REGIONS

The City's numerous watercourses drain 17 major catchment areas, as shown in **figure 2.1**. Some of these areas in fact include a number of relatively small but discrete catchments, which are grouped together for management purposes (e.g. South Peninsula catchments), while others have no major natural open watercourses other than stormwater ponds, pipes and outlets into the sea (e.g. Mitchells Plain and Atlantis areas).

The City manages its watercourses through stormwater planning regions. There are four such regions – the Northern, Southern, Eastern and Central regions, each with their own regional planner. The regional boundaries do not, unfortunately, take account of the major river sub-catchments and, in many cases, cut through sub-catchments, assigning sections of a river and its tributaries in some cases to two or even three different managers, hampering the management of stormwater and its associated water quality issues from a catchment perspective. The stormwater planning regions are shown in relation to the main catchment areas in **figure 2.2**.

Seven of the catchments (or sub-catchments within catchments) have been identified by the City for focused interventions intended to improve river and wetland ecosystem function and, through this, bring about an improvement in water quality. These priority sub-catchments are:

- The lower Diep River (upstream of Milnerton Lagoon)
- The Soet River
- The lower Salt River
- The Kuils River/Eerste River
- The Hout Bay River
- The Big and Little Lotus rivers (within the Zeekoe catchment)
- The Sand catchment (upstream of Zandvlei)

The above catchments also form the focus of two major City programmes, namely the Liveable Urban Waterways (LUW) Programme, and Workstream (WS)4 of the Mayor's Priority Programme (MPP) on Sanitation and inland water quality. The (lower) Diep, Soet, Black (lower Salt) and Zeekoe catchments are also priority catchments in the more recently formed WS6 of the MPP ('Reducing pollution and solid waste in catchments and rivers').

2.2 REPORTING CYCLE NOMENCLATURE

The annual reporting period used in this report comprises the period from 1 October to 30 September in any given cycle and is given the year identity of the end of the period. Data for the period 1 October 2024 to 30 September 2025 are accordingly referred to as the 2025 dataset or the 2025 reporting period.

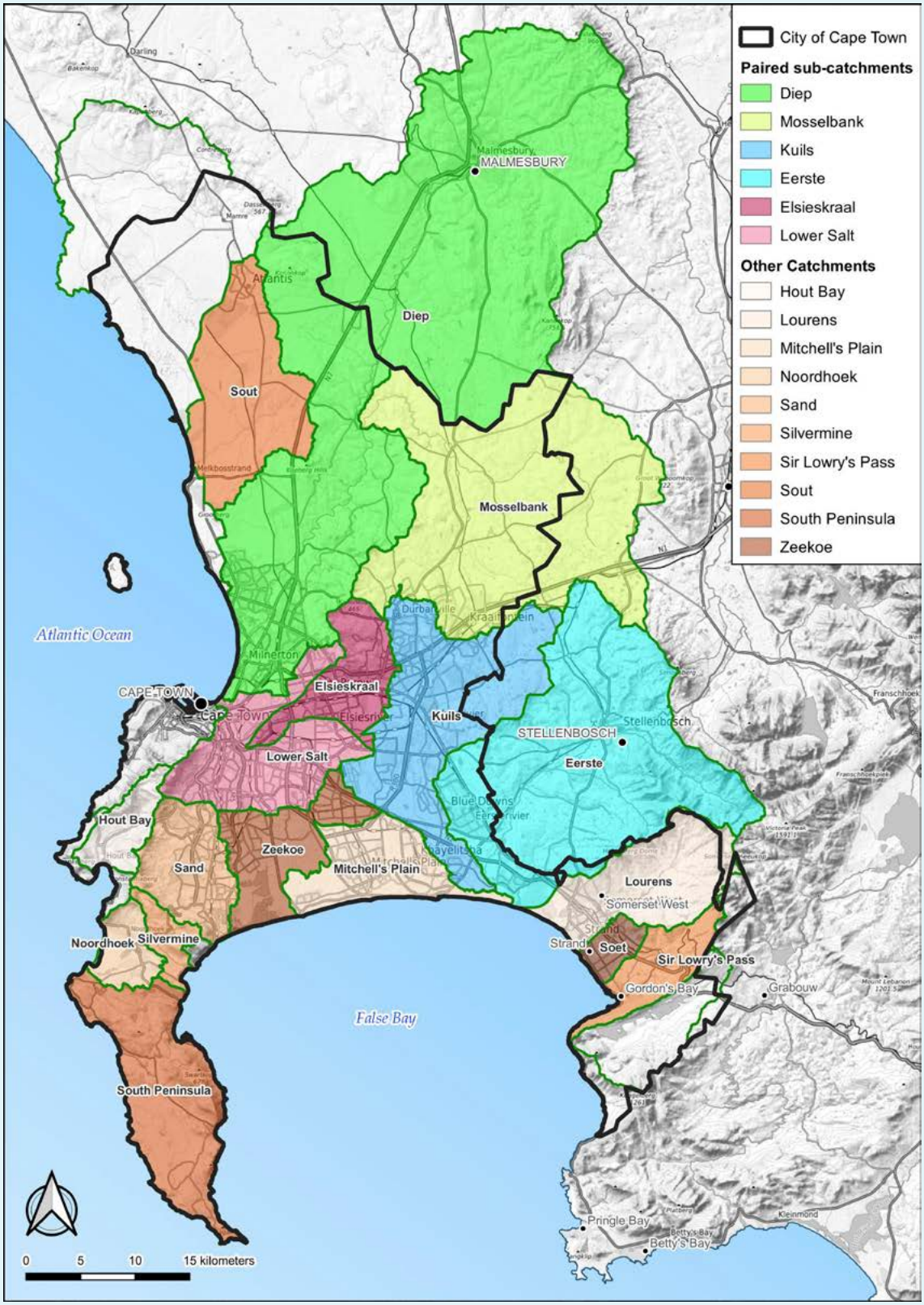


Figure 2.1

Cape Town's major catchments and watercourses. Note that the larger catchments (Eerste, Salt and Diep) have been subdivided into sub-catchments.

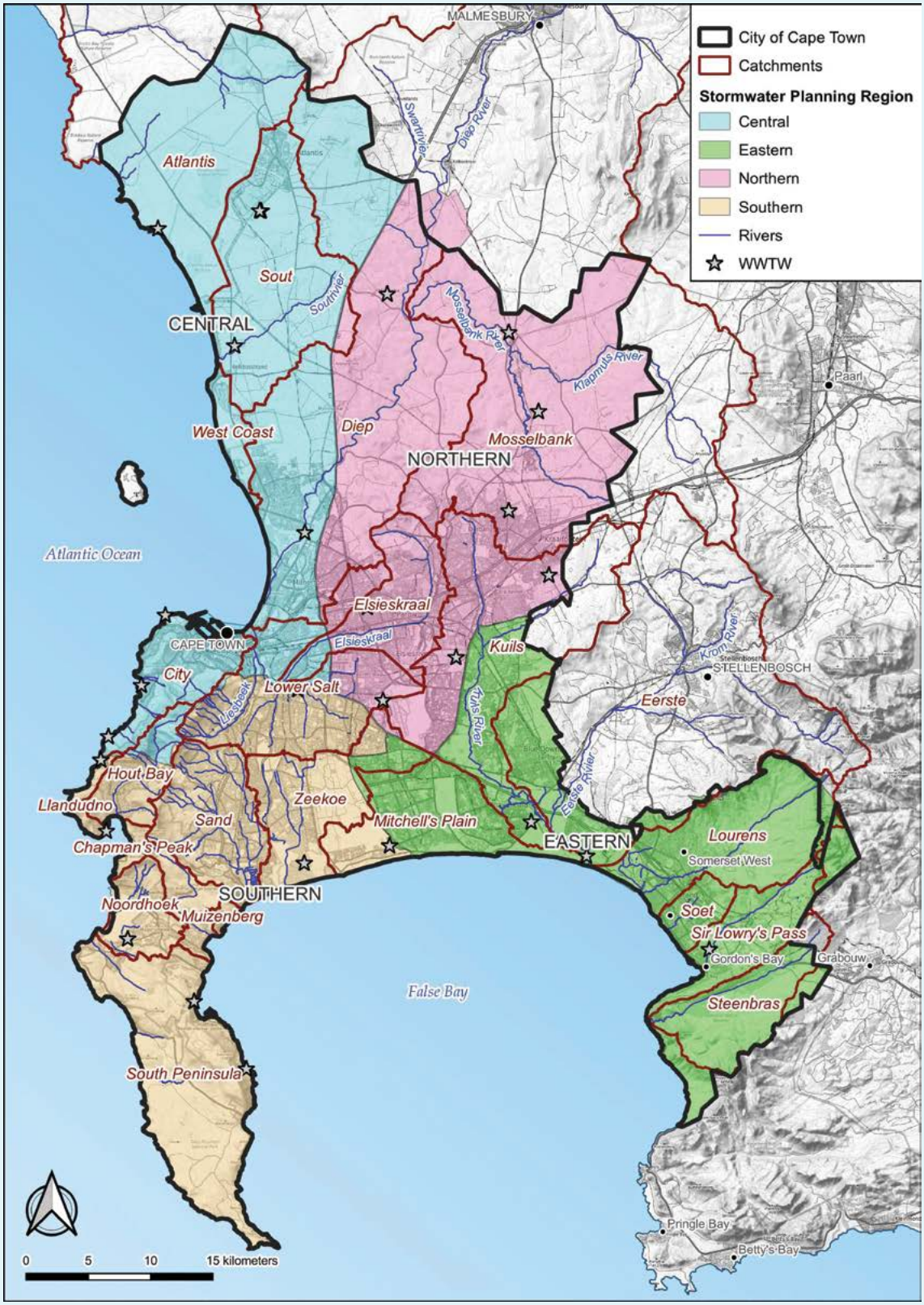


Figure 2.2

Relationship between the City's stormwater planning regions and Cape Town's river catchments.

2.3 MONITORING POINTS IN THE CITY'S INLAND WATER QUALITY MONITORING PROGRAMME

Water quality samples are currently collected by the City for analysis from 247 sampling points located on watercourses (rivers and wetlands/vleis) as well as estuaries, canals and stormwater outlets into the sea within the City's boundaries. This is an increase of 66 points over those reported on in the 2024 Inland Water Quality Report, reflecting efforts by the City to improve representation of a broader range of waterbodies in its monitoring programme as well as to increase monitoring in some areas where specific water quality issues have been noted and require data to inform interventions. The locations of the City's routine water quality monitoring points are shown in figure 2.3, with new points added in the 2025 reporting period highlighted. Only those new points for which a minimum of a full year of water quality data are available are included in this report. Tables in appendix A list sampling point locations, types and catchments.

It must be noted that until the above additions, the City's Water Quality Monitoring Programme had been designed primarily to monitor changes in watercourses where water quality is likely to be a cause for concern. Many of the monitoring points are therefore downstream of WWTW effluent discharge points, and in river reaches in catchments where runoff is likely to be contaminated. Some sampling points are located in watercourses that are used for religious rituals (e.g. baptisms) and/or recreational purposes (e.g. sailing, rowing and kayaking). Water quality data for such systems are thus used to provide information as to the fitness for use of these systems. An important result of this is, however, that since the sampling points used by the City have historically focused on problem areas, water quality data do still over-emphasise problem areas, and do not provide an overarching view of water quality in the City's rivers and wetlands as a whole.

2.4 WATER QUALITY VARIABLES CONSIDERED IN THIS REPORT

Data for the following water quality variables are referenced in this report (abbreviations are shown in brackets):

- Phosphorus nutrients, as measured in orthophosphate concentration (PO_4-P)
- Un-ionised (or 'free') ammonia (NH_3)
- Dissolved oxygen (DO)
- *Escherichia coli* bacteria (*E. coli*)
- Microcystin concentrations
- Chlorophyll-a (Chl-a)

The more detailed (now planned for five-yearly) water quality reports include reference to other variables, either directly measured or obtained by calculation, namely:

- pH (used to calculate ammonia toxicity)
- Electrical conductivity (as a measure of salinity)
- Total inorganic nitrogen (TIN) – through addition of NH_4-N and (NO_3+NO_2)-N
- NH_4:TIN – the ratio of NH_4-N:TIN
- TIN: PO_4P – as a ratio of TIN to PO_4-P
- Total phosphorus (Tot-P) – these data have not been available since December 2022, because of equipment breakdown at the City's Scientific Services Branch (SSB).

PUBLIC ACCESS TO WATER QUALITY DATA

Water quality data from the City's Inland Water Quality Database can be downloaded from its publicly accessible data portal [https://odp-CCTegis.opendata.arcgis.com/documents/inland-water-quality/about]. These data include most but not all of the monitored water quality variables (e.g. not total phosphorus) from routine inland and estuary monitoring points, from 2017 onwards. They are updated on at least a monthly basis.

LIMITATIONS OF WATER QUALITY DATA

Water quality data show only what the quality of water was like at the time of sampling and at the specific location where the sample was collected. The data cannot be used to infer future water quality (for example whether a waterbody is fit for swimming a day or even an hour after sampling, or to show what it was like immediately before sampling). 'Plugs' of pollution, for example, may be missed, or accidentally targeted by the timing of sampling. Furthermore, where watercourses are seriously contaminated, point-source pollution streams may be difficult to identify, because of the high level of general contamination.

The City's data provide information about a limited number of water quality constituents only – there may also be other kinds of pollutants in the water. For example, the City's routine water quality monitoring does not include analyses of heavy metals, hydrocarbons, or contaminants of emerging concern (CECs). CSIR (2025) analysed coastal waters around Cape Town and found that the greatest number of pharmaceutical compounds in sea water were associated with sites that are directly influenced by discharges from wastewater treatment works, highlighting these unmonitored but potentially problematic outputs into Cape Town's rivers, vleis, estuaries and coastline.

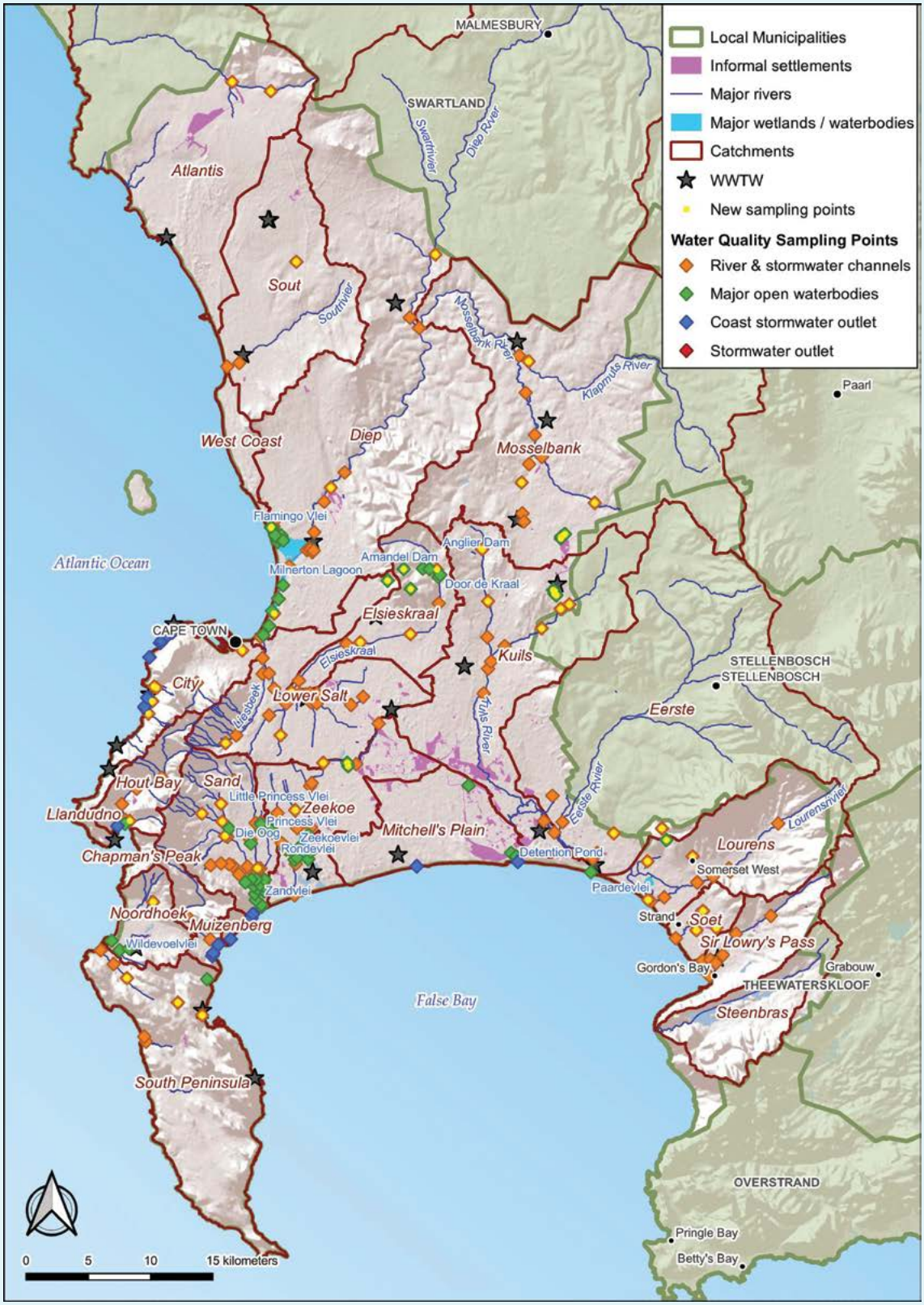


Figure 2.3

Locations of sampling points included in the City's Inland Water Quality Monitoring Programme. 'New' points (introduced in the 2025 reporting period) highlighted with yellow marker.

2.5 ANALYSIS OF WATER QUALITY DATA

Appendix F provides a brief summary of the key principles followed in data cleaning, preparation and analyses.

2.6 WATER QUALITY THRESHOLDS TO GUIDE DATA INTERPRETATION

Tables 2.1 and 2.2 outline the ranges in concentrations of key water quality variables used to guide data interpretation in this report, with regard to their implications for aquatic ecosystem condition. The ranges and thresholds distinguish between flowing water systems (rivers, channels and canals) and open water systems (dams, vleis, detention ponds and coastal lakes). Note that since the SSB has not had the capacity/equipment to analyse samples for total phosphorus since December 2022 (see Day et al., 2025), phosphorus concentrations in open water systems have been evaluated/rated using the orthophosphate criteria used for rivers.

Since orthophosphate phosphorus has been identified as posing the greatest risk to Cape Town's urban aquatic ecosystems (see Day et al., 2025, 2024 and 2020), and is present in many waterbodies at concentrations well above those already flagged as 'unacceptable' (that is, above the hypertrophic threshold for this variable), orthophosphate phosphorus concentrations have been further divided into different levels of enrichment (level 1: > 0,125 to 0,1 mg P/ℓ; level 2: > 1,0 to 10 mg P/ℓ; level 3: > 10 mg P/ℓ). These levels are displayed in this report in graphs depicting trends in orthophosphate concentration, as well as in **table 2.1**.

Tables 2.3 and 2.4 present the thresholds used to determine the risks that exposure to different waterbodies pose to human health on the basis of two key variables, namely *E. coli* bacteria (an indicator of exposure to raw sewage and other faecal sources from warm-blooded animals) and microcystin toxins, which can be associated with cyanobacteria (also called blue-green algae). Concentrations of these variables are evaluated in terms of the level of risk they pose to people undertaking 'intermediate contact' recreational activities (e.g. sailing, rowing, fishing), as opposed to swimming (full contact recreation).

The rationale/supporting data for the thresholds used in this report are outlined in detail in Day et al. (2025).

Table 2.1

Rating ranges for variables considered in this assessment of water quality in Cape Town's rivers.

Note: PO_4-P = orthophosphate phosphorus; TIN = total inorganic nitrogen; DO = dissolved oxygen; N:P = ratio of TIN:PO_4-P; NH_3 = un-ionised ammonia. Note also that the terms 'PO_4-P' and 'TIN' are abbreviations and are not the full chemical notation for these variables. TIN and N:P have not been analysed in this brief report but remain important water quality constituents for consideration in more detailed assessments (i.e. the planned five-yearly water quality reporting).

City water quality categories (CWQC)	Interpretation of CWQC	PO_4-P mg P/ℓ	TIN mg N/ℓ	DO mg/ℓ	N:P	NH_3 mg/ℓ
GOOD	TARGET	≤ 0,015 (oligotrophic)	≤ 0,70 (oligotrophic – mesotrophic)	> 7 ≤ 12	> 25	≤ 0,007
FAIR		> 0,015–0,025 (mesotrophic)	> 0,70–1,00 (mesotrophic)	> 6–7 ≤ 12		> 0,007–0,015
POOR	POOR	> 0,025–0,125 (eutrophic)	> 1,00–4,00 (mesotrophic – eutrophic)	> 4–6 OR > 12–15	10–25	> 0,015–0,1 (chronic toxicity)
UNACCEPTABLE	UNACCEPTABLE	> 0,125 (hypertrophic) Level 1: > 0,125 to 1,0 mg P/ℓ; Level 2: > 1,0 to 10 mg P/ℓ; Level 3: > 10 mg P/ℓ	> 4,00 (eutrophic – concentrations > 10 mg/ℓ classified as hypertrophic)	≤ 4 OR > 15	< 10	> 0,1 (acute toxicity)

Table 2.2

Rating ranges for variables considered in this assessment of water quality in Cape Town's vleis and dams.

Notes: TP = total phosphorus; TIN = total inorganic nitrogen; DO = dissolved oxygen; N:P = ratio of TIN:PO_4P; NH_3 = un-ionised ammonia; CHL-A = chlorophyll-a.

The terms 'PO_4-P' and 'TIN', etc. are abbreviations and are not the full chemical notation for these variables. TIN and N:P have not been analysed in this brief report but remain important water quality constituents for consideration in more detailed assessments (i.e. the planned five-yearly water quality reporting).

Since the SSB has not had the capacity/equipment to analyse samples for total phosphorus since December 2022 (see Day et al., 2025), vlei phosphorus concentrations have been evaluated/rated using the orthophosphate criteria used for rivers. The thresholds for these variables remain in this table, for ease of future reference.

City water quality categories	Interpretation of CWQC	Total phosphorus mg P/ℓ	TIN mg N/ℓ	DO mg/ℓ	N:P	NH_3 mg/ℓ	Mean annual Chl-a (mg/ℓ)
GOOD	TARGET	≤ 0,015 (oligotrophic)	≤ 0,7	> 7 ≤ 12	> 25	≤ 0,007	≤ 5
							> 5–10
FAIR		> 0,015–0,047 (mesotrophic)	> 0,7–1	> 6–7 ≤ 12		> 0,007–0,015	> 10–20
POOR	POOR	> 0,047–0,130 (eutrophic)	> 1,0–4,0	> 4–6 OR > 12–15	10–25	> 0,015–0,1 (chronic toxicity)	> 20–30
UNACCEPTABLE	UNACCEPTABLE	> 0,130 (hypertrophic)	> 4	≤ 4 OR > 15	< 10	> 0,1 (acute toxicity)	> 30

Table 2.3

Approach to the interpretation of microbial data (faecal coliforms including *Escherichia coli*). Note that *E. coli* were previously assessed using membrane filtration technology, resulting in presentation of data as cfu/100 mℓ (coliform-forming units/100 mℓ). They have, since late 2022, been analysed using the Colilert system, which gives results as the most probable number (of *E. coli* cells)/100 mℓ (MPN/100 mℓ). It is assumed for the purposes of this report that these units are similar enough to be disregarded, although the actual analyses themselves have different levels of accuracy and precision, and are based on fundamentally different measurement approaches.

Note the inclusion of additional levels of 'unacceptable' in these tables, to allow some differentiation of degrees of pollution.

Interpretation	**Inland systems** Faecal coliform count (including *E. coli*)
Target for maximum acceptable risk for full contact recreation	≤ 400 cfu/100 mℓ
Target – intermediate contact	< 1 000 cfu/100 mℓ
Acceptable risk intermediate contact	1 001–2 500 cfu/100 mℓ
Tolerable risk – intermediate contact	> 2 500–4 000 cfu/100 mℓ
Unacceptable risk – intermediate contact – level 1	> 4 000–10 000 cfu/100 mℓ
Unacceptable risk – intermediate contact – level 2	> 10 001–100 000 cfu/100 mℓ
Unacceptable risk – intermediate contact – level 3	> 100 000 cfu/100 mℓ

Table 2.4

Water quality grades and corresponding threshold concentrations for microcystin toxins for inland waters adopted for this project.

Interpretation	Microcystin concentration
Target (acceptable)	≤ 20 µg/ℓ
Medium risk (unacceptable)	> 20–30 µg/ℓ
High risk (unacceptable)	> 30–40 µg/ℓ
Extreme risk (unacceptable)	> 40 µg/ℓ

3. WATER QUALITY OVERVIEW

This section presents an overview of water quality data on a citywide level, providing a broad overview of patterns, concerns and trends in key water quality indicators assessed here. Water quality drivers (rainfall and key pollution sources, especially treated and untreated sewage effluent) are also discussed broadly here. Sections 4 to 20 consider water quality in more detail, at a catchment level.

3.1 GENERAL DATA INFORMING WATER QUALITY INTERPRETATION

3.1.1 RAINFALL

Analyses of rainfall data were included to provide background understanding of rainfall patterns in different City catchments, both over the current reporting period and over a longer-term period. The data showed lower total mean annual rainfall in the 2025 reporting period compared with the previous two years, driven by lower rainfall during the winter of 2025. A single rainfall event in June 2025 accounted for between one-third and one-half of total rainfall in that month, and resulted in widespread damage (erosion, sedimentation and sewer overflows as a result of stormwater ingress).

3.1.2 SOURCES OF NUTRIENTS AND HUMAN HEALTH PROBLEMS

Although informal settlements, as well as any areas with unserviced backyard settlements, contribute permanent streams of raw sewage into watercourses, usually by way of formal or informal stormwater systems, by far the greatest loading of sewage-associated pollutants into the City's watercourses is assumed to stem from formal sewage reticulation and treatment systems (WWTW). This is because of the much greater volumes of effluent associated with WWTW discharges (with loading being a measure of the total quantity of a pollutant that accumulates over a period of time).

3.1.3 IMPACTS OF WASTEWATER TREATMENT WORKS

The City has 25 WWTW, 16 of which pass effluent into inland aquatic ecosystems and are therefore considered in this report. These 16 WWTW treated approximately 546 Mℓ/day in total during the 2025 reporting period (see **appendix C** for summaries of the flow and effluent quality data), and this effluent is discharged into a number of different aquatic ecosystems. The remaining nine of the City's WWTW plants discharge directly to the marine or coastal environment. Cape Town's marine outfalls contribute approximately 5% of the total amount of wastewater produced in Cape Town, with 95% of Cape Town's wastewater discharging first into inland aquatic ecosystems, which lead to the sea via rivers and/or estuaries. Of these, the Cape Flats and Macassar WWTW discharge into estuaries in close proximity to the mouths of these systems.

The assessed data presented in **appendix C** highlighted the following key issues:

- The worst performing WWTW in terms of the data presented here were Athlone and Macassar, which were both 100% non-compliant with general effluent limits for TSS, COD, total ammoniacal nitrogen and *E. coli*, with only orthophosphate concentrations being mostly within the general limits.
    - Athlone WWTW is the City's third-largest effluent treatment plant, and during summer comprises almost 100% of the run of river flow in the Black River (lower Salt sub-catchment). This means that the poor effluent quality from the WWTW is effectively the summer run of river flow in the Black River, severely compromising its ecological functioning.
    - Macassar WWTW is the City's sixth-largest effluent treatment plant, and discharges into the Eerste River estuary.
    - High *E. coli* concentrations in final effluent suggest that disinfection by chlorination was not in practice (or effective) at either works over this reporting period, which is positive from an ecological perspective, since chlorination of waters with high concentrations of ammoniacal nitrogen results inter alia in the formation of persistent, highly toxic chloramines, but indicates generally poor sewage treatment that poses risks to downstream water users.
- The Cape Flats WWTW also performed extremely poorly, with only marginally better compliance results for COD and TSS compared with the Macassar WWTW. The maturation ponds of these works form part of the False Bay Nature Reserve (FBNR) Ramsar wetland site, and issues of high COD, high ammoniacal nitrogen and high TSS all suggest knock-on impacts to the Ramsar site.
- Zandvliet WWTW, the second-largest works in the City, performed best out of all of the works, achieving between 95% and 100% compliance with the general limits for all of the variables assessed in **figures C2 to C6**. This WWTW was recently upgraded, and the success of the upgrades appear to reflect in the quality of treated effluent.
- Potsdam WWTW, the City's fourth-largest treatment works and currently undergoing upgrades, also performed poorly in the 2025 reporting period, with high COD, TSS, and ammoniacal nitrogen concentrations well above general effluent limits and contributing to the ongoing deterioration of Milnerton Lagoon downstream (see section 6). High levels of compliance with general limits for *E. coli* at this site are, unfortunately, indicative of effective chlorine disinfection at the plant, where UV disinfection has been inactive for over three years, and it is again anticipated that additional unintended water quality impacts occurred in downstream receiving waterbodies (i.e. Milnerton Lagoon) due to the assumed but unmeasured production, in ammonia-rich water, of chloramines.
- Slightly better levels of performance were shown in the effluent quality of the City's fifth-largest WWTW (Bellville), with COD, TSS, ammoniacal nitrogen and orthophosphate data all lying above 80% compliant with general limits, although *E. coli* data fell to 55% compliance only. This system discharges into the Kuils River.
- Of the smaller WWTW, the worst-performing were Melkbosstrand and Klipheuwel WWTW.

- High levels of ammoniacal nitrogen and (associated) COD-characterised effluent from the Wesfleur Industrial outfall – one of the smaller WWTW but which nevertheless impacts on downstream water resources.
- The high levels of compliance across all City WWTW with regard to general limits for orthophosphate phosphorus mask the fact that the general limits at 10 mg/ℓ of phosphorus in orthophosphate **lie two orders of magnitude above the threshold for hypertrophic ecosystems** – this is an important note for naturally seasonal watercourses such as the Black and Kuils rivers where, at least in summer, the majority of flows derive from WWTW effluent releases.
- Overall, the City's WWTW contribute some 1 747 kg p/day to Cape Town's watercourses. This is a significant load, and one that most likely derives mainly from sewage as well as washing and personal hygiene detergents (laundry soaps, shampoos, soaps, etc.).

3.1.4 PUMP STATION OVERFLOWS

During the 2025 reporting period, 694 pump station overflows were recorded from 204 pump stations (see section D2 in **appendix D**). Of these, 47 pump stations overflowed five or more times during the year, suggesting repeated and possible systemic problems either in that part of the catchment (e.g. communities prone to dumping or disposing of inappropriate waste into sewers) or in the sewerage system itself (e.g. old infrastructure, lack of maintenance). **Table D2** ranks pump stations by number of overflows, with the Koeberg Road pump station clearly being the worst-offending, with 45 overflows over this period, followed by West Beach (Diep River catchment) (25 overflows), Nooiensfontein (Kuils River catchment) (16 overflows), Philippi Phase 4 (Zeekoe catchment) (15 overflows) and Summer Greens (Diep River catchment) (also 15 overflows). Prioritisation of repairs to, or redesigns of, these 13 pump stations should be an item for urgent consideration by the City.

With regard to the levels of pump station failure, one 'catastrophic failure' was reported from the Table View East pump station in the Diep River catchment, just north of Potsdam WWTW. This failure lasted three days and took place in early April 2025. It should be noted that this pump station also gave way to a catastrophic failure in the 2024 reporting period (Day et al., 2025).

Five 'major spills' were also recorded, variously from the Mosselbank, Zeekoe, Sand, Diep and City Bowl catchments. The other recorded overflows were rated as moderate (104), minor (levels 1 and 2 together) (366) and insignificant (221). Even small-scale overflows however, if repeated frequently or in combination with other overflows and pollution sources in a catchment, can have significant impacts on downstream water quality over time.

With regard to the cause of pump station failure, these data were limited in the dataset, with reasons outlined in only 148 of the total 694 recorded incidents. This is unfortunate, as it means that measures to systematically reduce the frequency and magnitude of pump station failures are more difficult to formulate without hard evidence.

3.1.5 SEWER MANHOLE OVERFLOWS

Manhole overflow data (see section D3 in **appendix D**), which unfortunately show little change since the 2023 and 2024 reporting years assessed in Day et al. (2025), indicate that, over the 2025 reporting period:

- The hotspots for sewage overflows, based on reported incidents, lay in the lower Salt, Kuils, Zeekoe, Soet and Elsieskraal catchments, as follows:
  - Lower Salt – Bonteheuwel, Ruyterwacht, Kewtown and Manenberg areas;
  - Kuils – Delft, Kalkfontein and Belhar areas;
  - Zeekoe – Manenberg, Crossroads/Gugulethu, and along the Parklands and Grassy Park areas;
  - Soet – Nomzamo, Strand and Lwandle areas; and
  - Elsieskraal – Goodwood and Epping areas, along both edges of the Elsieskraal River.
- Other significantly affected catchments or sub-catchments included:
  - The Diep River – there were, however, low levels of reporting across most of the sub-catchment;
  - Mitchells Plain (particularly in the Westridge, Eastridge, Tafelsig and Beacon Valley areas);
  - The Eerste River in the Faure and Macassar areas;
  - The Sout – northern corner of the catchment, including Witzands and parts of Atlantis; and
  - South Peninsula – northern corner including Ocean View.

Of the above, areas with the most intense levels of sewage overflows were those with high levels of informal settlement and/or backyard dwellings. These same sub-catchments are characterised by an accumulation of solid waste that is likely to contribute to the frequency of sewer blockage, along with an increased likelihood of vandalism of sewers and pump stations as a result of a range of socio-economic conditions.

3.1.6 RAW SEWAGE AND GREYWATER IN STORMWATER FLOWS

Not directly measured, other than in the inland water quality dataset (discussed below), is another serious issue affecting watercourses almost throughout the city – namely, raw sewage and greywater (from domestic use such as cooking and washing), which enter the stormwater system from informal settlements and other areas where access to formal piped sanitation is often limited or difficult (e.g. many backyard dwellings). While many of these areas have access to potable running water, often provided through shared communal standpipes, the disposal of this same water as a waste product is seldom catered for, resulting in streams of waste into the stormwater system and then into the watercourses. In some areas, such as the upper reaches of the Big Lotus River, these waste streams account for a significant portion of the river's flows, entering as strong, permanent flows.

This pollution source is a major threat to inland water quality and has knock-on effects on water quality in Cape Town's estuaries and coastal areas as well. Of the 15 catchments listed in section 1.6 and described in sections 4 to 20 of this report, only the Lourens River, Muizenberg, Sout and Silvermine catchments are considered relatively unimpacted to date by this issue. It affects the fitness for use of many of the City's waterways and drives eutrophication, the development of hypoxic conditions and threats to human health and natural ecosystems.

3.2 OVERVIEW OF KEY WATER QUALITY PARAMETERS AND THEIR TRAJECTORY IN CAPE TOWN'S WATERCOURSES

This section provides a broad overview of water quality across Cape Town's catchments, drawing on water quality data for a selected number of water quality variables, and using summary data and mapped outputs to describe water quality generally. Sections 4 to 20, which focus on water quality in individual catchments, will be more useful for understanding issues, trajectories and trends on a more detailed (but still broad) level.

It draws on **figures 3.1 and 3.2**, which provide summary data for all sites in each catchment for which there are data, presenting these as percentages of the assessment categories outlined in **tables 2.1 to 2.3**. The figures include all data for the catchment, including stormwater outlets to the sea, which do not pass into inland watercourses but do reflect catchment condition.

Figures 3.3 to 3.7 present summary annual data for five key variables at the level of individual sites, allowing a quick overview of the most problematic areas in the City's catchments. The data are provided as median annual data for all variables save *E. coli*, for which geometric[1] mean data are instead provided, as a more appropriate form of summary reporting for this variable. It must be stressed that these summary data are simplistic, in that they do not indicate the range of data around median or mean values. More detailed water quality reporting, anticipated to be provided on a roughly five-yearly basis going forwards, will include, as per previous Inland Water Quality Reports (Day et al., 2020, 2023, 2024, 2025), summary box-and-whisker data plots, which will provide more detailed statistical information about the data spread and its variability. These have not been provided in this report, which aims to present relatively brief and broad overviews of the main water quality parameters in each of the City's monitored catchments.

[1] The geometric mean (GM) is a type of average, which is often used as a measure of central tendency for bacteria concentrations and other datasets with a large range of variability. While the arithmetic mean finds the average by summing the values and dividing by the number of observations, the GM finds the average by multiplying and then taking a root of the product. The GM tends to dampen the effect of very high or low values to a greater degree than the arithmetic mean. If the variable of interest has a log-normal distribution, the GM is the same as the median for that dataset (Vogel, 2020), although random differences can be expected in practice, depending on the number of samples and the sampling frequency (DWAF, 1996). It is important to be aware that the GM is extremely sensitive to both the underlying distribution of a dataset and its skewness, as well as differences in sample size (Vogel, 2020).

3.2.1 INDICATORS OF RAW SEWAGE POLLUTION (*ESCHERICHIA COLI*)

Figure 3.1 suggests that the catchments most impacted by raw sewage, as shown by high *E. coli* levels, particularly in the unacceptable level 3 category (see **table 2.3**) in the 2025 reporting period comprised:

- Mitchells Plain (100% unacceptable level 3 – but note that this catchment has only four sites, all located in artificial detention ponds);
- The lower Salt sub-catchment of the Salt River;
- The relatively small Soet catchment (86% of samples were rated unacceptable with 81% in levels 2 and 3, again showing very high and sustained pollution levels); and
- The Kuils and Eerste sub-catchments of the Eerste River.

Catchments where sewage pollution was seemingly of relatively low magnitude and frequency comprise the Sout, South Peninsula, Sand and Noordhoek catchments. Nevertheless, the data do show that at least some samples in all but the Sout catchment were still exposed to sewage flows resulting in very high *E. coli* levels (affecting between 18% and 6% of samples). The Sout River catchment has only two sample sites; it is a relatively clean catchment with low informal settlement presence, and the Melkbosstrand WWTW within this catchment chlorinates its effluent discharges.

A relatively high frequency of samples impacted by sewage flows in the generally well-performing Silvermine catchment is of concern, but reflects mainly polluted stormwater outflows into the sea, rather than the river.

This nevertheless highlights the need for attention to sources of sewage in the urban areas of Fish Hoek.

On the other hand, catchments such as the Zeekoe and the Diep, known to be gravely

SEWAGE AND WATER QUALITY

Sewage is a threat to water quality because, as it breaks down, it releases phosphorus and nitrogen nutrients. Furthermore, it requires oxygen for its decomposition and thus often results in oxygen depletion in aquatic ecosystems. If low oxygen conditions are prolonged, anaerobic processes may dominate, resulting in the production of toxic hydrogen sulphide and methane gases. Moreover, since sewage is often associated with high concentrations of ammoniacal nitrogen from uric acid and decomposition of organic waste, the common treatment of *E. coli* bacteria in WWTW effluent with chlorine can result in the creation of persistent, highly toxic chloramines in downstream systems. Sewage is also a source of pharmaceutical products, microplastics and other potentially toxic chemicals of emerging concern. From a human health perspective, raw or poorly treated sewage is also associated with potentially harmful bacteria, parasites and other pathogens.

affected by raw sewage inflows, had 60% and 57% (respectively) compliance. These data, however, reflect the number of samples in wetlands (Rondevlei, Zeekoevlei, Princess Vlei and Rietvlei) in which *E. coli* levels are usually reduced through exposure to sunlight and dilution.

Generally, the compliance-type monitoring data provide broad overviews of water quality data but not much more information, and their main value is probably in year-on-year comparisons, assuming new sites are not added.

More useful summary data are provided in the map shown in **figure 3.3**, which shows which parts of the catchments are more or less impacted by raw sewage inflows.

The worst-impacted catchments or parts of catchments generally comprised (moving east to west across the city): the lower Sir Lowry's Pass, the Soet, the Kuils including the Bottelary River; the lower Salt, lower Elsieskraal, Zeekoe, Diep, upper Mosselbank, City Bowl, and lower Hout Bay tributary. All of these areas were seemingly characterised by very high levels of *E. coli* and affected by the multiple negative consequences of sewage inflows.

More positively though, the map highlights areas that were less impacted, and where the data reflected generally acceptable *E. coli* levels and (with the exception of examples such as the Sout catchment where *E. coli* is treated with chlorination) lower frequencies and/or magnitudes of sewage inflows. Such areas include:

- The upstream reaches of the rivers of the South Peninsula – the lower reaches of the Bokramspruit and Schusters rivers showed a downward trajectory, assumed to be linked mainly to informal settlement expansion and poor pollution control in the Ocean View settlement, resulting in frequent sewer blockages and overflows;
- The southern rivers draining into the Atlantic Seaboard in the City Bowl catchments;
- The Else and Silvermine rivers;
- The Liesbeek sub-catchment of the lower Salt;
- The Sout and (upstream) parts of the Modder (Atlantis) catchments to the north of the city;
- The dams of the upper Elsieskraal sub-catchment;
- The Lourens and upper Sir Lowry's Pass catchments;
- The important recreational vleis and estuaries comprising Rietvlei, Zandvlei, Zeekoevlei and Princess Vle; and
- The upper Moddergatspruit and its tributary inflows into the south eastern part of the Eerste River catchment.

The above catchments/areas need to be carefully managed and safeguarded from sewage inflows from expanding or establishing informal settlements; failing sewer reticulation and pump station infrastructure; and inadequate solid waste management that threatens formal sewage reticulation.

3.2.2 PHOSPHORUS NUTRIENTS

Phosphorus enrichment has been noted in previous Inland Water Quality reports (e.g. Day et al., 2025) as the most pressing water quality issue affecting Cape Town's inland watercourses, and is the driver of major ongoing expenditure in the form of alien aquatic plant removal and reed control interventions. Where such management interventions falter, flooding and other associated risks increase, while the blue-green algal blooms that persist in some of the City's recreational vleis, at least at times, are the direct result of excessive phosphate enrichment. Vlei closures (e.g. Zeekoevlei's closure in December 2024/January 2025, and again, for a much longer timeframe, at the time of writing this report) are also the result of this issue.

Sewage, and, in particular, inflows of treated sewage effluent (largely because of their greater volume) are the primary contributors to the phosphorus enrichment problem afflicting many of Cape Town's watercourses. It is especially problematic for recreational vleis, where this nutrient can accumulate in these standing water systems, and be recycled into the water column by wind and wave action and changes in chemical conditions (e.g. low oxygen concentrations).

Orthophosphate data are presented here per catchment (**figure 3.1**), subject to the limitations in interpretation already discussed, and also spatially, albeit at a broad citywide level, in **figure 3.4**. A major limitation of the current water quality monitoring programme must, however, be noted upfront. That is, up until December 2022, SSB's limits of detection for orthophosphate phosphorus were reported as < 0,01 mg P/ℓ. From this date, however, the analytical equipment used by SSB for these analyses ceased functioning, and the laboratory now uses equipment with a limit of quantification (LOQ) of > 0,1 mg P/ℓ (see **appendix G**). This is an order of magnitude increase in the detectable concentrations of phosphorus, and has resulted in the fact that any data, no matter how low their actual phosphate concentrations are, will at best lie within the 'poor' range for all systems.

The above notwithstanding, **figure 3.1** (orthophosphate phosphorus) and **figure 3.4** allow the following broad conclusions to be drawn:

- The analytical methods currently in use do not allow for the identification of catchments or parts of catchments where watercourses are not impacted by elevated orthophosphates – all areas are categorised as poor and there is no way of tracking changes (improvement or deterioration) in low-nutrient systems, where even small changes could result in major ecological shifts.
- The data do show that catchments/sub-catchments most impacted by high orthophosphate concentrations comprise:
    - The Mitchells Plain, Sout, Mosselbank, Kuils and Diep systems, all with 90% or more of samples having orthophosphate concentrations above the unacceptable threshold for this nutrient (i.e. in a hypertrophic condition) and often orders of magnitude higher;

- Catchments with 60–90% of samples above unacceptable/hypertrophic thresholds comprised the Eerste (sub-catchment), Noordhoek, Soet and Zeekoe catchments, where nutrient enrichment drives a deterioration in wetland condition in particular; and
- Catchments least impacted by phosphorus enrichment comprise the City Bowl catchments, the Hout Bay, Lourens, Elsieskraal, Sand, Silvermine and South Peninsula catchments, all of which had ≤ 10% of samples in the unacceptable range in the 2025 reporting period. With the exception of the Hout Bay catchment, none of these have major informal settlements or WWTW discharges, all associated with orthophosphate loading.

- Spatial data mapped at a site level in **figure 3.4** support the above comments and suggest that:
  - Catchments such as Hout Bay and the Atlantis (Modder River) catchments show data that are skewed by a few (or single) sites downstream of point-source inflows, while their upper reaches remained in a relatively low nutrient-enrichment condition (poor);
  - Phosphate enrichment was extremely high in the Noordhoek wetlands, Milnerton Lagoon, the Kuils River, Soet River(s), Bottelary River (Kuils sub-catchment), Sout, Mosselbank and Diep sub-catchments, including the lower Diep and Milnerton Lagoon, lower reaches of the Black River through the lower Salt sub-catchment, the Big Lotus River and Zeekoe canal (Zeekoe catchment) – these systems are all fed by the City's WWTW and some have high levels of informal settlement in their catchments as well; and
  - Recreational vleis such as Zeekoevlei and Rietvlei were also in a hypertrophic condition, but with median annual data showing enrichment at lower levels.

- Chlorophyll-a and microcystin toxin data summarised in **appendix G** of this report show that mean annual chlorophyll-a concentrations (a surrogate measure of green algal concentrations in waterbodies) were above the unacceptable threshold of 30 µg/ℓ in all assessed waterbodies, other than the off-channel Die Oog wetland in the Sand catchment. Princess Vlei, Rondevlei and Zeekoevlei mean annual concentrations, however, far exceed those in other waterbodies, with the 2025 value for Zeekoevlei being 588,9 µg/ℓ, followed by Princess Vlei at 103,6 and Rondevlei at 95,6 µg/ℓ – all values suggestive of very high nutrient enrichment.
- Linked to the above are data for microcystin toxin concentrations, with Zeekoevlei the only system in which testing of microcystin toxin levels over the 2025 reporting period showed data to lie above levels of acceptable risk (see **table 2.4**), leading to vlei closure over a period of a few weeks.

The data suggest that an effective way to reduce orthophosphate concentrations in the City's waterways generally, and those affected by WWTW effluent and greywater inflows in particular, would be to bring in stimuli for the use of zero-phosphate detergents and to focus on achieving at least general limits, but preferably limits of an order of magnitude lower, in existing inland WWTW. Improving the treatment of raw sewage and greywater from informal settlements should also be a clear priority.

3.2.3 UN-IONISED (OR FREE) AMMONIA AS A TOXIN

Un-ionised ammonia data are reported on here because this compound is toxic to many aquatic organisms at concentrations as low as 0,1 mg/ℓ (DWAF, 1996 and 2008). Ammoniacal nitrogen generally (also referred to as total ammonia nitrogen) is associated with raw sewage (from the initial breakdown of organic waste as well as from urea), but also with treated sewage effluent and generally with areas in which decomposition of organic materials including plants occurs, under conditions of limited oxygen, which limit nitrification to nitrites and nitrates and result in an accumulation of ammoniacal nitrogen, some of which is in the form of un-ionised ammonia (NH_3).

Un-ionised ammonia data for sites included in the City's inland water quality data for the 2025 reporting period are shown in **figure 3.2**, summarised by catchment, and in **figure 3.5**, showing median annual data across all sites in the city. Drawing on the above discussion, these data suggest that:

- Catchments where high ammonia concentrations (resulting in acute or chronic toxicity) were most prevalent were Mitchells Plain and Kuils, where > 62% of samples were rated as above concentrations likely to result in acute toxicity to sensitive fauna.
- It should, however, be noted that sustained long-term pollution into these and many other systems in the city mean that there are probably no remaining sensitive fauna in these systems. However, the data should be taken cognisance of, as they indicate systems where water quality may well pose limitations on ecosystem rehabilitation opportunities.
- The Sout, Silvermine, Lourens, City Bowl, Hout Bay, South Peninsula, Atlantis (Modder River) and Sand catchments were all systems that showed very low levels of potential ammonia toxicity (< 20% of samples classified as above acute toxicity/unacceptable thresholds).
- In fact, most sites mapped across the City's catchments had median values of acceptable for this variable, suggesting periodic pollution flows in some areas that drove toxicity ratings – but in least-impacted systems that still retained sensitive fauna, would have had the most severe consequences.
- Catchments where median annual (2025) data for most sites were not in the acceptable range comprised the catchments already identified as associated with high levels of raw sewage and poorly treated WWTW effluent (see **appendix C**), namely the lower Sir Lowry's Pass, Soet, lower Kuils through to the Bottelary, Zeekoe (Big Lotus River sub-catchment), lower Salt, lower Diep, and parts of the Noordhoek wetlands (affected by runoff from the Wildevoëlvlei WWTW as well as from informal settlements in the wetland in the Masiphumelele settlement area).

3.2.4 DISSOLVED OXYGEN

Oxygen is critical for the respiration of all aerobic organisms, and, in aquatic ecosystems, adequate supplies of dissolved oxygen are needed for the survival of all non-air-breathing organisms. In aquatic ecosystems, it is sourced from atmospheric oxygen that dissolves in water, particularly if there is turbulent flow or wind-generated waves. It is also generated by submerged aquatic plants and algae during photosynthesis.

Low oxygen availability, particularly if combined with high temperature, can compound impacts on aquatic organisms, and can increase the toxicity of certain toxic substances such as various heavy metals (e.g. zinc, lead, copper) as well as sulphides and ammonia (DWAF, 1996a). In conditions where dissolved oxygen is limited, important nutrient cycling may be retarded. For example, oxidation of ammonia (NH_3) to nitrite (NO_2-) and then nitrate (NO_3-) may occur only very slowly, resulting in the accumulation of potentially toxic un-ionised ammonia. This is especially problematic for aquatic systems that are polluted with nitrogen-rich contaminants such as sewage. In standing waterbodies (e.g. vleis and dams), oxygen concentrations are also important in determining phosphorus release from sediments. At low oxygen concentrations, phosphorus can be released as biologically available orthophosphates, contributing to ongoing cycles of increased plant productivity (Cooke et al., 2005).

Dissolved oxygen concentrations vary with temperature and salinity/conductivity. Variations in photosynthesis through the day also mean that concentrations of dissolved oxygen also vary on a daily basis, with the highest concentrations occurring in mid-afternoon and lowest concentrations usually occurring near dawn. Exposure to water with very low dissolved oxygen concentrations can trigger immediate death for some non-air-breathing organisms, as in the case of some fish kill incidents. Continuous exposure to water with non-lethal but sub-optimal concentrations may also be very harmful to aquatic organisms, including impacts on fish fecundity and/or mortality (DWAF, 1996a). Dissolved oxygen concentrations greater than that in air (i.e. super-saturated or > 100% dissolved oxygen percentage saturation) can also occur in waterbodies dominated by algae or aquatic plants as a result of photosynthesis during the day. These can also have negative impacts on aquatic ecosystems.

Drawing on the above, DO data generated for the City's Inland Water Quality Programme and summarised in **figures 3.2 and 3.6** allow the following broad comments to be made, considered in more detail in sections on individual catchments across the city:

- All catchments included some samples that showed low DO concentrations below critical levels and rated unacceptable or rated poor, indicating conditions that, if sustained, could result in chronic effects on the health of ecosystems or sensitive individual taxa.
- Most of the 'unacceptable' ratings related to very low DO concentrations, with only a few linked to excessive DO concentrations, assumed to be associated with rapid photosynthesis under hypertrophic conditions.

- Catchments where low DO concentrations appeared to be of most concern (> 50% of samples rated as unacceptable) comprised the Soet, Kuils, lower Salt, Mosselbank and Mitchells Plain catchments/sub-catchments – all systems subject to high levels of organic loading from treated and untreated sewage waste.
- When summary data for individual sites are considered (**figure 3.6**), they suggest that:
    - Low DO concentrations (unacceptable range) indeed characterised sites in the catchments already identified as areas of concern with regard to high *E. coli*, high orthophosphate and elevated free ammonia concentrations.
    - DO concentrations were generally of low concern in the monitored wetlands, including the City's major recreational vleis (Zeekoevlei, Rietvlei and Princess Vlei) as well as Zandvlei estuary, where median annual DO concentrations were generally in the acceptable range. The exception to this was one site in the upper reaches of Zeekoevlei, where samples were rated as unacceptable and deteriorating, and associated with inflows from the highly polluted Big Lotus River, in which DO was consistently low and rated as unacceptable.
    - DO concentrations in Milnerton Lagoon were also rated as low and generally in the unacceptable range, reflecting the lower reaches of the Diep estuary, which have been plagued over the past few years by highly polluted inflows of water with high levels of organic material, including raw sewage, primarily from the Koeberg pump station, and poorly treated sewage effluent from Potsdam WWTW (Rose et al., 2025a and b). The Potsdam WWTW and the Koeberg pump station are currently being upgraded.
    - All sites flagged as having low DO in the unacceptable range are shown in this figure as having deteriorated over the past year, suggesting that there has been little positive impact on factors driving this condition.
- Low DO concentrations also mean that chemical processes such as nitrification of ammonia to nitrates and nitrites may not take place effectively, particularly in hypoxic conditions. This is evident in the discussion of data for un-ionised ammonia (section 3.2.3).
- While the City's recreational vleis do not generally show that DO concentrations were problematic, chemical oxygen demand (COD) data for the recreational vleis, presented in summary form in **figure 3.7**, paradoxically show high median COD concentrations at sites in all of these systems. These data are useful and highlight the dual effects of excessive nutrient enrichment and inflows of organic pollutants (mainly raw or poorly treated sewage) in all of these waterbodies. That is, while dissolved, biologically available nutrients, especially orthophosphate phosphorus, trigger photosynthesis, mainly by algae, resulting in high diurnal DO concentrations, organic pollutant loads, including decaying algae, require oxidation.
- The high COD concentrations shown in the figure thus highlight the ongoing threat, especially in the summer, of nocturnal/early morning fish die-offs in these systems as a result of the high nocturnal COD that is not offset by photosynthesis.



Figure 3.1

Summary water quality data for Cape Town's monitored inland aquatic ecosystems, shown per catchment, and presented as compliance-type data, showing percentage of all samples that fall into pre-allocated categories, as per tables 2.1 and 2.3. Data include (top) (geometric) mean annual *Escherichia coli* data; (bottom) median annual orthophosphate phosphorus (PO_4-P) data.



Figure 3.2

Summary water quality data for Cape Town's monitored inland aquatic ecosystems, shown per catchment, and presented as compliance-type data, showing percentage of all samples that fall into pre-allocated categories, as per tables 2.1 and 2.3. Data include (top) median annual ammonia (NH_3) data, (bottom) median annual dissolved oxygen (DO) data.

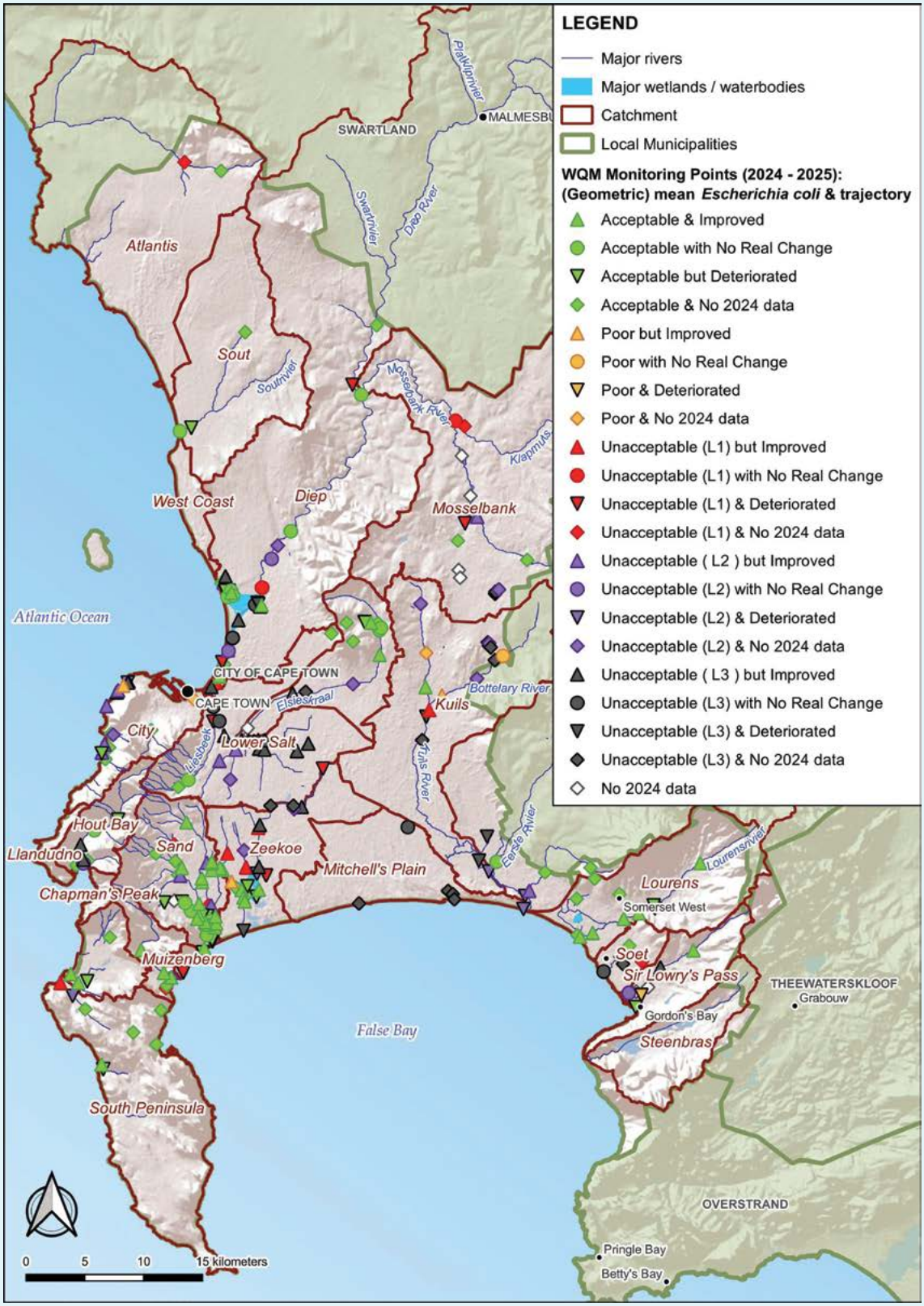


Figure 3.3

Geometric mean annual *Escherichia coli* data, for all sites included in the City's routine Water Quality Monitoring Programme. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory and condition calculations explained in appendix E.

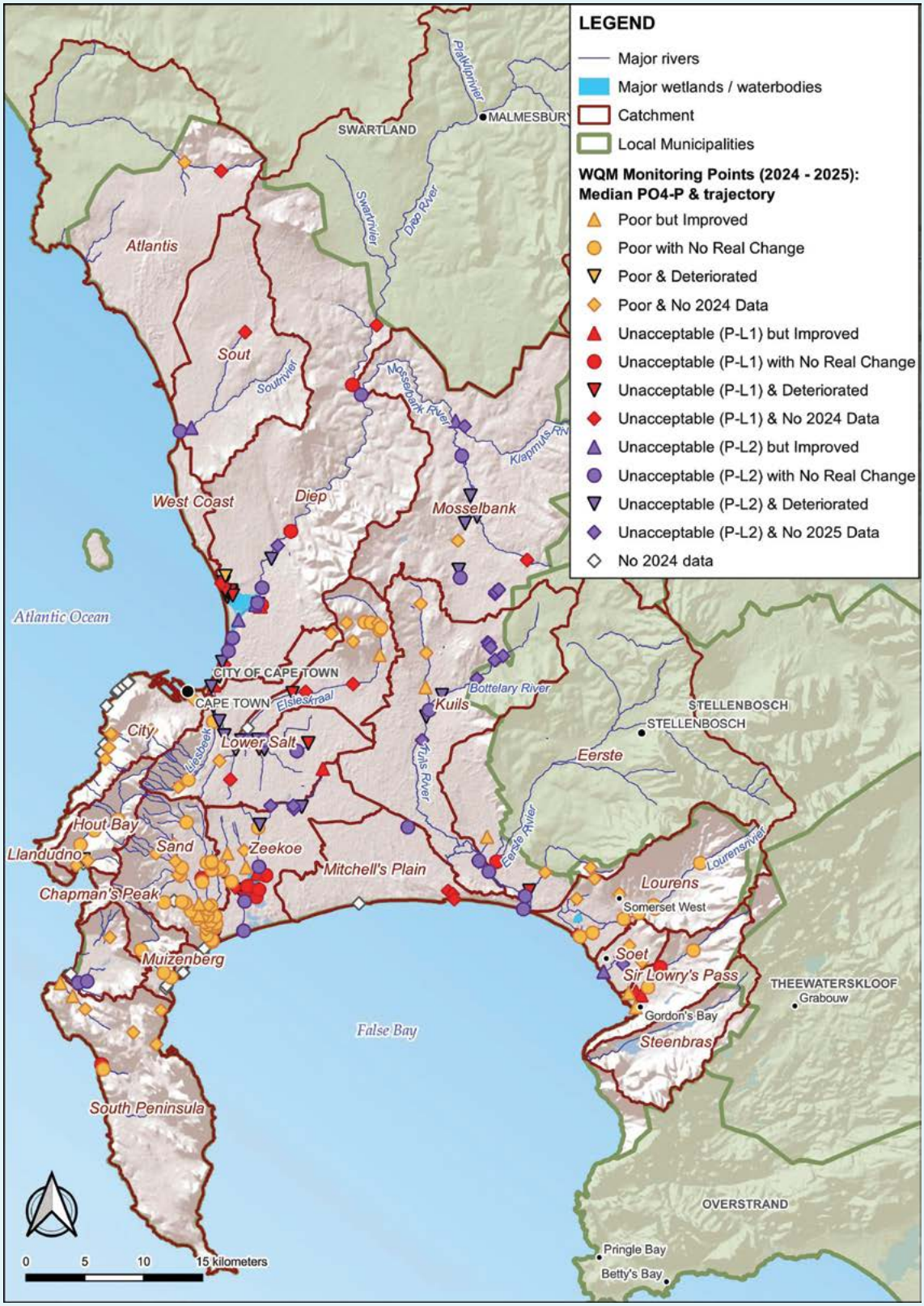


Figure 3.4

Median annual orthophosphate phosphorus (PO_4-P) concentrations, for all sites included in the City's routine Water Quality Monitoring Programme. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory and condition calculations explained in appendix E.

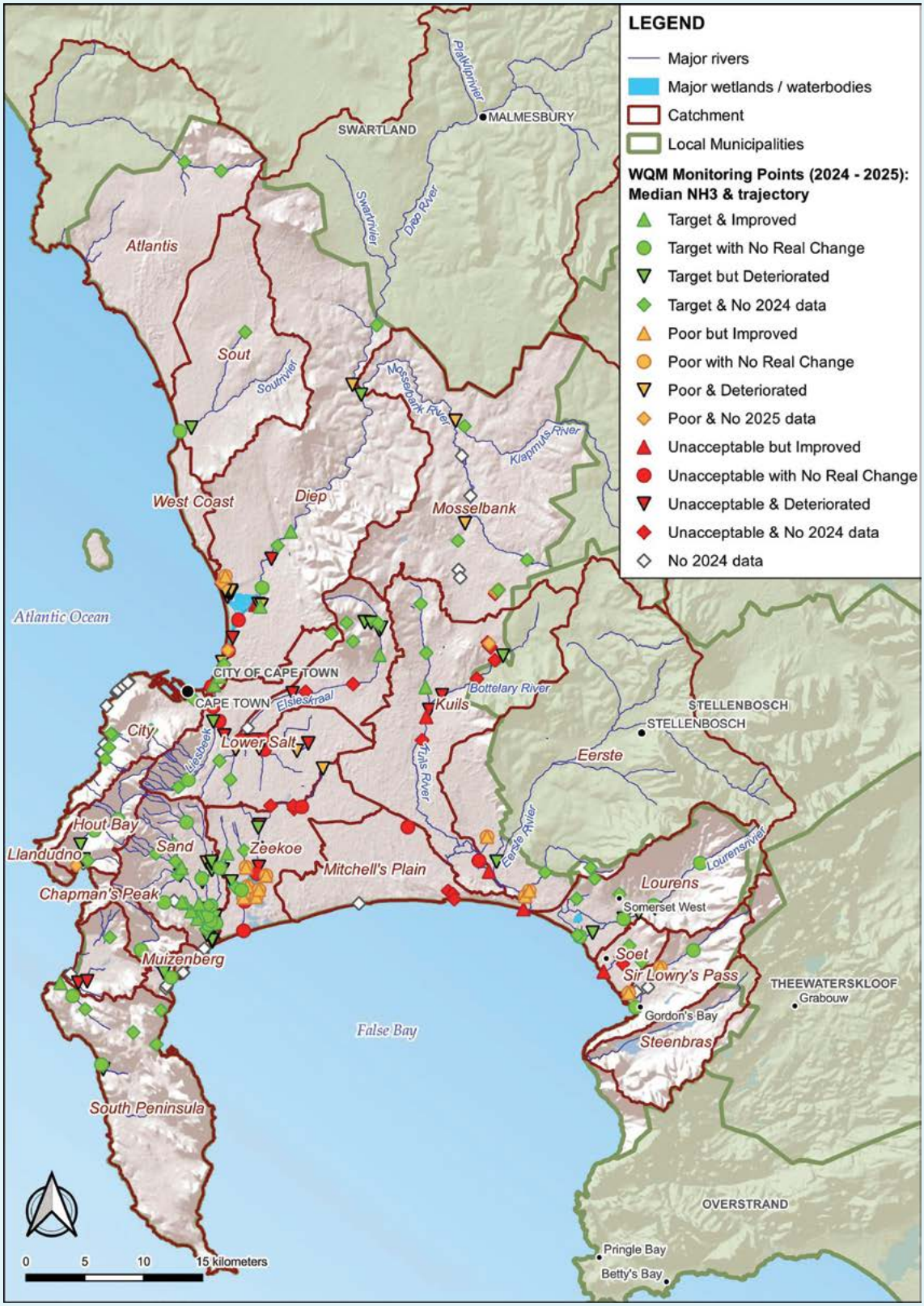


Figure 3.5

Median annual un-ionised (or free) ammonia (NH_3) concentrations, for all sites included in the City's routine Water Quality Monitoring Programme. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory and condition calculations explained in appendix E.

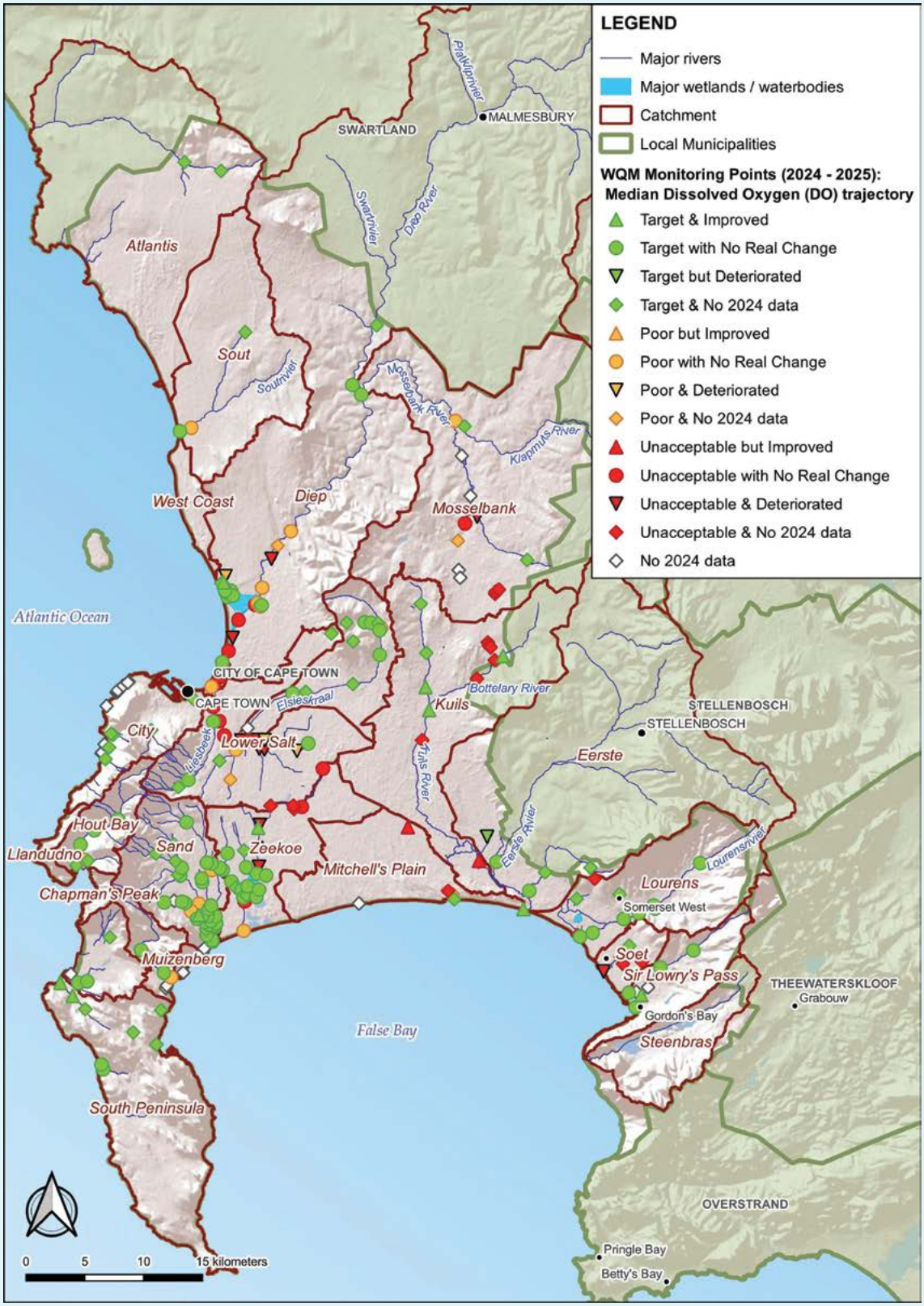


Figure 3.6

Median annual dissolved oxygen (DO) concentrations, for all sites included in the City's routine Water Quality Monitoring Programme. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory and condition calculations explained in appendix E.

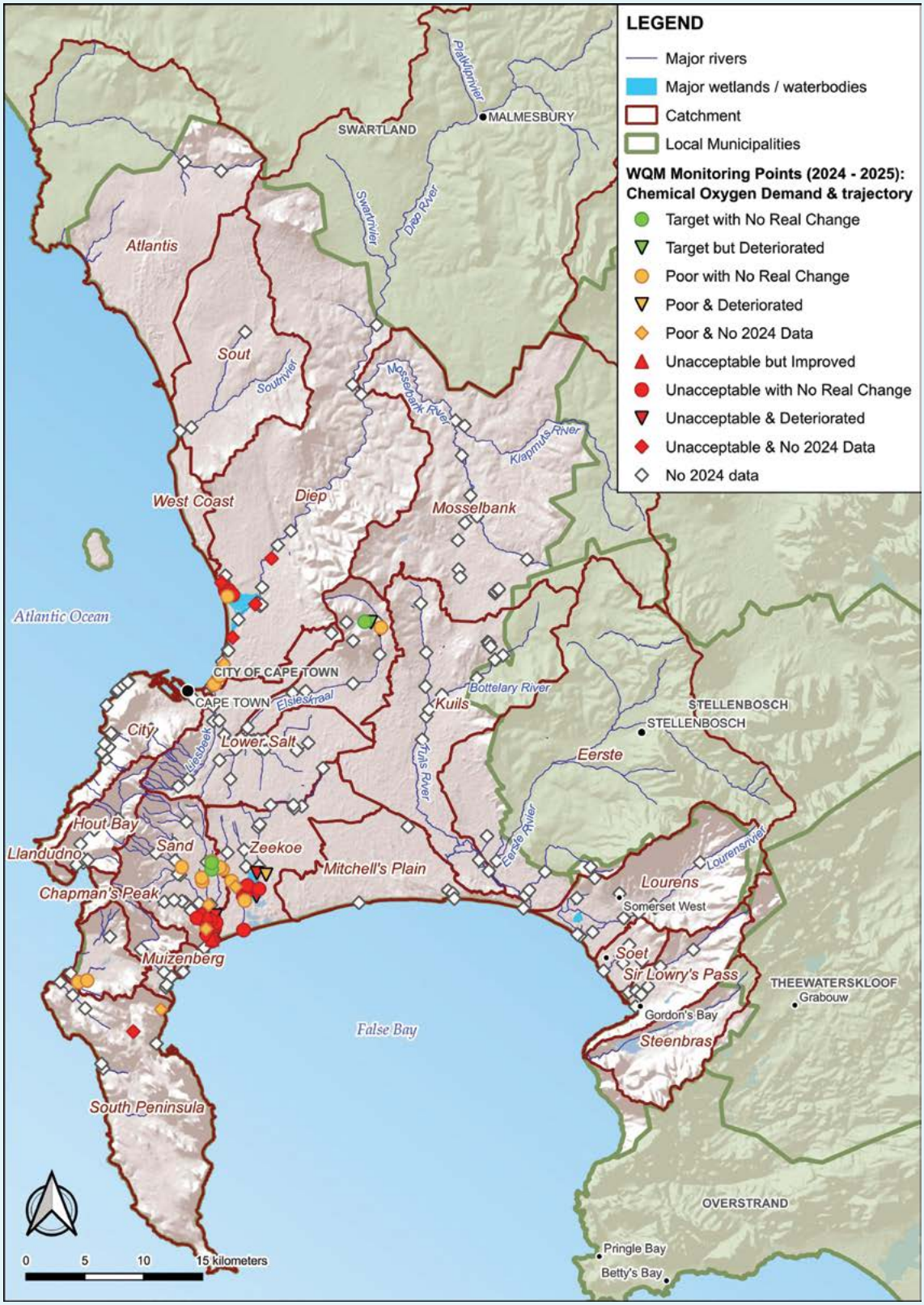


Figure 3.7

Median chemical oxygen demand (COD) data, for (limited) sites included in the City's routine Water Quality Monitoring Programme. No COD ecosystem guidelines. COD thus rated against general and special effluent limits: > 75 mg/ℓ = unacceptable; > 30–75 mg/ℓ = poor; ≤ 30 =acceptable. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory and condition calculations explained in appendix E.

3.3 GENERAL COMMENTS

The issues, patterns and trends in water quality across Cape Town's catchments are considered in more detail on a catchment basis in the following sections. The coarse overview and discussions provided here do, however, highlight the pervasive issues of pollution of many of the city's catchments by both raw and in some cases poorly treated sewage, together considered the biggest problems affecting the city's watercourses and their water quality. This problem is compounded by high levels of solid waste, which block infrastructure, resulting in more frequent leaks and overflows.

Phosphorus concentrations that trigger rapid growth of reeds, (mostly alien) floating aquatic plants and, of most concern, algae that include blooms of at-times toxic blue-green algae (cyanophytes) stem primarily from treated and untreated sewage sources. The City's inland WWTW discharge approximately 95% of treated effluent directly or indirectly into inland rivers and wetlands, excluding effluent of a good enough quality to be used or sold for uses such as irrigation. Even effluent from those WWTW that comply with DWS general effluent limits for orthophosphate are problematic, because these limits are set almost two orders of magnitude higher than the lower limit for hypertrophic ecosystems, and in summer, these flows comprise most of the run-of-river flow in Cape Town's naturally seasonal rivers.

Generally, water quality data suggest that Cape Town's **rivers** are impacted much more than its monitored **standing water systems**, as suggested by the graphs in **figure 3.8** for *E. coli* and orthophosphate. This is in part an artefact of the fact that most water samples from standing waterbodies are taken from those used for recreational purposes or in parks and wetlands, and only a few are from detention ponds from areas close to informal settlements on the Cape Flats, for example, subject to dire levels of sewage and other pollution. Nevertheless, standing water systems should generally have greater resilience to polluted flows than rivers, at least up to ecosystem tipping point thresholds. That is because they should allow dilution of inflows, promote uptake of nutrients by plants, and expose bacteria such as *E. coli* to sunlight over an extended period, breaking these pathogens down. Unlike rivers, however, many wetlands accumulate pollutants and their products (e.g. organic sediments from algal growth), and these impacts may persist long after upstream inflows have been addressed. Rivers by contrast have more limited capacity for nutrient uptake and dilution, but arguably their water quality would recover quickly if upstream pollution sources were addressed. This is encouraging for systems such as Milnerton Lagoon, where future natural flushing by flood flows, under conditions of improved inflows, could allow that system to be reset.

With regard to overall water quality trajectory over the 2025 reporting period, and focusing on the two main parameters in **figure 3.8**, which drive the other variables of concern presented earlier, the data show that, in the 2025 reporting period, 54% and 59% respectively of all river samples were rated as having unacceptable levels of *E. coli* and orthophosphate phosphorus, while 11% and 50% of standing water systems were similarly rated. Given the fact that numerous new sample points were included in the 2025 dataset, some of which were deliberately selected to include systems in good condition, direct comparison between the 2024 and 2025 compliance-type data is not particularly helpful.

On a positive note, the inclusion of new catchments and sample points across a wider part of Cape Town's extent in this 2025 Inland Water Quality Report has highlighted the fact that there are several river systems and indeed catchments in relatively good condition, including the small river catchments within the City Bowl along the Atlantic Seaboard, the Modder River in the Atlantis catchment, tributaries in the south-eastern part of the Eerste catchment and in the South Peninsula. Other systems that remain in a good condition, albeit all subject to occasional sewage inflows and other sources of pollution, include the Lourens and Silvermine catchments and the upper Hout Bay catchment.

The Steenbras catchment is also likely to include rivers and wetlands in a relatively unimpacted condition, but no monitoring points are provided there as yet.

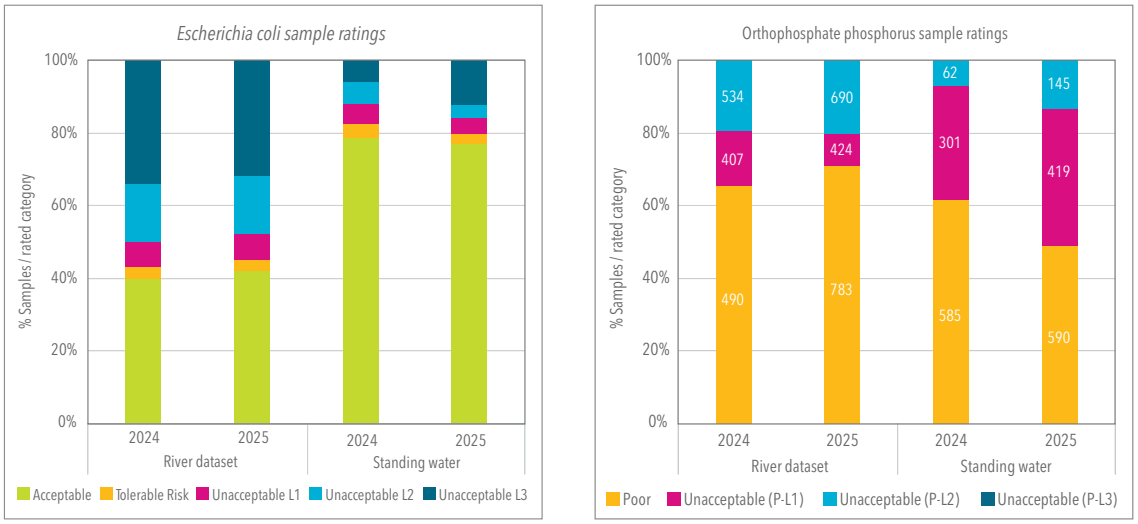


Figure 3.8

Summary data for *E. coli* and orthophosphate, allowing comparison of rivers ('flowing systems' including channels, canals and stormwater outlets into rivers) and standing water systems (including vleis, detention ponds and non-riverine wetlands). Note that data exclude stormwater outfalls directly into the sea.

The following sections (sections 4 to 20) present water quality data for Cape Town's catchments in alphabetical order, and provide brief to more detailed discussion and commentary, depending on the availability of data and the importance of the system in the City's Mayoral Priority Programme (MPP) (see **section 2.1**).

4. WATER QUALITY IN THE ATLANTIS CATCHMENT

4.1 CATCHMENT OVERVIEW

The Atlantis catchment includes a number of minor watercourses, many of which dissipate into the deep sands of this area before they reach the sea. Most of these are naturally seasonal to ephemeral systems and flow only for short periods of the year. The exception to this is the Modder River and its tributaries, which form a broad network of channels, including valley bottom wetlands, that drain into the sea at Grotto Bay on the Atlantic Ocean via a small micro-estuary.

The main tributary of the Modder River is the Louwskloof River, which flows through rolling agricultural areas and then through the small town of Mamre. It flows through the urban area within a broad vegetated corridor, which has been divided into multiple long plots, seemingly for market gardening and irrigated out of the river in the wet season (Mamre Local Spatial Development Framework 2023). The river is joined by the Koerasierivier some 1,6 km downstream and west of the outskirts of Mamre, and from this point the combined flows are referred to as the Modder River. There is no formal WWTW at Mamre and much of the town relies on septic tanks and soakaways, and some treatment in communal oxidation dams or ponds. The nearest WWTW is the Wesfleur WWTW at Atlantis, and pump stations shown in the City's data are assumed to convey at least some sewage to that facility.

Informal settlements appear limited in this catchment, which is dominated by agriculture, although small enclaves of informal settlement are evident in places downstream of Mamre.

The Modder River catchment includes terrestrial and wetland areas where the City has been proactively acquiring, managing and retaining important biodiversity land outside the urban edge as a mechanism to facilitate development in Atlantis through a land banking mechanism as a form of biodiversity offsetting (Mamre Local Spatial Development Framework 2023). The presence of such areas in the downstream catchment makes water quality management upstream important.



Photo 4.1 *Modder River in its reaches through Mamre – photo from Google Earth*

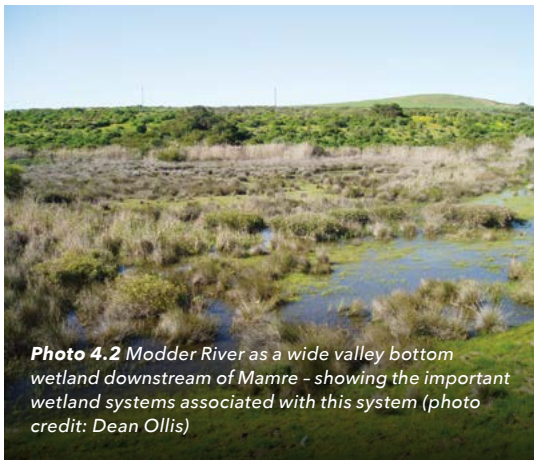


Photo 4.2 *Modder River as a wide valley bottom wetland downstream of Mamre – showing the important wetland systems associated with this system (photo credit: Dean Ollis)*

4.2 THREATS TO WATER QUALITY

Limited available information at the time of this report suggests that the main threats to water quality in the system comprise:

- Runoff of nutrients and potentially fertilisers and pesticides from agricultural areas, including market gardens along the river edge through Mamre;
- Nutrient enrichment from soakaways and septic tanks;
- Runoff from livestock – no large feedlots were, however, identified during a desk-top review of Google Earth imagery of the area; and
- Future expansion of settlements in the area, in the absence of adequate sanitation infrastructure to treat and manage it.

4.3 WATER QUALITY THROUGH THE CATCHMENTS – CONDITION AND TRAJECTORY

4.3.1 MONITORING POINTS AND WATER QUALITY MAPPING

The City has, since the start of the 2025 reporting period, collected routine water quality samples from just two sites in the Atlantis catchment area, both in the Modder River catchment, and comprising:

- MOD01, on the Louwskloof River immediately upstream of Mamre town, on Dassenberg Road; and
- MOD02, on the Louwskloof downstream of Mamre town and immediately upstream of the confluence with the Koerasierivier and near (downstream of) a small informal settlement to the south-east.

Figure 4.1 (A to D) presents summary water quality data for *E. coli*, orthophosphate (as PO_4-P), dissolved oxygen and free ammonia (NH_3) for the 2024 and 2025 reporting periods. The data are shown as percentages of all of the samples collected in the 2025 reporting period that fell into different water quality categories (as per **tables 2.1 and 2.3**). **Figures 4.2 to 4.5** present the same data on a site-by-site basis, showing spatial changes through the catchment and including trajectory analyses, comparing data from the 2025 reporting period with those of the previous year.

The following sections provide brief commentary on these findings, which have also been interpreted with reference to the assessments and data presented in appendices A–F, and appendices C and D in particular.

4.3.2 RAW SEWAGE POLLUTION INDICATORS (*ESCHERICHIA COLI*)

Figure 4.2 shows three sewer pump stations in the Atlantis catchment as a whole, with two of these located within the town of Mamre itself and associated with repeated faults leading to overflows in the 2025 reporting period, as indicated in the heat map in figure D5 (**appendix D**). Of these, the Mamre North pump station had five overflows over this period (see **table D2**). All faults reported in the Atlantis catchment as a whole were rated by the City as insignificant, with two moderate events (**table D3 – appendix D**).

No C3 reports were, however, generated in the catchment over the 2025 reporting period (**figure D5** in **appendix D**), despite repeated pump station overflows, suggesting low awareness of the C3 system among local communities or low visibility of affected areas.

Escherichia coli data for the two sites, presented in **figures 4.1 and 4.2**, show that 45% of samples collected in the Modder catchment had *E. coli* levels rated as unacceptable and with 8% rated as unacceptable level 2, indicating a high magnitude of sewage inflow at that time.

Figure 4.2 more usefully shows that the downstream site MOD02 was primarily responsible for these high levels of *E. coli* contamination, with mean annual *E. coli* concentrations categorised as unacceptable, compared with upstream flows categorised as acceptable. These data suggest that the main sources of *E. coli* derived from periodic pump station overflows, with five samples showing clear periods of point-source inflow. Lower levels of *E. coli* in data throughout the year are assumed to include possible seepage from septic tanks and with minor inputs from small areas of informality and livestock/domestic animals.

4.3.3 PHOSPHORUS NUTRIENTS

Phosphorus enrichment would be expected to be associated with many of the land uses upstream of and between the two monitoring points. The data shown in figure 4.3 in fact show higher median annual orthophosphate (as phosphorus) concentrations than the downstream site, despite inflows of raw sewage at least at times between the two sites. Median concentrations at MOD02 were rated as poor rather than unacceptable. The reason for this pattern is unclear. It is possible that phosphorus in raw sewage flows was present mainly in particulate organics and had not yet broken down to its orthophosphate form. This is highly speculative, however, and should be considered in a longer-term dataset and informed by a site visit for context. Nevertheless, the data suggest that, even in this mainly rural catchment with a relatively small population, phosphorus enrichment is a potentially serious concern.

4.3.4 OTHER VARIABLES OF CONCERN

Un-ionised (or free) ammonia as well as dissolved oxygen concentrations are also considered in the summary data in **figure 4.1** as well as in **figures 4.4 and 4.5**. Both of these variables are often linked to raw sewage inflows and high associated CODs for its breakdown. In the Modder catchment:

- Median annual data for both sites suggest that these sites were not routinely impacted by high concentrations of ammonia or low DO concentrations.
- The summary data in **figure 4.1** suggest, however, that at least at times both variables reached levels of concern, that might have had negative consequences for aquatic ecosystem communities, but which were probably only short-lived.

4.4 CONCLUSIONS AND RECOMMENDATIONS

Urban development in the Modder catchment is presently limited to the small town of Mamre. Nevertheless, the water quality data indicate that the settlement did result in negative impacts to the affected watercourse, at least at times during the 2025 reporting period. These would have contributed to downstream impacts that included nutrient enrichment and at least temporary plugs of water with low DO and high un-ionised ammonia concentrations. Such instances could, over time, affect the resilience of the downstream system.

Unlike many of the City's catchments, Mamre is relatively small and other urban impacts such as informal settlement, greywater runoff and solid waste accumulation do not appear to be major factors in this area at present. This means that effecting measurable improvement in water quality impacts in this catchment should still be achievable. The following measures are recommended for consideration:

- Investigation of whether septic tanks are likely to contribute to nutrient enrichment;
- Consider telemetry and additional bunding of the most problematic pump station;
- Incorporate vegetated buffers along the river, between the market garden areas and the river edge, by setting these plots further back from the river's edge; and
- Upgrade sanitation services in line with existing and predicted population expansion in the area, before it occurs (as recommended in the Mamre Local Spatial Development Framework 2023).



Figure 4.1

Summary water quality data for the Atlantis catchment, presented as compliance-type data, showing percentage of all samples that fall into preallocated categories, as per tables 2.1 and 2.3. Data include (A) (geometric) mean annual *Escherichia coli* data; (B) median annual orthophosphate phosphorus (PO_4-P) data; (C) annual ammonia (NH_3) data; (D) median annual dissolved oxygen (DO) data.

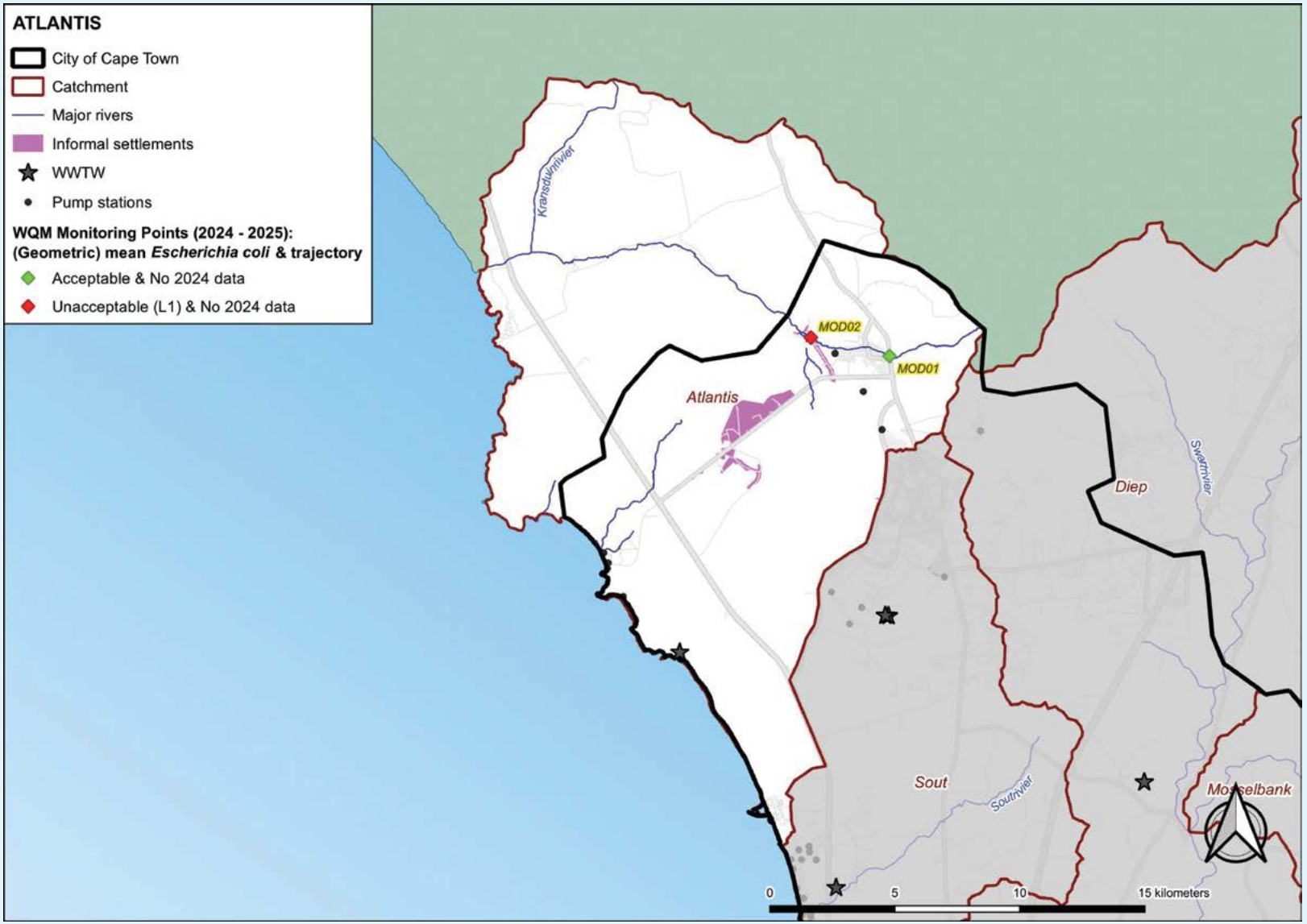


Figure 4.2

Escherichia coli data, focusing on the Atlantis catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory and condition calculations explained in appendix E.

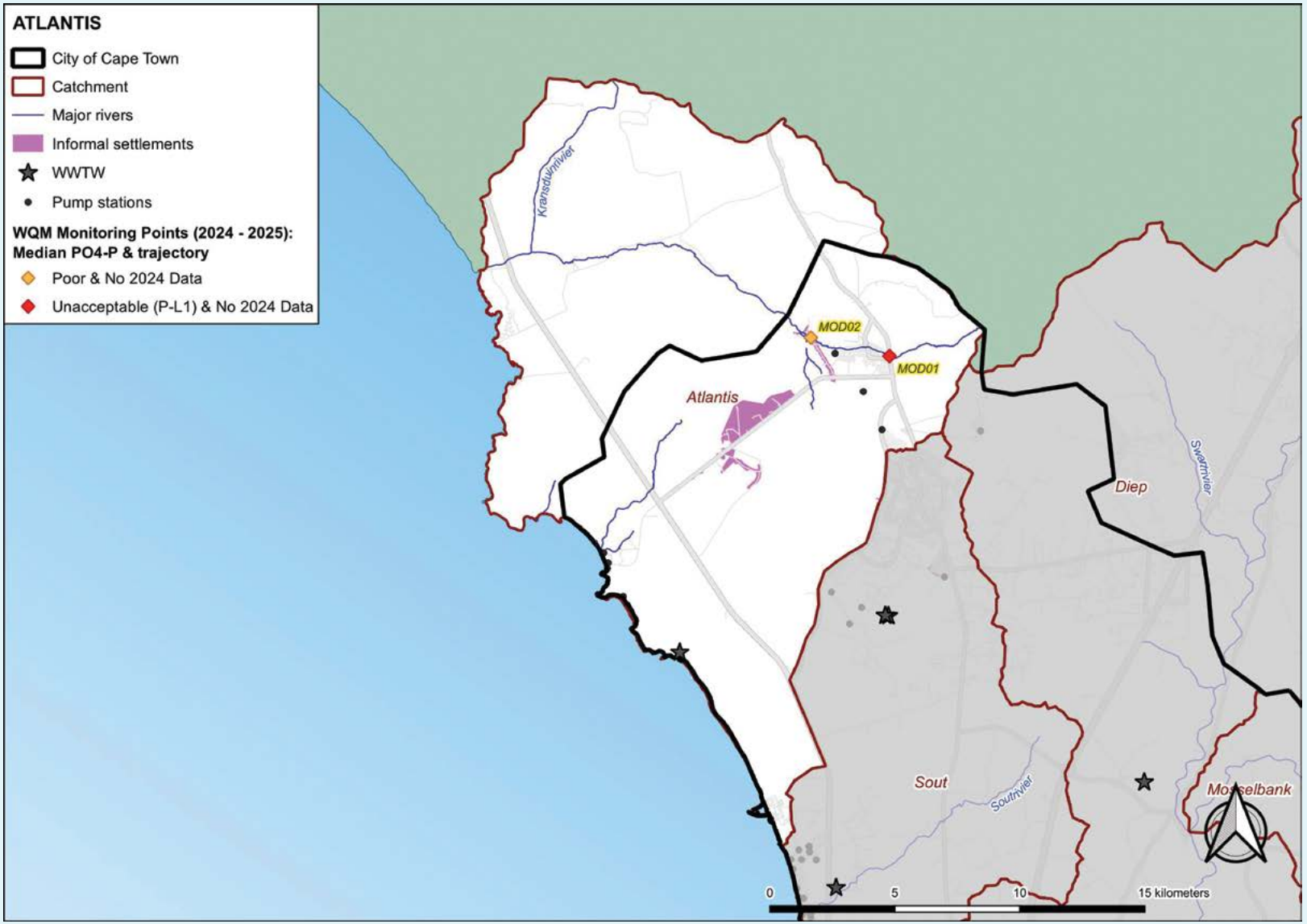


Figure 4.3

Median annual orthophosphate (PO_4-P) data, focusing on the Atlantis Seaboard catchments. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

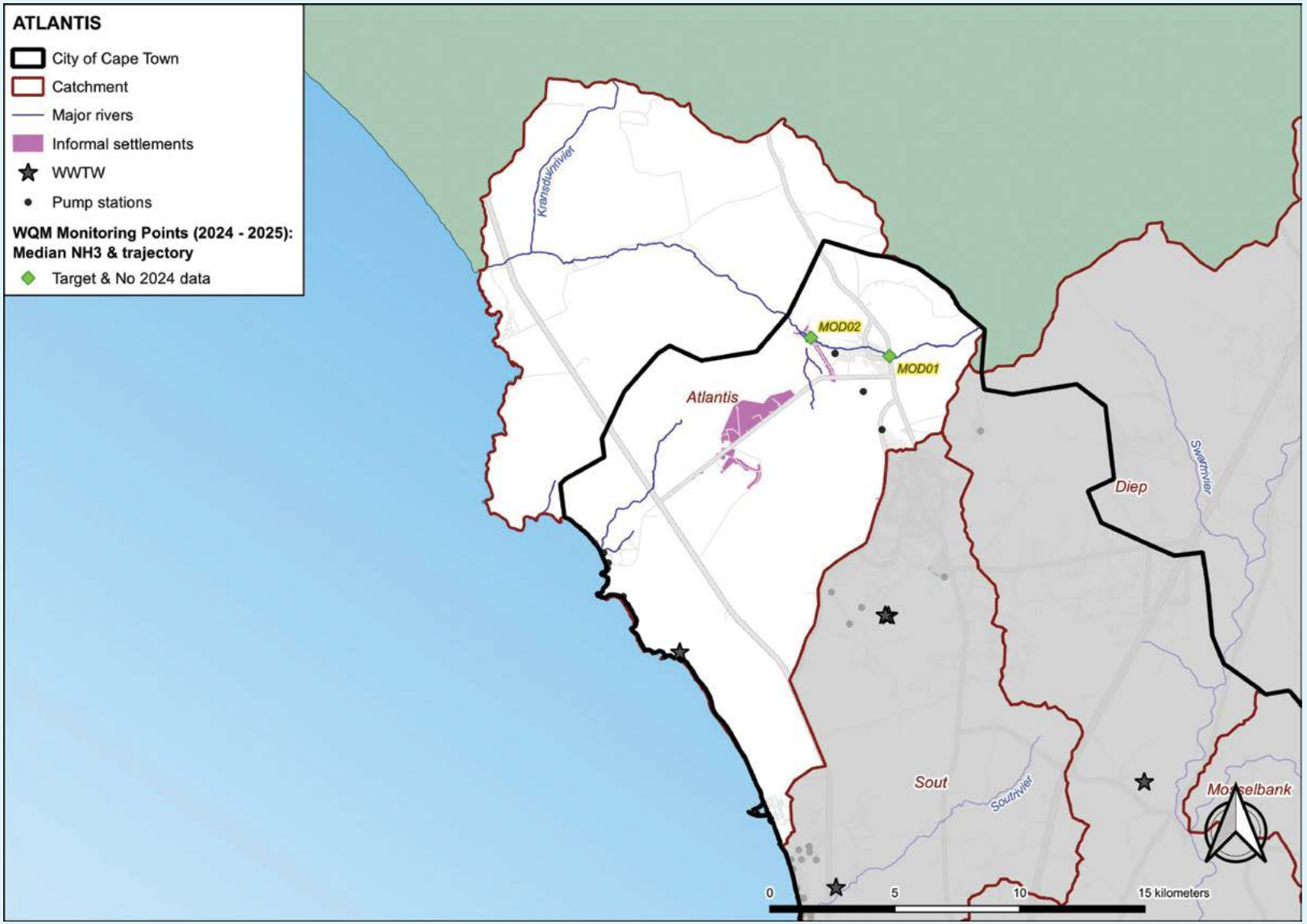


Figure 4.4

Median annual un-ionised (or free) ammonia (NH_3) data, focusing on the Atlantis catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

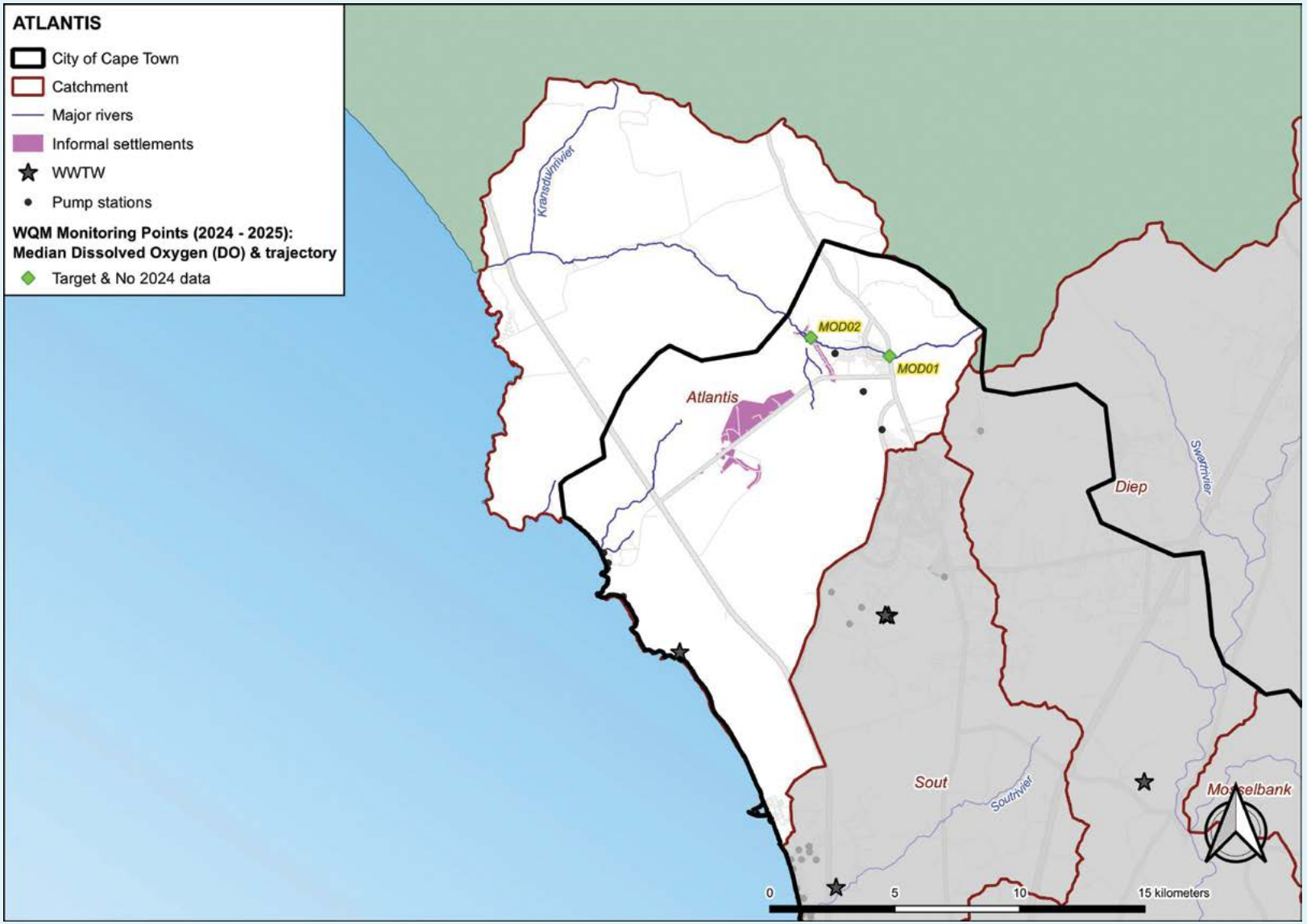


Figure 4.5

Median annual dissolved oxygen (DO) data, focusing on the Atlantis catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

5. WATER QUALITY IN THE CITY BOWL AND ATLANTIC SEABOARD CATCHMENTS

5.1 CATCHMENT OVERVIEW

This area in fact includes the catchments of multiple relatively minor rivers that rise on the northern and western slopes of the Table Mountain range, and drain into the Atlantic Ocean between the Cape Town CBD and Bakoven. Rivers in this area are typically fast-flowing down steep mountain slopes. They are, however, fed by extensive seeps, and in some areas along the Atlantic Seaboard the rivers are associated with broad swathes of palmiet wetland – a wetland type often associated with the formation of peat (that is, highly organic soils that perform important ecosystem services such as carbon sequestration and water storage).

The upper reaches of these systems typically flow through the Table Mountain National Park, and are generally in good condition, with invasion by alien plants assumed to be the most pressing issue and water quality being relatively unimpacted. However, with distance into the developed urban edge, significant impacts to many of these watercourses accrue. Most of the natural watercourses off the northern slopes of Table Mountain have been piped underground for centuries, and flow under the city in closed, lined canals, passing out into Table Bay via numerous stormwater outlets.

Flows from the Oranjezicht springs, previously used by Cape settlers as a water source, were subsequently diverted into the piped urban stormwater system, and discharged into the sea, until their incorporation into the Green Point Biodiversity Park in 2010, where they are used for irrigation and the maintenance of artificial educational water features.

Along the Atlantic Seaboard, the rivers are generally open watercourses, but tightly constrained by intense urban development, in many cases resulting in erosion and river degradation, exacerbated by alien invasion and manipulation of channel form.

5.2 THREATS TO WATER QUALITY

The Atlantic Seaboard catchments are among Cape Town's relatively 'cleaner' catchments and are not impacted by runoff from informal settlements or WWTW. They are, however, subject to periodic sewage overflows from blocked or surcharging manholes and pump stations, as well as to the impacts of stormwater off a hardened catchment with roads and parking areas as well as suburban gardens. Above the urban edge, within the TMNP, water quality is assumed to be near-natural. Alien invasion along riparian corridors that reduces flows, particularly in summer, would amplify the impacts of pollutants within the catchment on downstream water quality, while erosion of watercourses as they pass through dense development contributes to elevated TSS concentrations and downstream sedimentation.

Watercourses through the CBD are also assumed to have water quality in a near-natural condition in their reaches above the urban edge but then flow underground through a hardened catchment, receiving runoff from roads and parking areas with high levels of usage and subject to the accumulation of solid waste, as well as impacts from enclaves of homeless residents, including (over the timescale of this assessment) large tented camps at Green Point and near the Castle in the CBD. The latter were removed under court order in February and November 2024 respectively. These and general urban activities generate stormwater that is assumed to be contaminated with oils and other petrochemical residues, including heavy metals, as well as plastics, microplastics, organic waste and associated ammonia and phosphorus-based nutrients.

5.3 WATER QUALITY THROUGH THE CATCHMENTS – CONDITION AND TRAJECTORY

5.3.1 MONITORING POINTS AND WATER QUALITY MAPPING

The City collects routine water quality samples from 18 sites in the City Bowl/Atlantic Seaboard catchments, including six river/canal sites and 12 stormwater outfalls to the sea. Of these, the river/canal sites are all new additions, reported on in this report for the first time in annual Inland Water Quality reports. The latter lie variously as follows:

- NR30, located on a canal along the R27 that discharges into a (from here onwards) piped outlet into the Ben Schoeman Dock in Cape Town Harbour – the canal discharges into runoff from an unnamed and seemingly mostly piped (within the urban area) stream system that flows off the northern slopes of Table Mountain, through University Estate and Salt River;
- CEN01, located on the upper reaches of Platteklip Stream, at the downstream end of Van Riebeek Park and downstream of the historic washhouses on this stream. The stream is passed underground some 250 m downstream;
- CEN02 on the Kasteelpoort River that discharges into the sea through the Bakoven residential area;
- CEN03 at Little Glen, located downstream of an extensive palmiet-dominated wetland through an area referred to as Happy Valley in Google Earth imagery; and
- CEN04 and CEN05, located on Diepsloot and Camps Bay Stream respectively, which flow off the western slopes of Table mountain through wide vegetated corridors, entering the Atlantic Ocean as a micro-outlet on the northern end of Camps Bay beach.

Figure 5.1 (A to D) presents summary water quality data for all of the monitored sites for *E. coli*, orthophosphate (as PO_4-P), dissolved oxygen and free ammonia (NH_3) for the 2024 and 2025 reporting periods. Only *E. coli* is monitored at the stormwater outfall. The data are shown as percentages of all of the samples collected in the 2025 reporting period that fell into different water quality categories (as per **tables 2.1 and 2.3**). **Figures 5.2 and 5.5** present the data as categorised

median (geometric mean for *E. coli*) annual values on a site-by-site basis, showing spatial changes through the catchment and including trajectory analyses, comparing data from the 2025 reporting period with those of the previous year.



Photo 5.1 *The Plattekloof River is passed under the City Bowl in covered, brick-lined culverts*



Photo 5.2 *Stream at Little Glen, located downstream of an important palmiet wetland – this system is vulnerable to inflows from raw sewage from periodically discharging sewers*

5.3.2 RAW SEWAGE POLLUTION INDICATORS (*ESCHERICHIA COLI*)

Figure D5 (appendix D) shows that C3 reporting occurred at a generally very low intensity in these catchments, with most occurring (not surprisingly) in the densely populated/urbanised CBD, Green Point and Sea Point areas. Sewer pump station overflow data suggest relatively few chronically problematic pump stations, although **figure D4** indicates pump failures throughout the urbanised areas of these catchments, with two included in **table D2** as associated with five or more spills over the 2025 reporting period, namely the Steel Doors pump station in Bantry Bay and the Thibault Square pump station in the CBD, which were affected by seven and five overflows respectively. However, they were rated as insignificant to minor (see **figure D3**).

The above impacts, along with the impacts of sewage runoff during storm events from homeless residents as well as excrement from domestic pets and birds, contribute to the *E. coli* concentrations that are measured in sampling points in these areas. **Figure 5.1** highlights the fact that 68% of samples collected fell within the acceptable risk range for *E. coli* in the 2025 reporting period. Of the remaining samples, 2% fell into the poor category and 30% were rated unacceptable, of which 25% fell into the level 2 and level 3 categories, showing very high *E. coli* concentrations in some samples at times.

Figure 5.1, read in conjunction with **figure 5.2** and its insert, showing data per site for this multi-catchment area, summarises data per site suggesting that:

- The least-impacted sites were those representing rivers (prefix CEN) rather than the stormwater outfalls to the sea. This makes sense in that these open water systems have access to ecosystem services performed by plants and exposure to air that piped systems lack. With the exception of CEN04 (Diepsloot Stream), > 75% of data for all of the river sites fell within the acceptable range for *E. coli*, suggesting generally safe conditions in these systems, marred by periodic episodes of high contamination (unacceptable levels 2 and 3);
- CEN04, on the Diepsloot Stream, showed, by contrast, a high frequency (78%) of samples rated as unacceptable, suggesting a persistent source of sewage inflows into this system that should be investigated, and does not appear to be linked to any upstream sewer pump station but may be linked to a problematic sewer; and
- The stormwater outfalls to the sea had much lower levels of compliance, with only CN27, CN33 (best performing) and NR30 having more than 58% of samples in the acceptable range, while < 20% of samples from the other sites rated as acceptable and by far the majority of samples (at least 65%) were rated as unacceptable levels 1 and 2, indicating frequent inflows of raw sewage of high magnitude.

Figure 5.2 shows annual geometric mean (2025 reporting period) data for the new sites, and data trajectories for the marine stormwater outfalls between 2024 and 2025, all of which actually show improvement, albeit from a very low level.

5.3.3 PHOSPHORUS NUTRIENTS

Orthophosphate concentrations in sites measured in this area (and reflecting only river samples and not stormwater outfalls to the sea) in **figure 5.1** show that 95% of samples had concentrations rated as poor, with 5% in the unacceptable category. The 'poor' ratings, reflected spatially in **figure 5.3**, are difficult to interpret, as they are somewhat confounded by the City's current detection levels for this variable of < 0,1 mg/ℓ, making all samples analysed at best lie in the 'poor' category. Drawing on data presented in **appendix E**, it is clear that all river samples fell below the limits of detection over this time period, suggesting that at least the periodic sewage inflows affecting all of the assessed systems did not appear to have significantly raised orthophosphate concentrations.

5.3.4 UN-IONISED (OR FREE) AMMONIA AS A TOXIN

Figure 5.1, read in conjunction with **figure 5.4**, suggests that ammonia toxicity was not likely to have been an issue affecting the monitored rivers in the City Bowl and Atlantic Seaboard area.

5.3.5 DISSOLVED OXYGEN

Data presented in **figures 5.1 and 5.4** showing dissolved oxygen (DO) concentrations for monitored river/canal sites suggest that low DO was not likely to have been a significant issue affecting these sites, pointing to generally healthy river systems with regard to water quality, in that DO deteriorates when there are high levels of organic and other pollution, not evident in these results.

5.4 CONCLUSIONS AND RECOMMENDATIONS

Water quality data for this area, including multiple small catchments, suggest that natural watercourses – that is, even where now piped or canalised through highly urbanised areas, showed relatively good water quality (poor to acceptable, with poor categories driven by poor data resolution and not necessarily by poor water quality). This is despite all systems being affected at least at times by inflows of raw sewage from various sources. In general however, water quality data suggest that the monitored rivers have resilience to the level of impact they are exposed to, highlighting the importance of maintenance of open vegetated systems through urban areas where ecosystem services can be harnessed.

By contrast, the stormwater outfalls to the sea, most of which are not diluted by natural watercourses but comprise entirely runoff from hardened surfaces polluted with urban runoff and, in most cases, very high frequencies of high magnitudes of sewage runoff, and have seemingly few opportunities for upstream amelioration. These data suggest the important need for investigation of sites where sewage overflows are frequent and of a high magnitude (e.g. CN28 and CN17E) as well as the importance of integrating green infrastructure in deeply embedded urban drainage, wherever possible.



Figure 5.1

Summary water quality data for the City Bowl and Atlantic Seaboard catchments, presented as compliance-type data, showing percentage of all samples that fall into preallocated categories, as per **tables 2.1 and 2.3**. Data include (A) (geometric) mean *annual Escherichia coli* data; (B) median annual orthophosphate phosphorus (PO_4-P) data; (C) annual ammonia (NH_3) data; (D) median annual dissolved oxygen (DO) data.

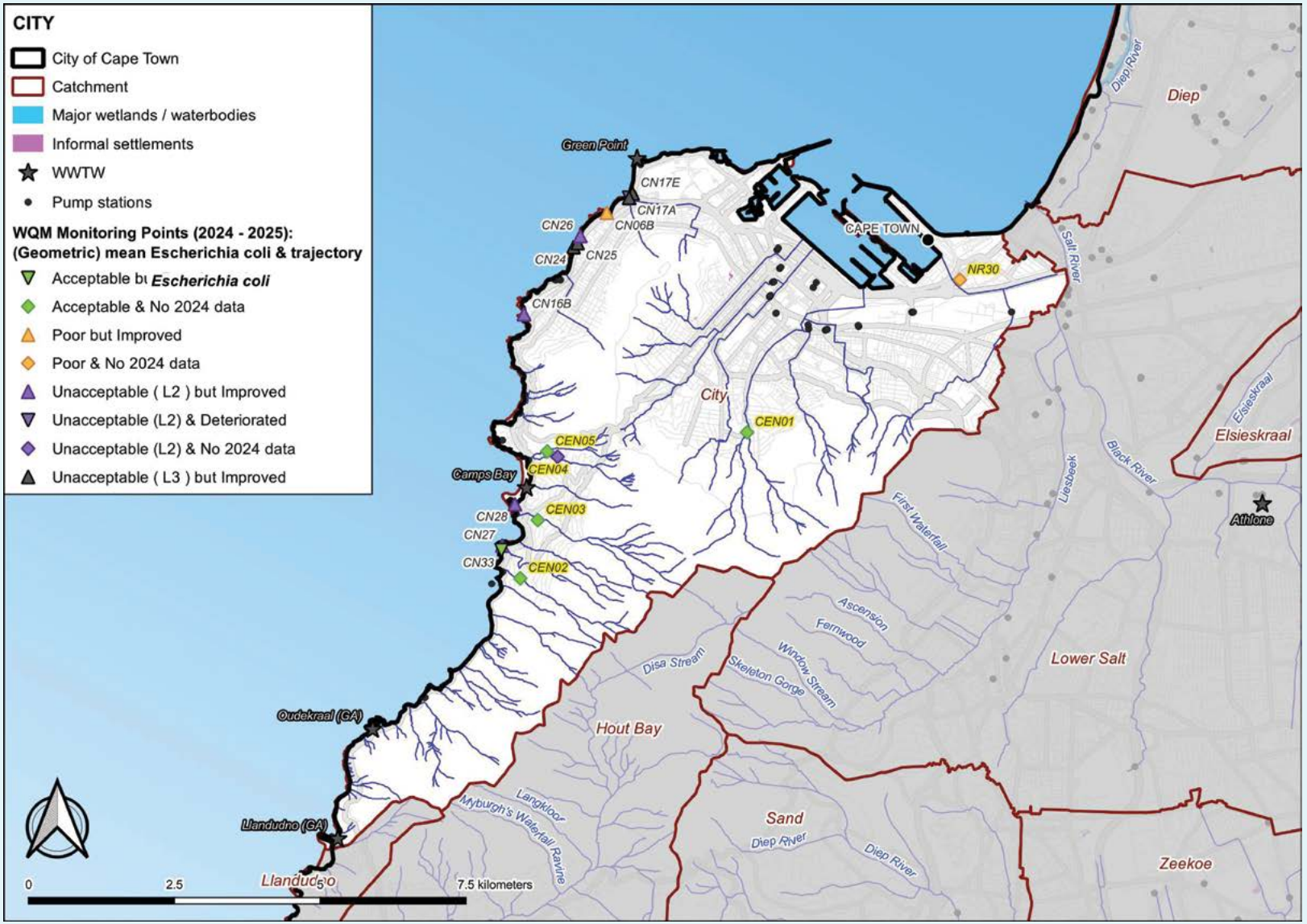


Figure 5.2

Escherichia coli data, focusing on the City Bowl and Atlantic Seaboard catchments. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory and condition calculations explained in appendix E. Insert showing rated *E. coli* samples per site, given that this area comprises several catchments and each site in fact represents a discrete catchment.

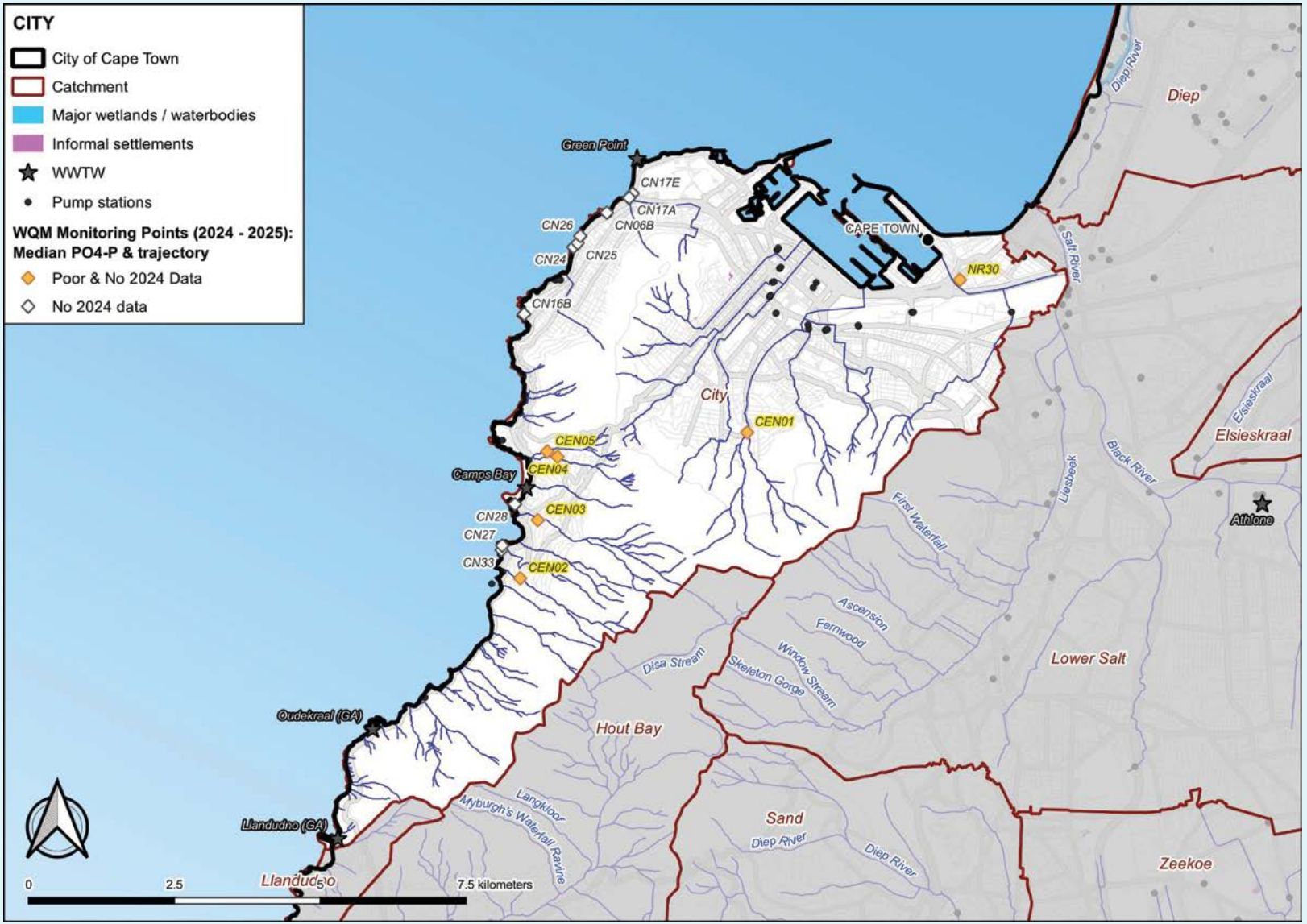


Figure 5.3

Median annual orthophosphate (PO_4-P) data, focusing on the City Bowl and Atlantic Seaboard catchments. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

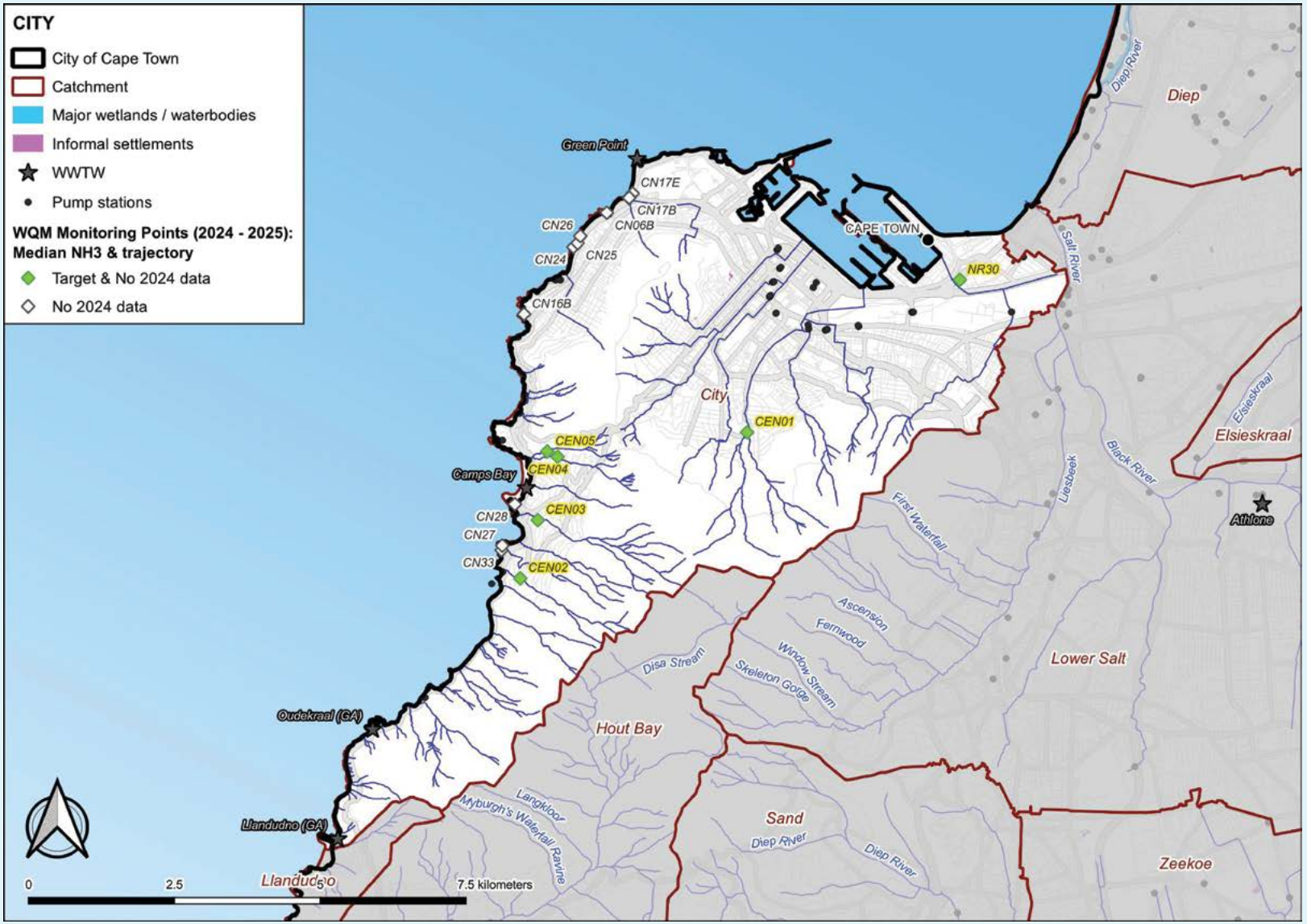


Figure 5.4

Median annual un-ionised (or free) ammonia (NH_3) data, focusing on the City Bowl and Atlantic Seaboard catchments. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

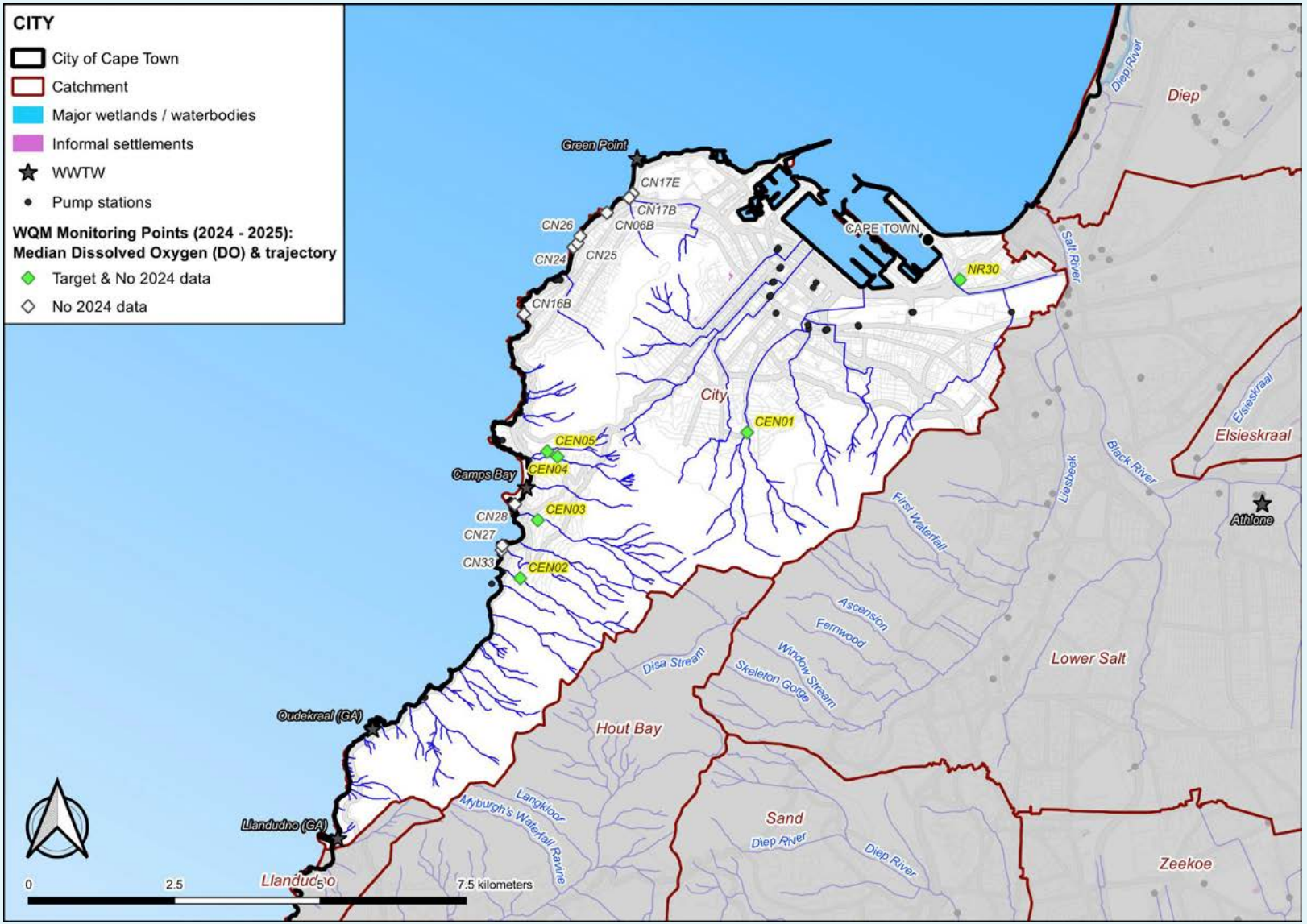


Figure 5.5

Median annual dissolved oxygen (DO) data, focusing on the City Bowl and Atlantic Seaboard catchments. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

6. WATER QUALITY IN THE DIEP RIVER CATCHMENT

DIEP AND MOSSELBANK RIVER SUB-CATCHMENTS, INCLUDING RIETVLEI AND MILNERTON LAGOON

6.1 CATCHMENT OVERVIEW

The Diep River catchment is Cape Town's largest river catchment and extends well beyond the metropolitan area's boundaries into the Swartland, Drakenstein and Stellenbosch local municipalities, with a total extent of 1 495 km^2. The mainstem of the Diep River originates in the Riebeek-Kasteel mountains north-east of Malmesbury, and flows for about 65 km south-west towards Cape Town. It passes through agricultural areas, primarily wheat and vineyards, as well as the urban area of Malmesbury, before reaching Cape Town. The river is impacted by abstraction from instream and off-channel dams, which have reduced average summer flows reaching the estuary by about 39% compared with reference levels (Clark, 2018). Agricultural runoff from the extensive cultivated areas of the catchment, as well as urban stormwater and treated wastewater from the Malmesbury WWTW, which has a daily treatment capacity of 10 Mℓ/day, impact on the water quality.

The catchment includes the Mosselbank River, a major tributary that drains the northern slopes of the Durbanville Hills and flows north- and westward to its confluence in the Philadelphia area. The Mosselbank River passes through mainly residential and peri-urban areas in its upper reaches, and agricultural areas including stock farming and feedlots in its lower reaches. Historically, the Mosselbank River would have been seasonal but is now impacted by the perennial receipt of treated wastewater from the Kraaifontein WWTW (28 Mℓ/day treatment capacity) and Fisantekraal WWTW (58 Mℓ/day treatment capacity, from which the bulk of the flows are reportedly diverted to treated effluent supply). The Mosselbank's largest tributary is the Klapmuts River, which drains parts of the Drakenstein and Stellenbosch municipalities and is also impacted by flows from the Klapmuts WWTW.

The Diep River enters the urban area of Cape Town immediately downstream of the Malibongwe Drive bridge, where it flows through extensive unserviced informal settlements (Dunoon and Doornbach) in and adjacent to the floodplain. A minor tributary, the Kleine Stink River, enters the Diep River within this zone, passing under Malibongwe Drive some 780 m south-east of the Diep River crossing.

Some 600 m downstream of the Blaauwberg Road bridge, the remnant waterbodies and surrounding undeveloped areas form a broad triangle with Rietvlei and Flamingo Vlei extending westward towards the coast to the west; the Potsdam WWTW to the east; and dense urban development to the north, including industrial areas, residential suburbs and the Jo Slovo Park and Phoenix residential areas, characterised by extensive backyard settlements. Otto du Plessis Drive forms the western boundary of the upper part of this area, and downstream of the Otto du Plessis bridge, forms the eastern edge of Milnerton Lagoon.

No natural tributaries enter the Diep River between the railway bridge and the estuary mouth, with all point source inflows in these reaches today emanating from piped or channelled (and in some cases highly polluted) stormwater flows and treated effluent from the Potsdam WWTW.

The lower Diep River sub-catchment includes the urban areas of Milnerton, Table View, Bloubergstrand, and the rapidly expanding Parklands, as well as Montague Gardens and Killarney Gardens. It straddles both parts of the Central and Northern stormwater management regions, and is designated a priority sub-catchment under the Mayoral Priority Programme.



Photo 6.1 *Diep River at the railway crossing downstream of Dunoon*



Photo 6.2 *Potsdam WWTW, discharging into the Diep River and Milnerton Lagoon*

6.2 THREATS TO WATER QUALITY

The primary threats to water quality in the Diep catchment are related to the discharge or spillage of wastewater. The scale of the catchment means a great number of pollutant sources and other threats to water quality are encompassed, including –

In the **Mosselbank** and upper[2] **Diep River** catchments:

- Treated wastewater inflows from a number of minor and mid-sized WWTW, including the Fisantekraal, Malmesbury, Klapmuts and Kraaifontein WWTW;
- Extensive agricultural land uses, including crop cultivation and livestock feedlots, resulting in the abstraction of the bulk of the summer flows from the Diep River before it enters the Cape Town municipal area and also contributing runoff of pesticide and fertiliser to the river; and
- Unserviced and informal settlement areas in the Klapmuts, Bloekombos (Kraaifontein) and Malmesbury areas.

[2] Being outside the municipal boundary

In the **lower Diep River** sub-catchment within the City's boundary:

- Discharges of treated wastewater of varying quality from the **Potsdam WWTW**, which has a capacity of 43 Mℓ/day but regularly receives flows well in excess of this capacity; major upgrades of the WWTW were under way during the reporting period, but are scheduled for completion only in 2026/27, and during the 2024/25 reporting period effluent quality remained poor, with high concentrations of suspended solids and nutrients, and high bacterial counts and chemical oxygen demand;
- Extensive and densely developed informal settlements at Dunoon and Doornbach, where raw sewage and greywater from domestic use pass directly into the Kleine Stink River and the Diep River via its floodplain;
- Periodic, and in some cases regular, discharges of sewage flows from pump stations in the lower catchment, including the Koeberg pump station that discharges into the Theo Marais channel, which during the period assessed in this report had extended periods of failure and overflow, as reported by Day et al. (2025);
- Solid waste, particularly from areas with high levels of informal and backyard settlement;
- Illegal effluent and sewage discharges from industry and other users into the stormwater system in the Montague Gardens and Killarney Gardens industrial areas and elsewhere; and
- Stormwater runoff from both agricultural and urban areas, carrying residues from petrol and oil on roads (e.g. various heavy metals and hydrocarbons); solid waste; runoff from fertilised sports fields and gardens; and other contributors to conventional urban stormwater quality.

6.3 WATER QUALITY THROUGH THE CATCHMENT – CONDITION AND TRAJECTORY

6.3.1 MONITORING POINTS AND WATER QUALITY MAPPING

The City collects routine water quality samples from 32 sites in the Diep sub-catchment, and a further 14 sites in the Mosselbank sub-catchment. Of the former, eight sites are located in the Rietvlei/Flamingo Vlei open waterbodies. A total of 12 new sites were added in 2025 and are reported on in this report for the first time in an annual Inland Water Quality Report:

- RTVD1 and RTVD5 in the Dolphin Beach south and north pans, respectively;
- RTV38, a site in the Diep River upstream of Malibongwe Drive;
- PEV3, in the Zoarvlei wetland at Bancroft Street;
- DIEP12, in the Diep River adjacent to Old Malmesbury Road;
- MOS12, in the Mosselbank River near County Fair farm on R304;
- MOSAH03; on Radio Street just off the R304 at Klipheuwel;
- MOSAH11 in a concrete water structure on farm Bakoor Jakkalsdraai; and

- Four new sites in the Sandringham pond in Kraaifontein with SAP_1 at the southwestern inflow, SAP_4 at the central outflow, SAP_3 at the minor inflow, and SAP_2 at the northern inflow.

Figure 6.1 (**A to D**) presents summary water quality data for *E. coli*, orthophosphate (as PO_4-P), dissolved oxygen and free ammonia (NH_3) for the 2024 and 2025 reporting periods. The data are shown as percentages of all of the samples collected in the 2025 reporting period that fell into different water quality categories (as per **tables 2.1 and 2.3**). **Figures 6.2 to 6.5** present the same data on a site-by-site basis, showing spatial changes through the catchment and including trajectory analyses, comparing data from the 2025 reporting period with those of the previous year.

The following sections provide brief commentary on these findings.

6.3.2 RAW SEWAGE POLLUTION INDICATORS (*ESCHERICHIA COLI*)

The data in **appendix D** demonstrate that the Diep catchment was in receipt of nearly one-third of all sewer pump station spills in the city during the reporting period, with over 200 spills recorded. While most of these were classified as minor, they also included 37 'moderate' spills, one 'major' spill and one 'catastrophic' overflow, highlighting the fact that pump station overflows are likely to be a significant contributor to at least episodic pollution in the catchment. Of all of the City's pump stations, the three with the highest number of overflow events were all in the Diep catchment. The Koeberg Road pump station was clearly the worst, with 45 overflows into the Diep River at the Theo Marais channel recorded over this period. The second worst-performing pump station in the metro was West Beach, which experienced 25 overflows, and the third was Summer Greens, with 15. The Dunoon and Phoenix Park pump stations each recorded 10 overflow events. The spill event classified as 'catastrophic' occurred at the Table View East pump station into the Diep River, just north of Potsdam WWTW. This failure lasted three days, and took place in early April 2025. Heat mapping of pump station faults in **figure D4** reflects these data, with the highest intensity of spill events located in and around the lower Diep catchment at the. The Mosselbank sub-catchment had five recorded pump station overflows, all at the Fisantekraal Main pump station. It was, however, subject to a large number of C3 reports for sewer spills or overflows, concentrated in the Bloekombos informal settlement area (**figure D5**). A low intensity of C3 reports across the lower Diep catchment reflects a number of spills and overflows, concentrated in particular around the Phoenix and Doornbach areas. More significantly, though likely unreported in these data, are the permanent flows of greywater and night soil from Dunoon and Doornbach directly into the Diep River and via the Kleine Stink River.

Figure 6.1 highlights the differences in the intensity of sewage pollution among the various sub-catchments draining to the Diep River:

- Sewage pollution was generally not problematic in the Rietvlei and Flamingo Vlei waterbodies, with more than 90% of samples lying within the acceptable range for *E. coli*, and thus unlikely to have posed major human health risks, although the data do show significant deterioration between the 2024 and 2025 reporting periods and an increase in the proportion of 'unacceptable' data.

- The proportion of samples within the acceptable range for this parameter in the Zoarvlei showed a marked improvement between 2024 and 2025; approximately 25% of sample dates, however, remained within the unacceptable range in this wetland.
- Approximately half of all samples collected in the Mosselbank River sub-catchment were within the unacceptable range for *E. coli*, and a marked increase in the number of sites in the level 3 unacceptable range was recorded in this sub-catchment, reflecting levels of *E. coli* that would have been at least two orders of magnitude higher than acceptable. The four new sites added in the Sandringham pond all had mean *E. coli* counts in the unacceptable range, which may have contributed to the appearance of a deterioration at the sub-catchment level.
- More than 60% of all samples collected in the Diep River itself, upstream of the R27, were in the unacceptable range for *E. coli*, and nearly 40% were in the level 3 unacceptable range, reflecting conditions that would have posed major human health risks.
- Lastly, the Milnerton Lagoon downstream of the R27 continued to experience exceptionally poor water quality, with an increase in the proportion of samples in the unacceptable range year-on-year to over 80%. Fully half were in the level 3 unacceptable range, reflecting conditions that would have posed major human health risks, and reflecting also the significant ongoing contributions of the Potsdam WWTW and Koeberg Road pump stations to the conditions in the Diep River estuary.

The data shown on the map in **figure 6.2** show that:

- *E. coli* counts in the upper Mosselbank River outside of urban areas were within the target range for this indicator of faecal pollution, but were unacceptable at the sites in the urban areas of the sub-catchment;
- The Klapmuts River sites showed no real change and remained within the unacceptable range for this parameter;
- Newly monitored sites in the Sandringham pond all had mean *E. coli* counts in the unacceptable range;
- *E. coli* counts in the Diep River at the N7 road bridge remained within the target range, but deteriorated with distance downstream with mean counts all within the unacceptable range at all sites downstream of the N7 to the lower Milnerton Lagoon;
- Sites nearest the Potsdam WWTW declined in quality from 2024 to 2025;
- Zoarvlei data showed an unchanged high mean *E. coli* count at the upstream (southern) end of the vlei, reducing to acceptable in the northern end of the vlei, and showing some improvement since 2024;
- All sites within the Flamingo Vlei and Dolphin Beach waterbodies had mean counts in the acceptable range, although with some deterioration in the open water sites in Flamingo Vlei; and
- Mean counts remained within the unacceptable ranges in the Bayside canal, although with some improvement from 2024 to 2025.

6.3.3 PHOSPHORUS NUTRIENTS

Figure 6.1 indicates that the number of samples in the Milnerton Lagoon reach of the lower Diep River with orthophosphate concentrations in the unacceptable range increased by about 10 percentage points between the 2024 and 2025 reporting periods to nearly 100% of samples. The Zoarvlei also remained hypertrophic, with a similar increase in the number of samples in the unacceptable range. More than 95% of all samples in both the Rietvlei/Flamingo Vlei and the Mosselbank sub-catchments remained within the unacceptable range (i.e. hypertrophic) for orthophosphate, but both showed a small improvement from approximately 100% of samples in the 2024 reporting period. More than 80% of samples in the Diep River upstream of the Milnerton Lagoon were in the unacceptable range, showing a slight deterioration in this variable from 2024 to 2025.

The map in **figure 6.3** illustrates that:

- Median orthophosphate concentrations in the upper Mosselbank catchment generally deteriorated from 2024 to 2025, remaining within the unacceptable range at all sites monitored, and were within the unacceptable range at the new sites monitored in the Sandringham pond, as well as in the Mosselbank River near the County Fair farm on the R304;
- The Diep River upstream of the Mosselbank River confluence remained in the unacceptable (level 1) range with no real change from 2024 to 2025;
- Median orthophosphate concentrations in the Flamingo Vlei waterbodies were in the unacceptable range, and at all sites showed a deterioration between 2024 and 2025 potentially attributable to the removal of reedbeds and the ongoing construction works at the Bayside canal reducing the uptake of this nutrient from inflows;
- The Diep River itself was orthophosphate-enriched, with samples rated as unacceptable (i.e. hypertrophic) at all sites monitored, including at sites near the City's boundary, where water quality is affected by upstream activities; and
- The Milnerton Lagoon remained in the unacceptable range at all sites monitored.

6.3.4 UN-IONISED (OR FREE) AMMONIA AS A TOXIN

Summary data presented in figure 6.1 show that:

- In the Mosselbank sub-catchment, more than one-third of all samples collected had ammonia concentrations in excess of the 'unacceptable' threshold, indicating conditions likely to be associated with acute toxicity to aquatic organisms; this sub-catchment also had marked deterioration in the 2025 reporting period, with more than one-third of samples being rated unacceptable and more than half with concentrations higher than the target range. These data may, however, be a product of the addition of new water quality sites in the catchment, particularly at the Sandringham pond.

- In the Zoarvlei, an improvement in conditions indicative of ammonia toxicity was apparent, with more than 80% of sites in the target range for this parameter, and fewer than 5% in the unacceptable range.
- Unchanged conditions in the Diep River channel upstream of the estuary, with approximately 30% of samples having ammonia concentrations in the unacceptable/acutely toxic range and a further 30% in the poor range.
- The Rietvlei/Flamingo Vlei sites deteriorated in respect of this parameter, with an increase by approximately 15 percentage points in the number of samples in the unacceptable range indicative of acute toxicity, and a similar 20 percentage-point decrease in the number of samples in the target range.
- As for most other indicators of water quality, the Milnerton Lagoon sites deteriorated between 2024 and 2025, with more than 60% of all samples containing ammonia concentrations that would have been acutely toxic to aquatic organisms, and only 10% of samples within the target range.

Spatially, **figure 6.4** shows that:

- Ammonia toxicity was unlikely to have been a concern in the upper reaches of the Diep and Mosselbank rivers outside of urban areas;
- Sites in the Milnerton Lagoon downstream of the Potsdam WWTW displayed a marked increase in ammonia levels in the reporting period, and had median values in the unacceptable range; elevated ammonia concentrations would persist under low dissolved oxygen conditions in the estuary, relative to the chemical and biological oxygen demand of the system;
- The Flamingo Vlei waterbody had median values in the poor range, but all sites deteriorated in the reporting period, potentially, as suggested above, due to the reduction in water quality amelioration provided by the extensive reedbeds into which the Bayside Canal formerly discharged, but which were removed in the reporting period for the construction of new flood attenuation and treatment wetland systems; and
- Ammonia toxicity was probably not a factor affecting the Zoarvlei over the current reporting period, reflecting much lower nitrogen pollutant loads into this system; a longer retention time than in the flowing lagoon; and more effective relative nitrification processes as a result.

6.3.5 DISSOLVED OXYGEN

Summary data presented in figure 6.1 show that the number of samples that fell within the unacceptable and poor ranges increased in the 2025 reporting period, compared with the previous year, in all sub-catchments monitored. In the Mosselbank sub-catchment, which displayed the largest deterioration in dissolved oxygen, this is at least partially attributable to the addition of the new sites that had generally poor water quality.

The lowest median oxygen concentrations were in the lower Diep River downstream of the Potsdam WWTW, and site RTV18 at the Erica Drive stormwater outfall displayed a deterioration in surface oxygen concentrations from 2024 to 2025, reflective of the high oxygen demand in Potsdam effluent.

Minimum concentrations at most sites in the Milnerton Lagoon, as well as in the Theo Marais channel and in the Sandringham pond, were below 1,0 mg/ℓ, reflecting conditions that at times would severely stress most aquatic life and would substantially reduce the rates of nitrification of ammonia, contributing to the high and often toxic concentrations of this nutrient.

6.4 CONCLUSIONS AND RECOMMENDATIONS

Overall, the data show that the Diep River catchment continues to experience severe and pervasive water quality challenges, driven largely by chronic sewage pollution, high nutrient loads, and widespread infrastructure failures. While the impacts of upstream agricultural and wastewater impacts are significant, the most acute deterioration occurs in the lower catchment, where persistent inflows from informal settlements, frequent pump station overflows, and poor-quality effluent from the Potsdam WWTW collectively overwhelm the system. Meaningful improvement will require urgent and sustained interventions at these major pollution sources – particularly at Potsdam WWTW, the Koeberg Road pump station and within the Dunoon/Doornbach area – supported by broader efforts across the catchment to reduce nutrient enrichment and strengthen wastewater and stormwater management.



Figure 6.1

Summary water quality data for the Diep River catchment, presented as compliance-type data, showing percentage of all samples that fall into preallocated categories, as per tables 2.1 and 2.3. Data include (A) (geometric) mean annual *Escherichia coli* data; (B) median annual orthophosphate phosphorus (PO_4-P) data; (C) annual ammonia (NH_3) data; (D) median annual dissolved oxygen (DO) data.

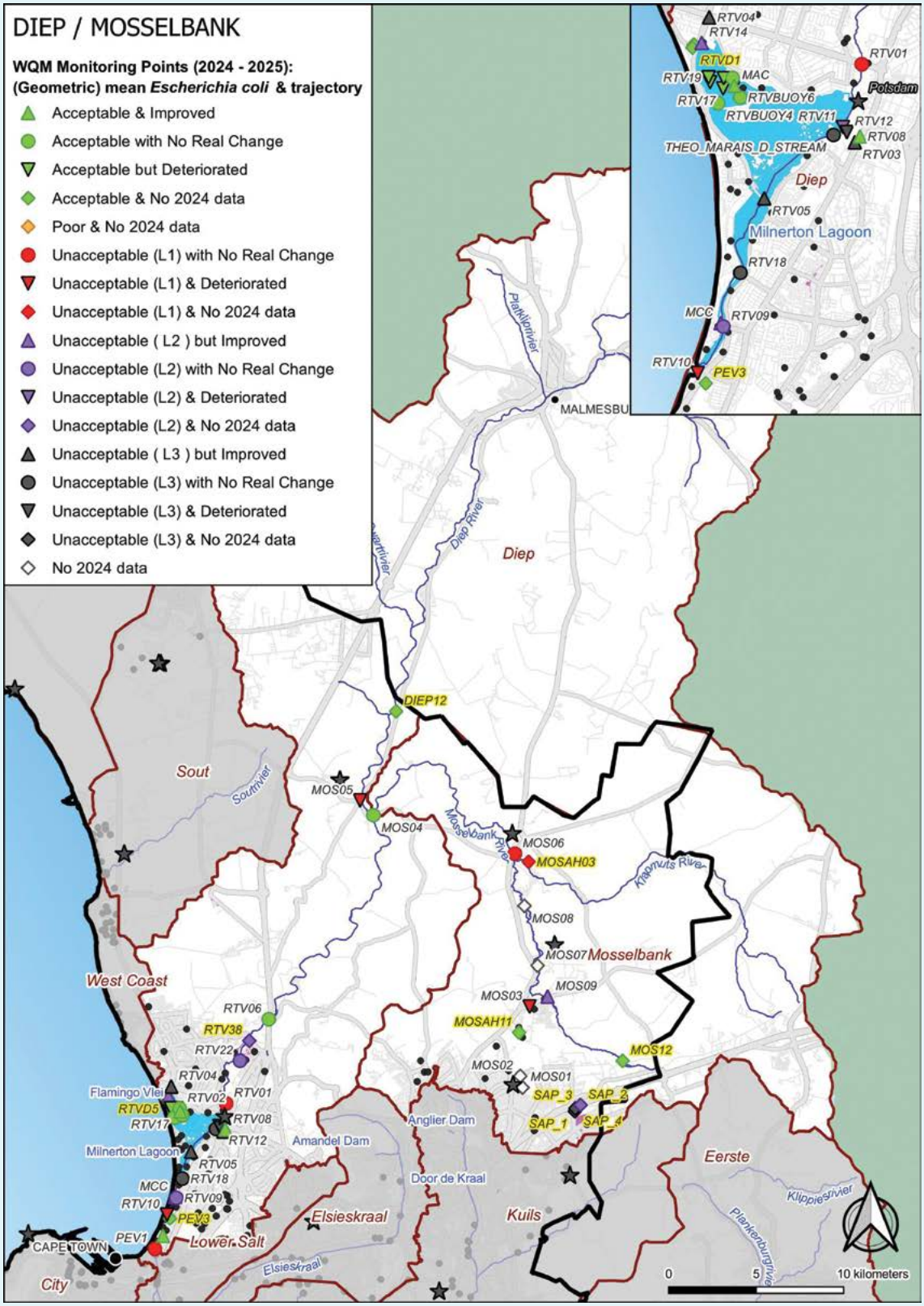


Figure 6.2

Escherichia coli data, focusing on the Diep River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory and condition calculations explained in appendix E.

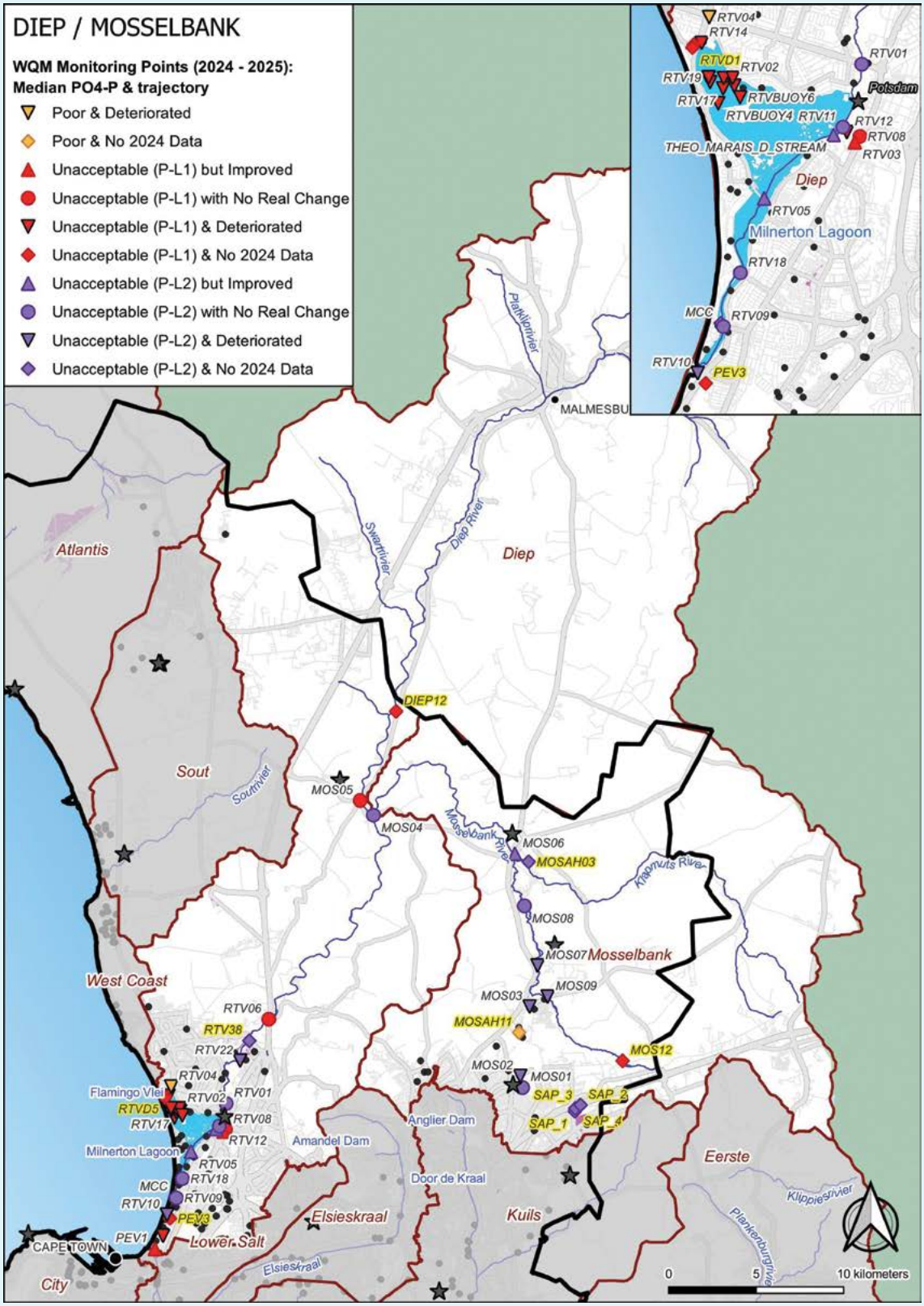


Figure 6.3

Median annual orthophosphate (PO_4-P) data, focusing on the Diep River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

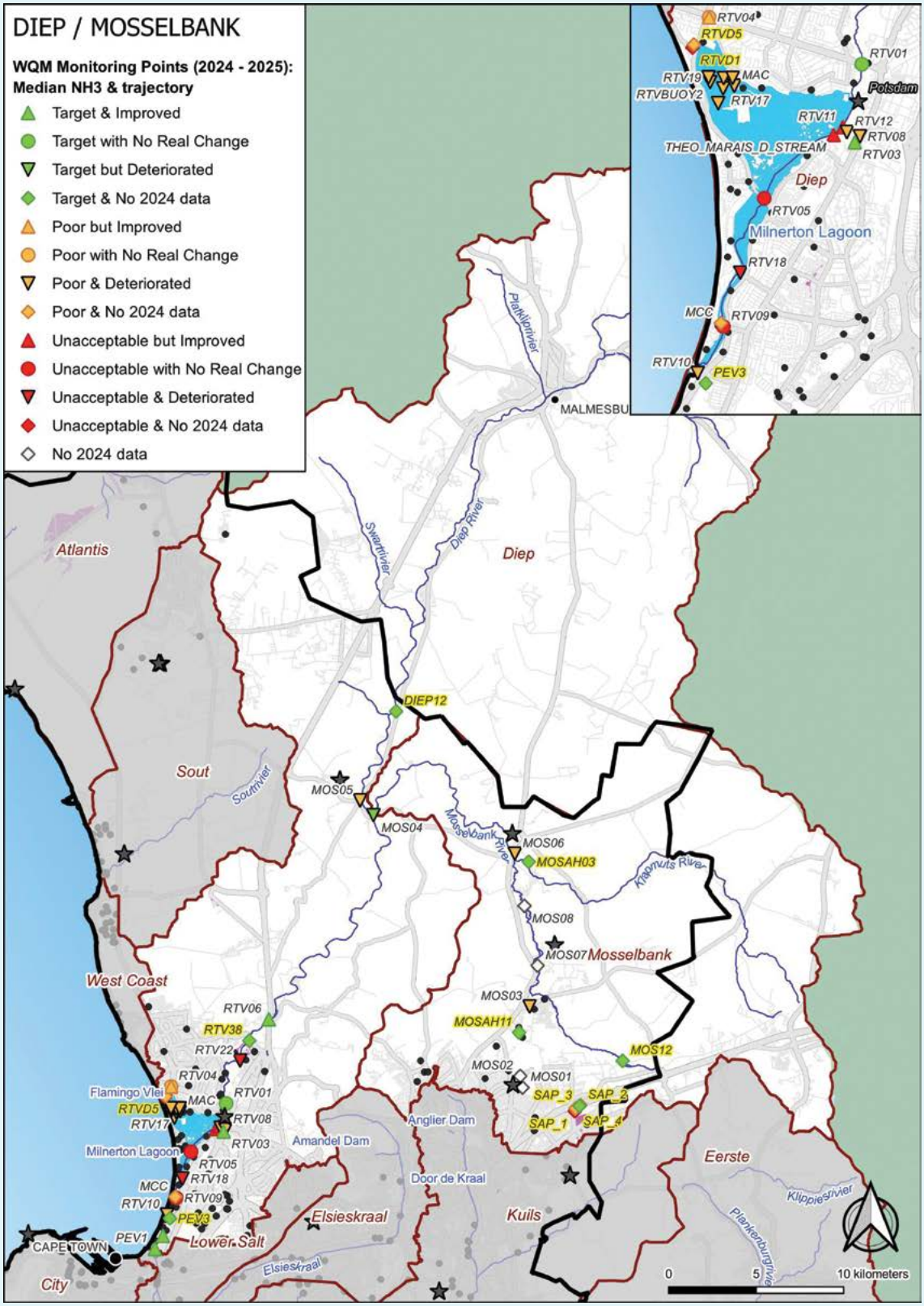


Figure 6.4

Median annual un-ionised (or free) ammonia (NH_3) data, focusing on the Diep River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

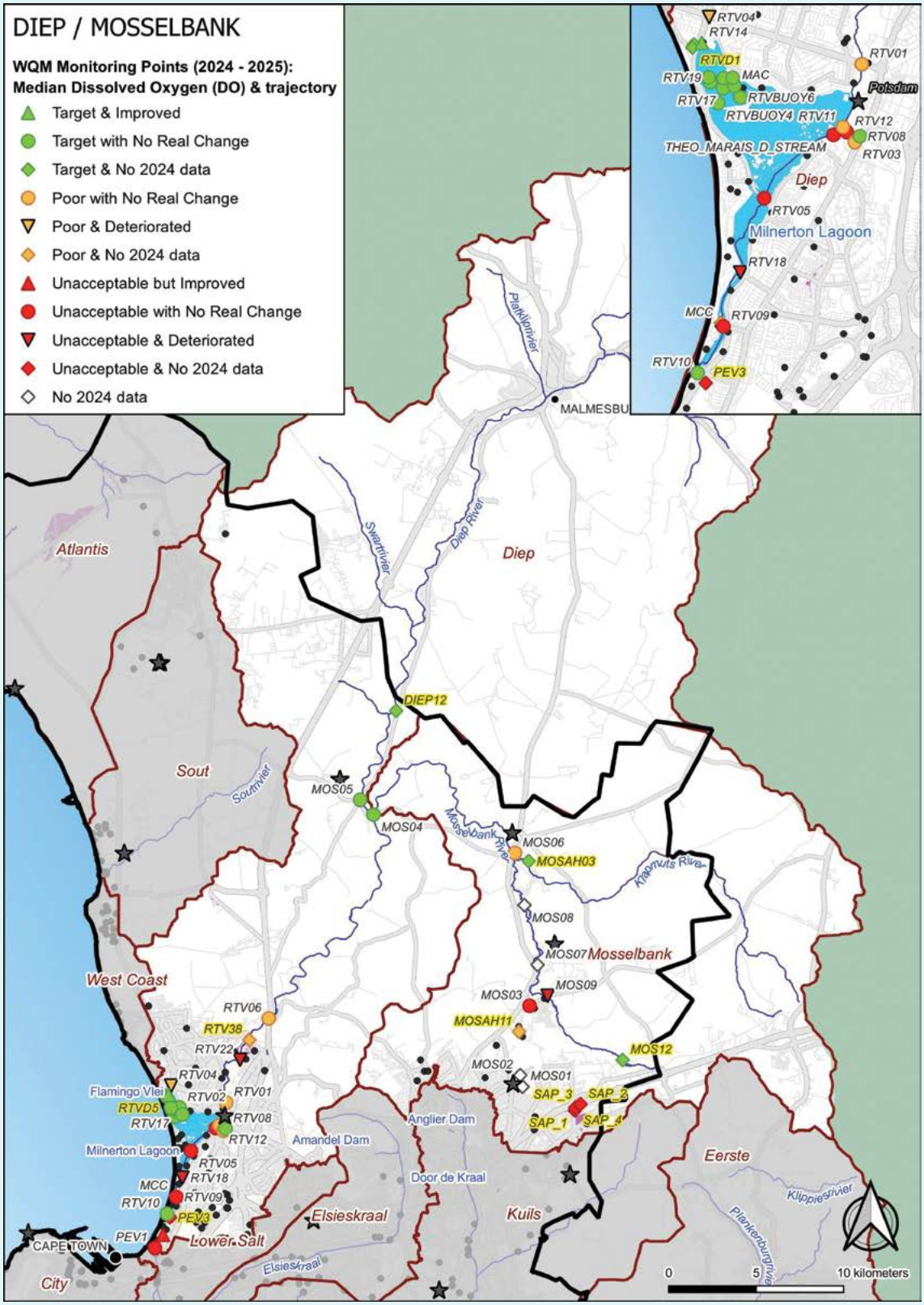


Figure 6.5

Median annual dissolved oxygen (DO) data, focusing on the Diep River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period.

7. WATER QUALITY IN THE EERSTE RIVER CATCHMENT

EERSTE AND KUILS RIVER SUB-CATCHMENTS

7.1 CATCHMENT OVERVIEW

This catchment includes the Kuils and Eerste River sub-catchments, of which only the lower Eerste (south/south-west of Van Riebeek Road) flows within the City's boundaries, while the upstream mainstem river and its tributaries lie in the Stellenbosch municipal area. Four City municipal WWTW are in operation in the catchment, which also receive runoff from the Stellenbosch WWTW and various industries and informal settlements in the Stellenbosch municipal area upstream. Water quality in the Eerste River downstream of the Stellenbosch industrial areas is described as perennially highly polluted (e.g. Day et al., 2025b). Of the City's WWTW, the Zandvliet works, which discharges into the lower Kuils River, has recently undergone a major upgrade to increase treatment capacity and improve effluent quality. The upgrade was completed in the 2023 reporting period.

Land use in the Kuils sub-catchment is primarily urban, and includes major industrial and commercial areas such as Bellville CBD, the Bellville WWTW, Brackenfell, Stikland and Kuils River, likely to reflect in stormwater quality typical of these land uses. An exception is the north-eastern portion of the sub-catchment in the vicinity of the Scottsdene WWTW, which includes some agricultural land use (mainly wine estates) and more open spaces, including golf courses. With distance south through the sub-catchment, land use shifts to primarily residential, with high-density, low-cost housing predominating downstream of the Stellenbosch Arterial Road (M12).

The Driftsands Nature Reserve is located in the largely built-up southern portion of the sub-catchment, but this now deproclaimed nature reserve has been subject to significant land invasion and encroachment of informal settlement into the area. These invasions have resulted in the loss of important, previously protected wetlands. In nearby City-owned land in Khayelitsha, similar land invasions have resulted in marked expansion of informal and unserviced areas into wetlands.

In the relatively small portion of the Eerste River sub-catchment that falls within the City boundary, the dominant land uses in the northern half of the sub-catchment (to the north of Old Faure Road) are high-density housing (to the east of the R102, Voortrekker Road) and agriculture (to the west of the R102). To the south, land use is predominantly rural to semi-rural, with the exception of the urbanised areas of Macassar and Croydon. The Eerste River floodplain extends over much of this area, with some homes and other buildings located within the 1:100-year floodline and prone to flooding. These floodplains include floodplain wetlands, which are important remnant habitats, and representative of a wetland habitat type (floodplain wetlands) that is rapidly disappearing within Cape Town, with land invasion a primary cause of its loss (Day, 2024). The floodplains themselves perform important ecosystem services. The Macassar WWTW is located at the lower end of the sub-catchment, just upstream of the Eerste River estuary.

7.2 THREATS TO WATER QUALITY

The main sources of water pollution in the catchment within the City's boundaries include (from Day et al., 2025):

- Pollution loading from the Eerste River upstream of the City's boundary;
- Runoff and direct input of untreated sewage and highly polluted greywater from informal settlements and areas with high levels of backyard dwelling into stormwater systems, and from there either directly or indirectly into rivers and wetlands – these continue to expand within the Kuils River floodplain, and many of these discharge through isolated areas, where their visibility is low. They include the Bloekombos and Wallacedene informal settlements in the upper Kuils River catchment;
- Overflows from sewer and pump station blockages/failures, and frequent surcharging of manholes in the Kuils River floodplain, often close to the river;
- Dumping of solid waste and sewer overflows in the vicinity of the Kleinvlei Canal;
- Inputs of inadequately treated sewage effluent from underperforming WWTW, especially into the Kuils River (Bellville, Scottsdene and (Eerste River) Macassar WWTW);
- Stormwater runoff from commercial and industrial areas within the catchment, and from roads and built-up urban areas;
- Pollution inputs into river and wetland systems from remnant agricultural areas (mainly livestock) within the catchment, mainly in the form of nutrients (orthophosphates and nitrates); and
- Inflows of night soil (informal settlements) and leachate from septic tanks (Sandvlei and Kramat areas of the lower Kuils/Eerste River).



Photo 7.1 *Kuils River through extensive reedbed wetlands downstream of Khayelitsha*



Photo 7.2 *Eerste River near Macassar – the river was illegally bermed in this area and removal of the berm and river rehabilitation is required in this area*

7.3 WATER QUALITY THROUGH THE CATCHMENTS – CONDITION AND TRAJECTORY

7.3.1 MONITORING POINTS AND WATER QUALITY MAPPING

The City collects routine water quality samples from 26 sites in the Eerste catchment, including four (new) sites on one detention pond (BOP1-BO4); the Mew Way detention pond, one estuary; and 20 river/canal sites. Of the latter, EK27-EK31 are new sites, located variously on the upper reaches of the Kuils and Eerste rivers, while two new sites (STRM01 and STRM02) are located in the lower Eerste sub-catchment on an unnamed stream through Helderberg Village, which enters the Moddergatspruit further downstream, and the Moddergatspruit itself.

Figure 7.1 (**A to D**) presents summary water quality data for *E. coli*, orthophosphate (as PO_4-P), dissolved oxygen and free ammonia (NH_3) for the 2024 and 2025 reporting periods. The data are shown as percentages of all of the samples collected in the 2025 reporting period that fell into different water quality categories (as per **tables 2.1 and 2.3**). **Figures 7.2 to 7.5** present the same data on a site-by-site basis, showing spatial changes through the catchment and including trajectory analyses, comparing median data (geometric means for *E. coli*) from the 2025 reporting period with those of the previous year.

The following sections provide brief commentary on these findings.

7.3.2 RAW SEWAGE POLLUTION INDICATORS (*ESCHERICHIA COLI*)

Figure D5 (**appendix D**) shows a number of pollution hotspots in this catchment, as reflected by C3 reporting data, with the area south of Bloekombos/Wallacedene as well as Bellville South, Belhar, Delft, Blue Downs and Mfuleni along the Kuils River, and Macassar along the Eerste River all having a high frequency of reported sewage spills. **Figure D4** shows that these areas were also affected by numerous pump station failures and blockages. The Nooiensfontein and Symphony Way 1 pump stations in particular were among the 10 worst performing pump stations in the city (**table D2**) in terms of spill frequency in the 2025 reporting period, with respectively 16 and 10 spills reported. The Rietvlei and Helderberg pump stations were also poorly performing, with seven and six overflows recorded, respectively, all into the Kuils River sub-catchment. Of these, most were rated as insignificant to minor spill events, with a few rated as moderate (**figure D3**). The frequency of spills in these areas reflect high levels of informal and backyard settlement with high levels of solid waste accumulation in open spaces, roads, river corridors and in channels and stormwater drains, including Bellville South. The catchment as a whole is vulnerable to pump station failure and manhole overflows as a result of blockages, because it has multiple pump stations as a result of its generally flat gradients, particularly in the Kuils sub-catchment.

The above issues are reflected in *E. coli* data, shown in **figures 7.1 and 7.2**, which show that:

- Water quality in the Mew Way pond was highly polluted with all data in the 2025 reporting year falling above the unacceptable level 3 threshold, showing slight worsening since the previous period;
- Water quality in the Kuils River was generally more polluted than in the Eerste River and showed an increase in the percentage of samples rated as unacceptable compared with the previous year (78% versus 71% in the 2024 reporting period) and a decrease in the percentage of samples rated acceptable. The 2025 data do, however, include a number of new sites, all reflecting highly contaminated water, as shown in site level data in **figure 7.2**, in which annual geometric means for all the new sites in this sub-catchment were rated as unacceptable level 3, making comparison between years at a catchment scale difficult. The data for individual sites shows that *E. coli* contamination in the Kuils sub-catchment:
    - Was high (unacceptable level 3) in the upper catchment (Kuils mainstem and Bottelary rivers), affected by informal settlements and multiple sewage spills as described above, rather than inflows from the Scottsdene WWTW, which generally performed well with regard to *E. coli* treatment (80% compliance shown in **table C6**);
    - Pollution levels dropped with distance downstream in the Kuils River, with EK10 showing improvement and acceptable conditions in annual data;
    - All sites downstream of the confluence of the Bottelary River were rated unacceptable level 3 and deteriorating, indicating high levels of polluted inflows from surrounding settlements and problematic pump stations prone to frequent overflows;
- Data for the Eerste River showed less polluted conditions, and all sites upstream of the Kuils River confluence were rated as acceptable, suggesting that these parts of the catchment were less prone to sewage overflows and without major areas of informal settlement and enclaves of homeless citizens; and
- The estuary site was rated as improved, but of a poor level with an unacceptable level 2 rating, possibly improved by runoff from a slightly cleaner local catchment, as shown by the above data.

7.3.3 PHOSPHORUS NUTRIENTS

Figures 7.1 and 7.3 show that this nutrient was at lower concentrations in the upper Kuils River than elsewhere, despite the high *E. coli* associated with EK29. Orthophosphate concentrations were, however, very high (unacceptable level 2) at all sites in the Bottelary River, and throughout the lower reaches of the river, reflecting in particular high loading from the three upstream WWTW, as well as the known (but probably much lower) sources of phosphorus nutrients in untreated sewage. These comments are despite the high compliance levels of all WWTW in the Eerste catchment, which figure C4 shows to be > 95% for the current reporting year. However, the compliance threshold for general

effluent limits against which the effluent is measured are themselves high and already in the level 3 range for this variable.

Orthophosphate concentrations from sites in the Moddergatspruit and its tributary from the eastern side of the Eerste sub-catchment were by contrast much lower, with data all rated as poor, but potentially reflecting lower concentrations, not detectable with the current laboratory analytical methods in use (see **appendix F**).

Concentrations of the nutrient in the Eerste just upstream of the Kuils River confluence were, however, elevated to unacceptable level 1, reflecting upstream sources that include the Stellenbosch WWTW as well as runoff from informal and backyard settlements in the Stellenbosch area, as well as downstream agriculture.

The impact of the high orthophosphate phosphorus in the lower catchment reflect in the high volumes of water hyacinth (*Pontederia crassipes*) that proliferates in the river, blocking its flows and preventing previous recreational use by the once-active Khayelitsha Canoe Club (Day et al., 2025). Excessive phosphorus nutrient availability also promotes reed growth in the river channels, requiring flood-management maintenance.

7.3.4 UN-IONISED (OR FREE) AMMONIA AS A TOXIN

Despite elevated *E. coli* levels along the upper Kuils River, samples there showed that ammonia toxicity was unlikely to have been a problem, and similarly unproblematic in the generally cleaner eastern Moddergatspruit catchment. By contrast, and not surprisingly given the very high *E. coli* concentrations and known high frequency of sewage spills and runoff from informal settlements, ammonia concentrations were within the range for acute toxicity in the Bottelary sub-catchment in the north-east, and along the Kuils River, into the Eerste River and extending as far as the estuary. Median annual data do, however, show some improvement at some sites.

7.3.5 DISSOLVED OXYGEN

DO concentrations followed the same pattern as un-ionised ammonia. Low DO that gave rise to the categorisation of median annual values as unacceptable is assumed to be the combined result of high CODs in the river, stemming from high levels of organic material, and high concentrations of ammoniacal nitrogen, with these effects exacerbated by slow lowland river flows, low summer temperatures and an assumed accumulation of organically rich, hypoxic muds and sediments in the lower river in particular. The improvement in DO in the estuary to 'acceptable' is assumed to reflect diurnal algal production in that nutrient-enriched system, and not flushing by the sea, given that EC data in the dataset show freshwater and occasional brackish conditions (EC at EK17 < 542 mS/m).

7.4 CONCLUSIONS AND RECOMMENDATIONS

Pollution generated in and passing through this large and socially complex catchment has had a profound effect on aquatic ecosystem condition and on estuarine function. The Eerste River estuary, once regarded as an important feeding and resting habitat for inter alia migratory birds, was assessed as 'severely modified' by Van Niekerk and Turpie (2012), with poor water quality, deepening and poor quality of sediments, and changes in flows in summer as a result of WWTW discharges, cited among other reasons for this poor rating.

In the lower Kuils and lower Eerste River systems, sustained exposure to ammonia above thresholds of toxicity is expected to have had a long-term impact of reducing watercourse resilience, affecting indigenous plant health, rooting strength and simplifying macroinvertebrate communities to only the most hardy and pollution-tolerant (often the larvae of nuisance Chironomid midges). These make affected rivers more vulnerable to catastrophic responses to further pollution impacts; more prone to erosion during floods; and (given high nutrient availability) more vulnerable to invasion by aquatic and marginal plants, requiring maintenance and management.

Mitigation and management of these impacts are challenging, given the very high levels of informal settlements in the catchment, and the difficulty of provision of adequate sanitation. However, the major sources of phosphorus loading in the catchment is WWTW effluent, producing large volumes of effluent with very high orthophosphate concentrations. If these concentrations could be reduced significantly, it is possible that there could be measurable catchment-scale impacts. However, short-term attention to improved monitoring of pump stations prone to failure to identify sewage spills early, and rapid responses to C3 reporting of spills should be priorities in this catchment.

A focused attempt to collect and manage accumulating solid waste from burgeoning informal settlements and other pollution hotspots should also be prioritised, in conjunction with the City's Urban Waste Management Branch. It is noted that none of these functions are under the control of CSRM.

What is also important is to ensure that the few parts of the catchment that are currently not greatly impaired with regard to water quality (Moddergatspruit and the upper Kuils River) are not allowed to degrade through mismanagement and infrastructure neglect.



Figure 7.1

Summary water quality data for the Eerste River catchment, presented as compliance-type data, showing percentage of all samples that fall into preallocated categories, as per tables 2.1 and 2.3. Data include (A) (geometric) mean annual *Escherichia coli* data; (B) median annual orthophosphate phosphorus (PO_4-P) data; (C) annual ammonia (NH_3) data; (D) median annual dissolved oxygen (DO) data.

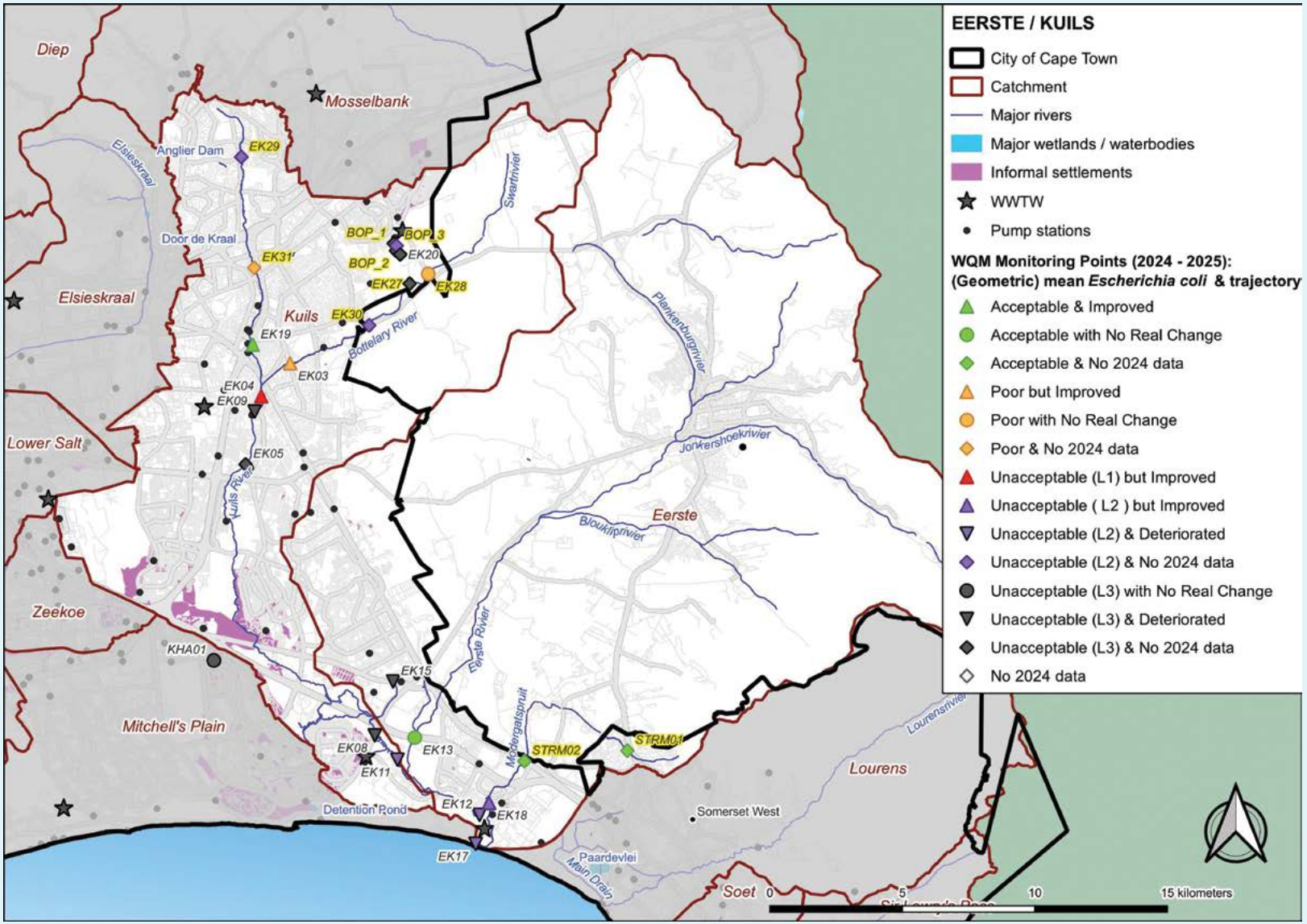


Figure 7.2

Escherichia coli data, focusing on the Eerste River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Insert showing rated *E. coli* samples per site over the 2025 reporting period, noting that this area comprises two major sub-catchments with combinations of ponds and rivers. Trajectory and condition calculations explained in appendix E.

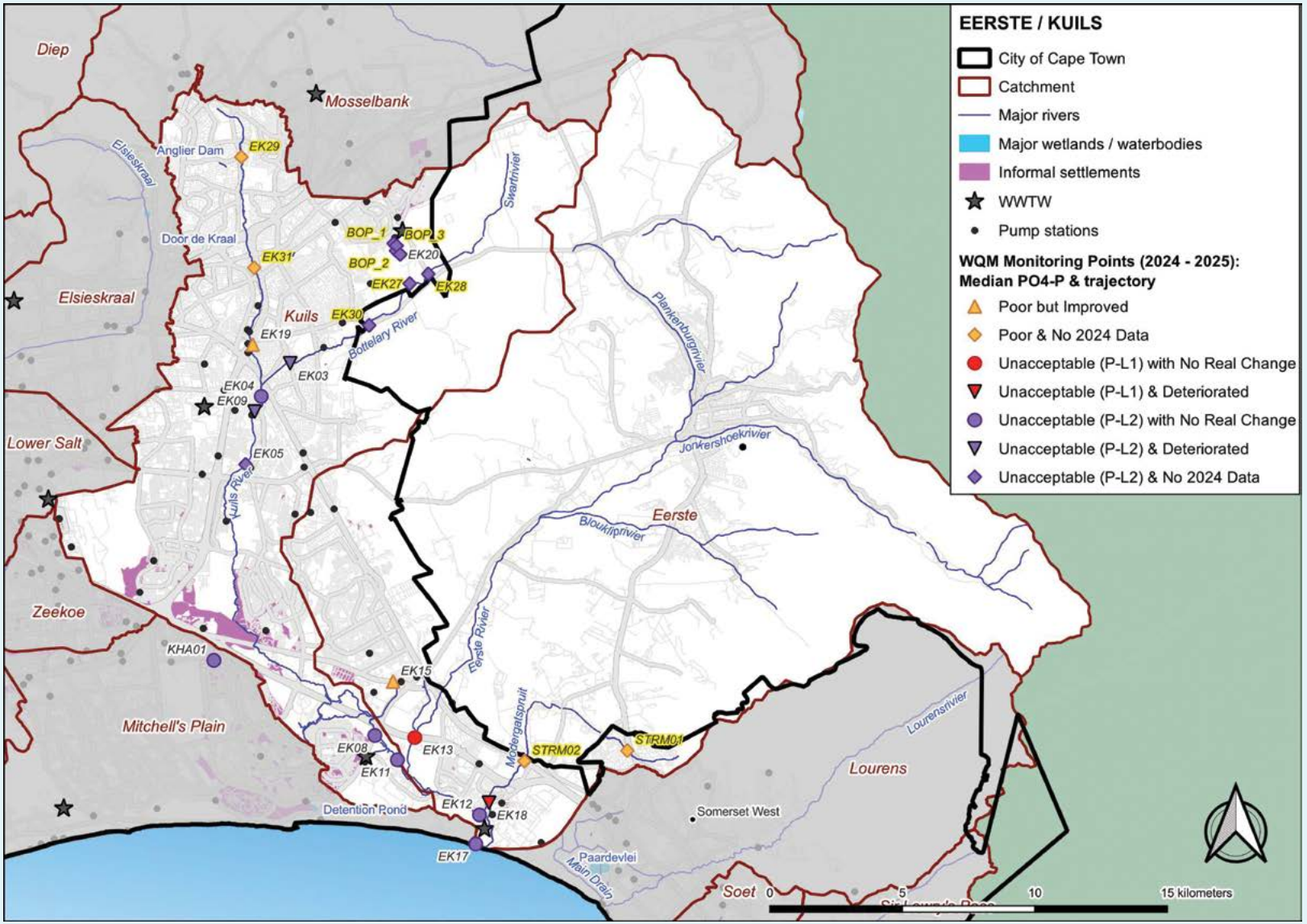


Figure 7.3

Median annual orthophosphate (PO_4-P) data, focusing on the Eerste River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

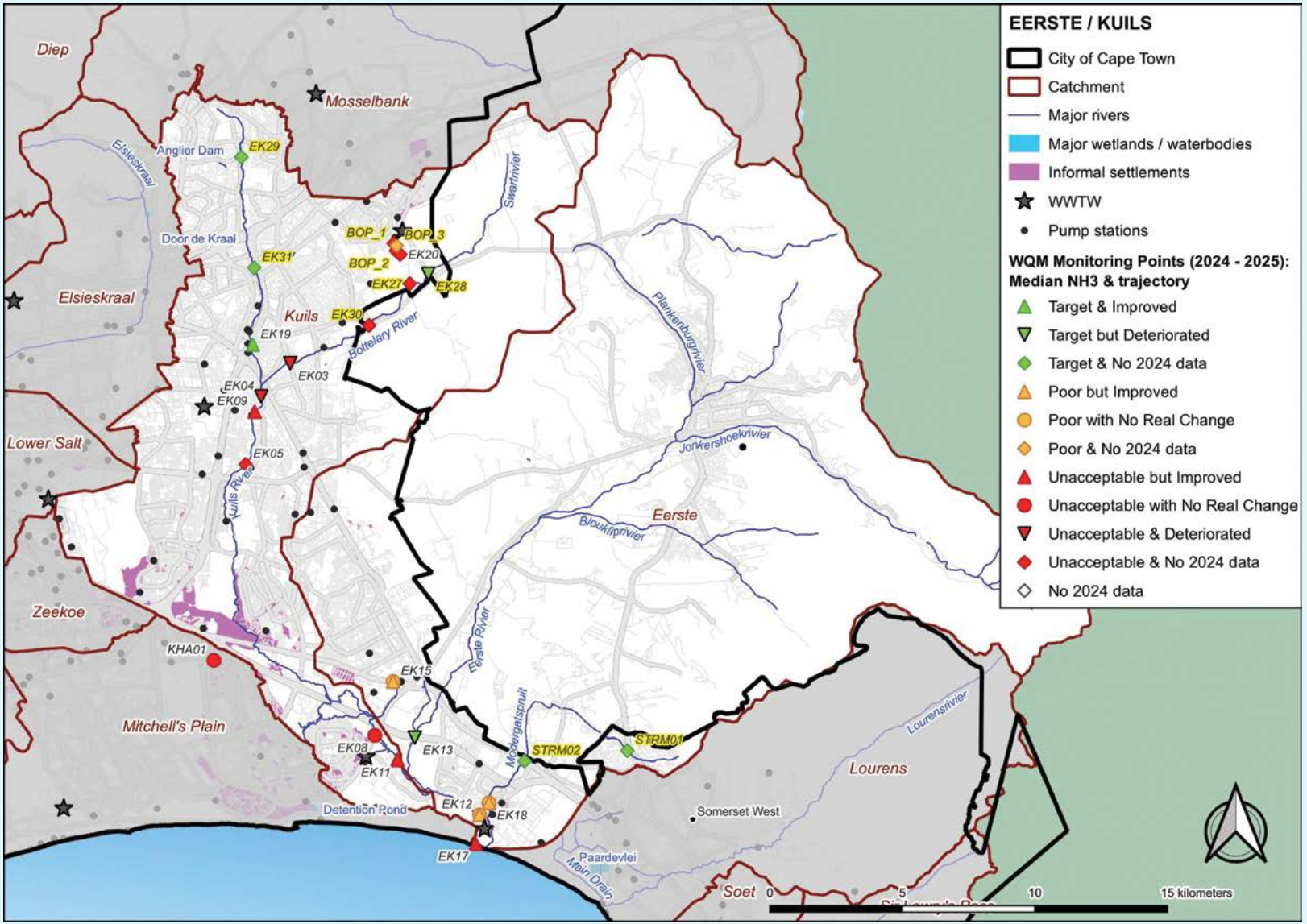


Figure 7.4

Median annual un-ionised (or free) ammonia (NH_3) data, focusing on the Eerste River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

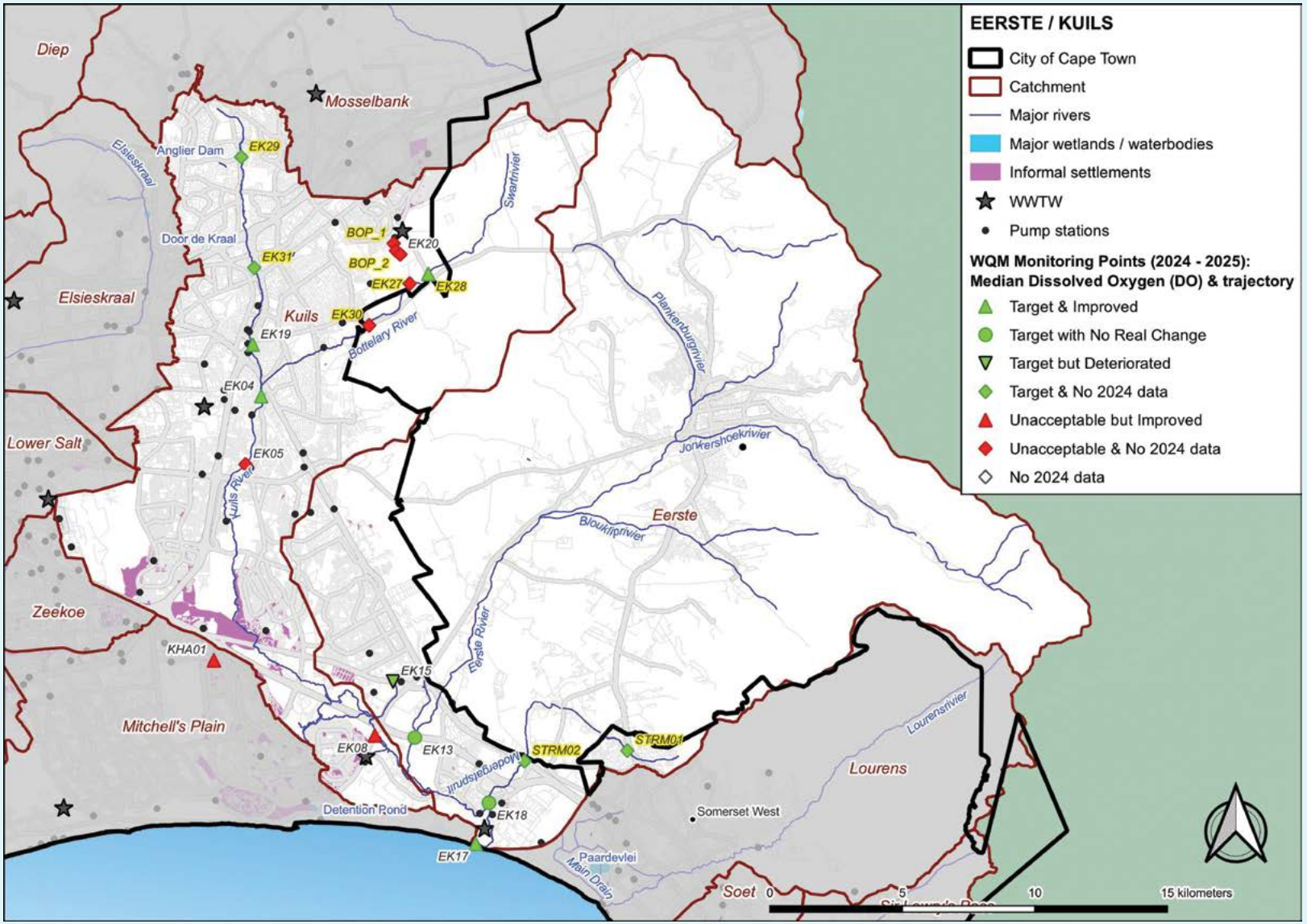


Figure 7.5

Median annual dissolved oxygen (DO) data, focusing on the Eerste River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

8. WATER QUALITY IN THE HOUT BAY RIVER CATCHMENT

8.1 CATCHMENT OVERVIEW[3]

The Hout Bay River catchment is a relatively small catchment (approximately 40 km^2), with the entire upper catchment located within the Table Mountain National Park (TMNP) and consisting mostly of natural areas. The middle to lower portion of the catchment is, however, dominated by urban, peri-urban and commercial land uses, occupying approximately 20% of the catchment area. There is a relatively large (especially in relation to the catchment size) informal settlement (Imizamo Yethu) in the lower reaches of the catchment. A number of dams in the upper catchment have significantly affected the flows of the Hout Bay River.

The Disa and its (upper reach) tributaries originate on Table Mountain at an altitude of 720 m AMSL. These streams join to form the Hout Bay River, in the access-controlled Orange Kloof section of the TMNP, which contains a relatively large, intact area of Afromontane forest. The Hout Bay River is approximately 12 km long, with steep and fast-flowing, naturally acidic waters in the more natural upper to middle reaches. The river meanders through farmlands and residential areas in its middle to lower reaches, where extensive reed beds flank the river channel, before it widens into a small lagoon that discharges into the sea on Hout Bay beach. In its lower reaches, much of the river has been bermed, separating flood flow from the floodplain.

The name 'Hout Bay' refers to the abundance of indigenous trees that once occurred in the middle to upper catchment ('hout' is the Afrikaans word for wood). The lower reaches of the Hout Bay River originally consisted of a naturally braided channel flowing through an extensive palmiet (*Prionium serratum*) and reed wetland area. Large-scale harvesting of the indigenous forest in the upper catchment, and removal of palmiet and other reed beds in the naturally wide floodplain further downstream (Grindley, 1988) resulted in severe erosion along the middle and lower reaches of the Hout Bay River, which was addressed by the construction of the Longkloof weir that had its own negative impacts on the ecological functioning of the downstream reaches of the river.

Other impacts in the middle to lower reaches of the Hout Bay River include channel straightening, dredging of sediments from the channel and construction of levees to prevent flooding of riverside properties. There is also extensive encroachment of invasive alien vegetation along the riverbanks and (especially reeds such as *Arundo donax* (Spanish reed)) on mid-channel sand bars that have formed as a result of the deposition of eroded sediment, which often causes further bank erosion through the deflection of flows.

The Hout Bay River is joined in its lower reaches by the Baviaanskloof Stream, which rises in the Table Mountain National Park on the steep slopes above Scott Estate, and then flows through mainly suburban development until it joins the Hout Bay River, just downstream of Princess Road.

[3] Most of this contextual information is taken from the State-of-Rivers Report prepared by the River Health Programme (RHP, 2003), with updates where relevant, based on more recent consulting and other reports.

Another small watercourse is included in the Hout Bay catchment, although it technically does not enter the river, but passes onto Hout Bay Beach just east of the harbour, via a concrete culvert under Harbour Road.

There are no WWTW that discharge treated effluent into rivers in the Hout Bay catchment, because primary treated wastewater from the area is released into Hout Bay via a marine outfall. There are, however, sewage pipelines in the catchment, as well as septic tanks and the (largely unserviced) informal settlement of Imizamo Yethu, which cause sewage-related pollution problems and the proliferation of algae, reeds and other alien instream vegetation in the middle to lower reaches of the Hout Bay River.

There are currently three main stormwater-to-sewer diversions from the Imizamo Yethu area, and a few minor ones. These comprise mainly greywater and night soil. However (see Day et al., 2025):

- There is insufficient capacity in the sewer for these, and surcharges into the Hout Bay River are common;
- The diversions are bypassed in winter;
- They require major maintenance as a result of solid waste blockages (daily to weekly cleansing); and
- The pump stations are designed for the current sewage capacity (i.e. excluding large areas of Imizamo Yethu and its greywater and night soils).

8.2 THREATS TO WATER QUALITY

While the causes of pollution to the Hout Bay River system are complex and often interlinked, the primary pollution types within the catchment have been categorised in the Hout Bay Catchment Pollution Abatement Comprehensive Study (Lukhozi, 2023) as comprising raw sewage discharges and spillages, greywater discharges, solid waste and sediment.

The Hout Bay PASAP of Martin (2024) ascribes the main sources of such pollution to:

- Smallholdings and horses in the middle reaches of the Hout Bay River;
- Sewage overflows from blocked pipes and pump station failures, mainly in the middle to lower reaches of the catchment, as well as from surcharging sewers as a result of low-flow stormwater diversions; and
- Input and runoff of sewage-contaminated water into the stormwater system from the largely informal Imizamo Yethu settlement, which flows into the lower reaches of the Hout Bay River, as well as from the Hangberg area where a large portion of formal housing is associated with backyard dwellings.



Photo 8.1 *The upper and middle reaches of the Hout Bay River are only moderately impacted by water quality (runoff from paddocks and gardens) and instream habitat is relatively good. Extensive alien invasion impacts on riparian quality.*

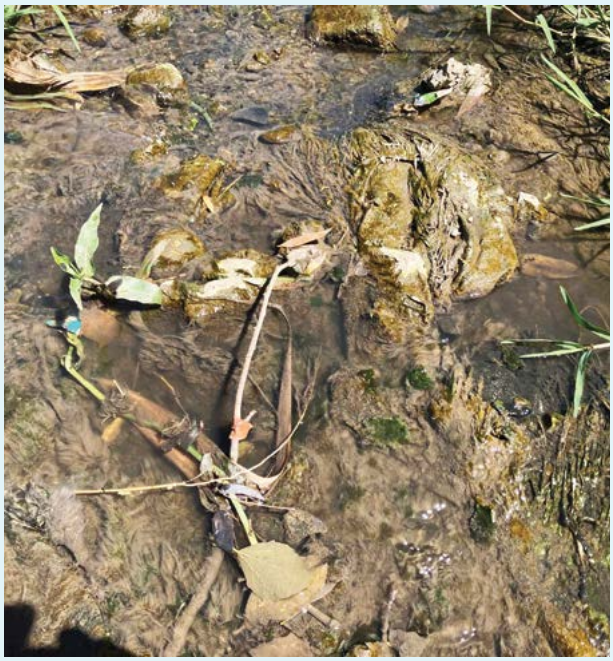


Photo 8.2 *Close-up photo showing so-called 'sewage fungus' in the visibly polluted lower reaches of the Hout Bay River, with main pollution sources being point-source inflows from the Imizamo Yethu settlement.*



Photo 8.3 *Pollution stream of black and greywater from Imizamo Yethu pass into the Hout Bay River via the stormwater system – at the time of this report, plans to intercept and treat this water were under consideration by the City.*



Photo 8.4 *Solid waste accumulates in parts of Imizamo Yethu (photo copied from Hout Bay Catchment PASAP)*

8.3 WATER QUALITY THROUGH THE CATCHMENT – CONDITION AND TRAJECTORY

8.3.1 MONITORING POINTS AND WATER QUALITY MAPPING

The City currently collects routine water quality samples from seven sites in the Hout Bay River catchment, including one stormwater outfall to sea; one site on the Baviaanskloof Stream (a tributary of the Hout Bay River) and five sites on the Hout Bay River itself. Of these, the Baviaanskloof Stream is a new site, added in the 2025 reporting period, while the stormwater outfall is located in the harbour and does not feed into the river.

Figure 8.1 (**A to D**) presents summary water quality data for all of the river sites for *E. coli*, orthophosphate (as PO_4-P), dissolved oxygen and free ammonia (NH_3) for the 2024 and 2025 reporting periods. Only *E. coli* is monitored at the stormwater outfall. The data are shown as percentages of all of the samples collected in the 2025 reporting period that fell into different water quality categories (as per **tables 2.1 and 2.3**). **Figures 8.2 to 8.5** present the data as categorised median annual values on a site-by-site basis, showing spatial changes through the catchment and including trajectory analyses, comparing data from the 2025 reporting period with those of the previous year.

The following sections provide brief commentary on these findings.

8.3.2 RAW SEWAGE POLLUTION INDICATORS (*ESCHERICHIA COLI*)

Figure D5 (**appendix D**) shows that C3 reporting occurred at a relatively low intensity in this catchment, while sewer pump station overflow data indicate five pump station overflows only over the 2025 reporting period, all rated as of 'insignificant' impact (see **table D2**) and all from the same pump station (Disa Road), located just north of Princess Street. What these data do not show are the permanent channels of greywater and sewage that pass into the stormwater channels from the informal settlements in Imizamo Yethu, which are not reported as they are now permanent features of this landscape. **Figure 8.1** highlights the fact that while around 45% of samples collected fell within the acceptable risk range in the 2025 reporting period, water quality in the remaining 55% of samples deteriorated, compared with the 2024 reporting period, with more samples falling into the unacceptable (level 3) and level 2 ranges than previously.

The data shown on the map in **figure 8.2** show that:

- Sewage pollution was generally not problematic in the upper reaches of the catchment, with mean annual values for both upstream river sites lying within the acceptable range for *E. coli*, and thus unlikely to have posed major human health risks, although the data for DR06 do show deterioration between the 2024 and 2025 reporting periods.

- Downstream of the Imizamo Yethu settlement, water quality deteriorated significantly in the Hout Bay River, with all three downstream sites lying in the unacceptable range. DR02 and DR01 were both in the level 3 unacceptable range, reflecting levels of *E. coli* that would have been at least two orders of magnitude higher than acceptable, and the 'improvement' marked in data for DR02 remains within such high levels of pollution that it is still a major cause for concern.
- Mean annual *E. coli* data at the most downstream site (DR06) was rated as unacceptable level 2, with the improved (but still grossly polluted) water reflecting dilution with cleaner inflows from the Baviaanskloof Stream.
- Mean annual data for the Baviaanskloof Stream, which enters the main river channel from the east, fell within the acceptable range, reflecting a sub-catchment with low levels of sewage contamination and overflow.
- Inflows into the (unnamed) western stream (HB11) were also within the acceptable range.

8.3.3 PHOSPHORUS NUTRIENTS

Figure 8.1 illustrates that the number of samples in this catchment with orthophosphate concentrations in the unacceptable range increased from 5% to 20% between the 2024 and 2025 reporting periods. The absence of any samples in the target range is probably an artefact of the high laboratory limits of detection (LoD) for this variable. An LoD < 0,1 mg/ℓ is reflected in the data, by convention, as 0,05 mg/ℓ. This means that samples where concentrations fall below detection limits are automatically assigned to 'poor'. This is clearly problematic, because it does not allow shifts (up or down) within this range to be tracked, and means that there is no possibility of any sites being rated as within target.

Figure 8.3 shows that median orthophosphate data have been rated as poor for sites throughout the catchment, with deterioration at DR01 between the 2024 and 2025 reporting periods.

Summary data presented in **appendix E** show that median annual orthophosphate data for the 2025 reporting period was 0,05 mg P/ℓ for all sites save DR01, where it was 0,1 mg P/ℓ, although the maximum measured concentration at this site was 0,92 mg P/ℓ, suggesting periods of elevated concentrations, as a result of polluted upstream flows. Sources of orthophosphate in this catchment would be likely to comprise some inflows from upstream paddocks, agriculture and gardens; possible inflows from historical point sources such as the World of Birds; runoff which enters the river between sites DR06 and DR02; and most significantly, inflows from the informal settlement, with phosphate being associated with detergents in greywater as well as raw sewage.

8.3.4 UN-IONISED (OR FREE) AMMONIA AS A TOXIN

Summary data presented in **figure 8.1** show that, while ammonia was not present in any samples at concentrations likely to be associated with acute toxicity (i.e. rated unacceptable), there was deterioration in the 2025 reporting period, with some 10% of samples being rated poor, compared with 100% rated acceptable in the previous year. These data are, however, a product of the addition of new water quality sites in the catchment, with the only site with median free ammonia concentrations falling into the poor range being the newly-added HB11 site. Elevated ammonia in samples from this small catchment might reflect the effects of low, slow flows through a covered culvert but are not fully explained by data for other water quality variables in this catchment, which do not suggest major pollution sources.

8.3.5 DISSOLVED OXYGEN

Summary data presented in **figure 8.1** show that the number of samples from this catchment that fell within the unacceptable and poor range increased in the 2025 reporting period, compared with the previous year.

Median dissolved oxygen concentrations were all within target range for this important variable, at all sites save DR01, where it fell to poor, suggesting high organic loads with high levels of chemical and biological oxygen demand (COD and BOD). The lower concentrations at DR01 compared with the target conditions at DR02 may reflect a lag in decomposition of organic matter associated with raw sewage inflows, the effect of decomposition of which is only observed with time from source.

Despite the median concentrations within target range, minimum concentrations at DR01 and DR02 were 0,5 and 2,5 mg/ℓ respectively, reflecting conditions that at times would severely stress most aquatic life and moreover could limit the rates of important chemical and biological processes, such as nitrification of ammonia, present in raw sewage and potentially also toxic to many aquatic organisms, as outlined above.

8.4 CONCLUSIONS AND RECOMMENDATIONS

Overall, these data show that although the Hout Bay River in its lower reaches were associated with high levels of pollution, the main source of this is defined and appears to be associated primarily with inflows from the Imizamo Yethu area. Efforts to improve water quality that focus on addressing outflows from this area would be likely to achieve meaningful change, while measures throughout the catchment to reduce cumulative pollution, mainly in the form of orthophosphates, but including smaller periodic sewage overflows, should bring about improved general ecosystem condition.



Figure 8.1

Summary water quality data for the Hout Bay River catchment, presented as compliance-type data, showing percentage of all samples that fall into preallocated categories, as per tables 2.1 and 2.3. Data include (A) median annual orthophosphate phosphorus (PO_4-P) data; (B) median annual ammonia (NH_3) data; (C) median annual dissolved oxygen (DO) data; (D) (geometric) mean annual *Escherichia coli* data.

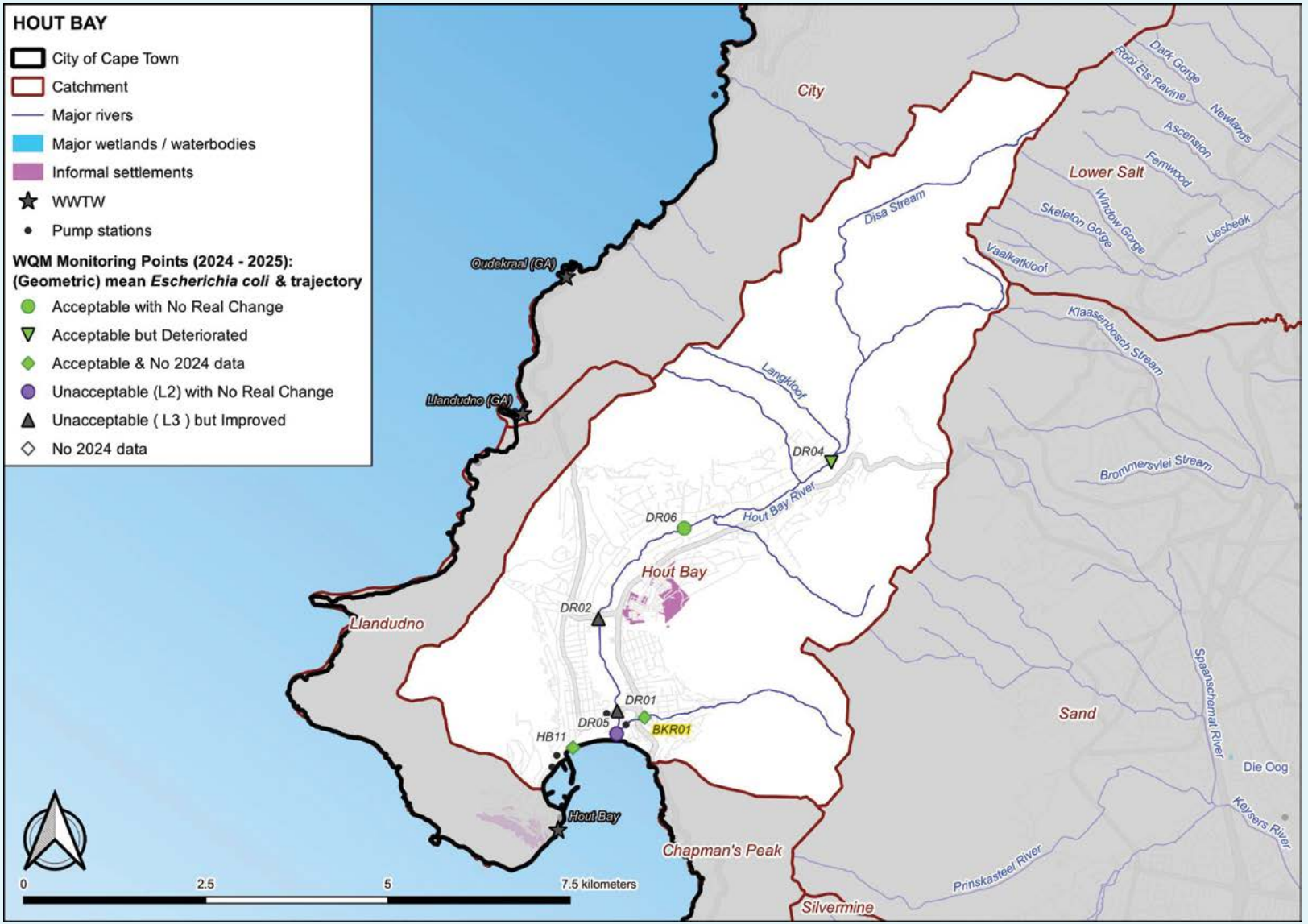


Figure 8.2

Comparison of median *Escherichia coli* data, showing condition rating (based on median data for the 2025 reporting period) and broad trajectory of change between the 2025 and 2024 reporting periods, focusing on the Hout Bay River catchment. Trajectory and condition calculations explained in appendix E.

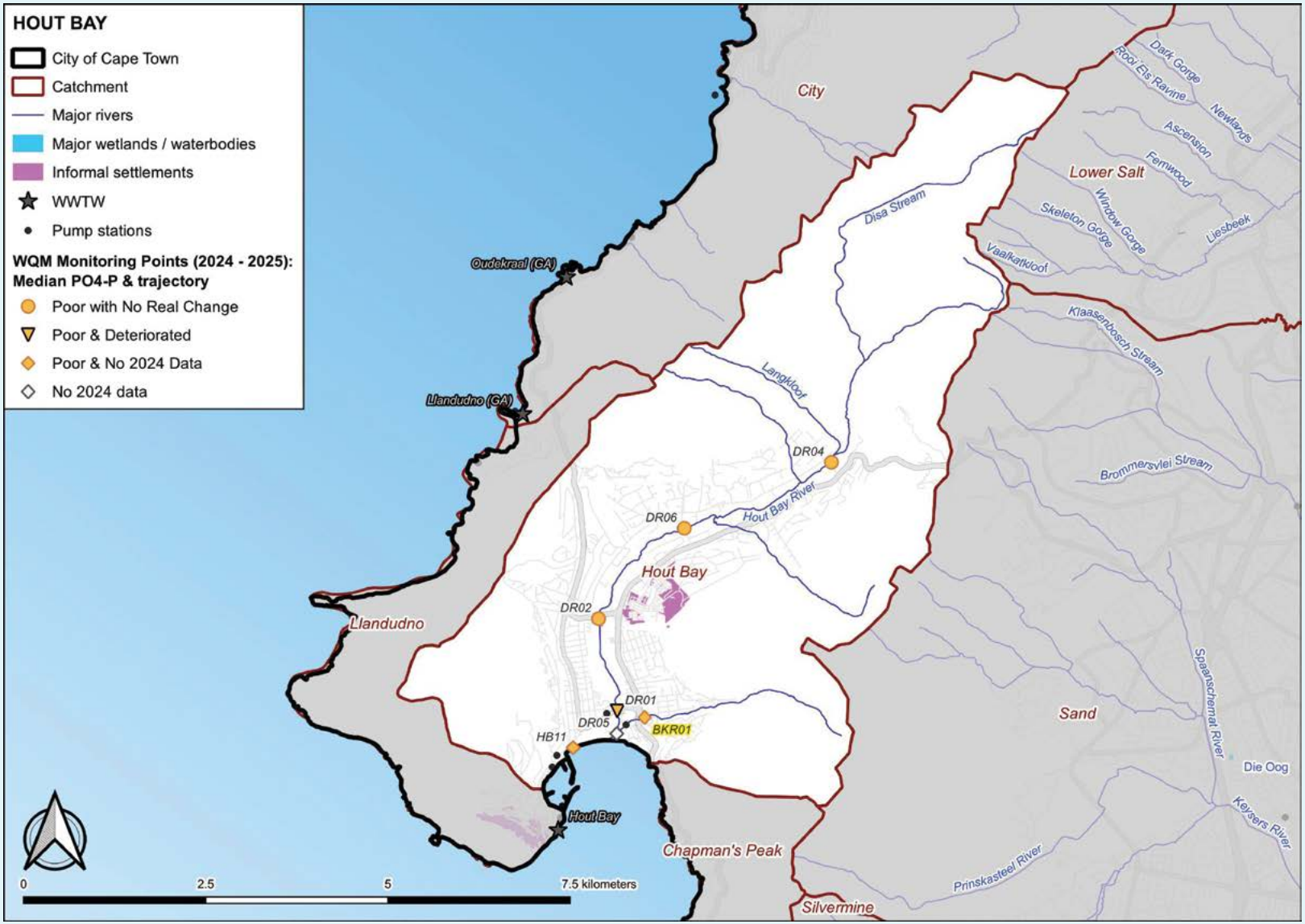


Figure 8.3

Comparison of median orthophosphate (PO_4-P) data, showing condition rating (based on median data for the 2025 reporting period) and broad trajectory of change between the 2025 and 2024 reporting periods, focusing on the Hout Bay River catchment. Trajectory and condition calculations explained in appendix E.

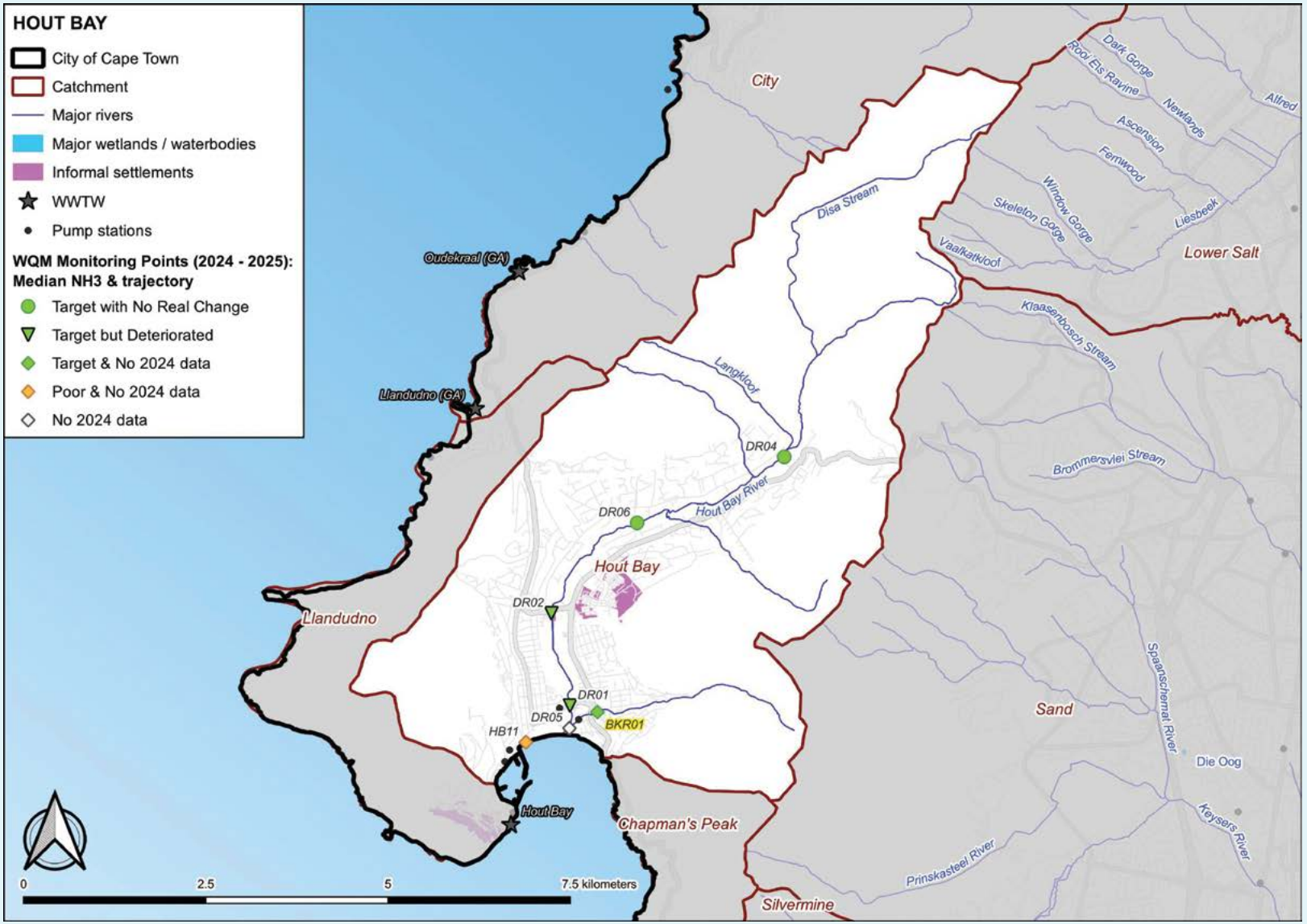


Figure 8.4

Comparison of median un-ionised (or free) ammonia (NH_3) data, showing condition rating (based on median data for the 2025 reporting period) and broad trajectory of change between the 2025 and 2024 reporting periods, focusing on the Hout Bay River catchment. Trajectory and condition calculations explained in appendix E.

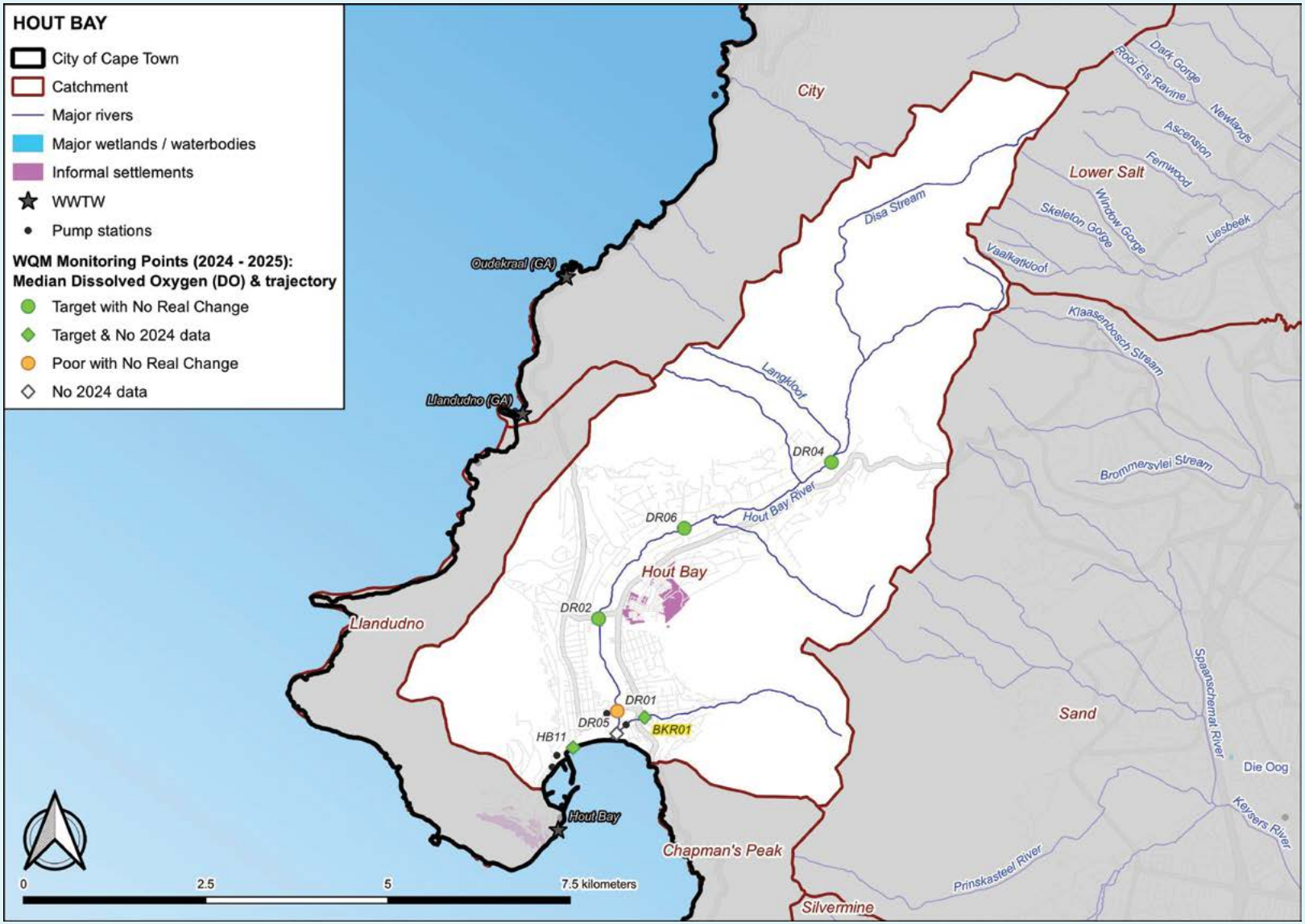


Figure 8.5

Comparison of median orthophosphate (PO_4-P) data, showing condition rating (based on median data for the 2025 reporting period) and broad trajectory of change between the 2025 and 2024 reporting periods, focusing on the Hout Bay River catchment. Trajectory and condition calculations explained in appendix E.

9. WATER QUALITY IN THE LOURENS RIVER CATCHMENT

9.1 CATCHMENT OVERVIEW

The Lourens River rises as a series of hillslope seeps and mountain streams in the Hottentots Holland Nature Reserve of the Hottentots Mountains, in the City's Eastern stormwater planning region, flowing in a generally south-westerly direction and passing through the town of Somerset West to reach its estuary into False Bay, just west of Strand. The river is some 20 km long and has no major tributaries. It has the distinction of being one of only a few rivers in South Africa that has been awarded the status of a protected natural environment (PNE) in terms of the (former) Environmental Conservation Act (ECA).

Despite significant impacts, including loss of freshwater flows from the river, the Lourens estuary has been rated as one of the priority estuaries in the Sir Lowry's Pass River integrated unit of analysis (IUA) in the Berg catchment Resource Quality Objectives Report (DWS, 2018).

In its upper reaches, the river flows first through natural fynbos, before land use changes to agriculture, and the river passes in the vicinity of mainly vineyards and orchards, including Vergelegen Wine Farm, but also livestock areas. Alien invasion is extensive along the river in many of these reaches. Within the urban area of Somerset West, the river is channelised[4] and its banks and beds progressively confined by adjacent residential gardens and urban infrastructure. The river is heavily abstracted for agricultural irrigation, industrial and domestic use. In its lower reaches, artificial canals[5] such as the Melcksloot have historically conveyed water from the Lourens River into adjacent areas for irrigation and for water supply dams (e.g. Paardevlei, which was developed as a source of water for fire control at the adjacent AECI fertiliser and munitions factories). This link to Paardevlei was, however, closed off around 2009, and the Paardevlei wetland has since been rehabilitated to a managed, seasonal wetland (Day, 2009). At the time of writing this report, the City was engaged in the process of having the wetland and its surrounding area, including links to the coast, declared as a formal nature reserve.

The Lourens River has also been the subject of a Flood Alleviation Project (CCA, 2000; Institute for Water and Environmental Engineering, 2014)), the implementation of which was under way at the time of writing this report. The project, which has been phased, allows for:

- Phase 1: Upgrading the current course of the river to ensure that the river can convey a minimum of 120 m^3/s (this approximates to a 1:5 year flood, or a flood with a 20% chance of occurrence);
- Phase 2: The construction of a flood diversion canal that would convey an additional 120 m^3/s in order to accommodate a predicted 1-in-20-year flood (i.e. a 240 m^3/s flood); and
- Phase 3: The construction of a flood attenuation dam in the Radloff Park area aimed at accommodating a 1:50 flood.

[4] Channelised rivers are those where flows have been confined within (usually) an artificially deepened and/or narrowed steep-sided channel or trench; the channel is, however, not lined with concrete, although it may be lined in places with gabion baskets or reno mattresses.
[5] By contrast to channelised systems (see footnote above), canals are artificial, concrete-lined channels, which may not even follow the natural alignment of the system.

The Lourens River catchment, along with the Silvermine River catchment (see section 15) has, over the past five years of inland water quality reporting, been recognised as one of the least impacted of Cape Town's river catchments, from a water quality perspective. This is largely due to the fact that, like the Silvermine catchment, the Lourens River catchment supports very limited areas of informal settlement, restricted to a few isolated enclaves only; includes extensive areas of natural vegetation, particularly in the upper catchment; and does not have any WWTW that discharge treated effluent into any of its watercourses, although some private developments may discharge low volumes of treated effluent from so-called sewage 'package plants' directly into the Lourens River or its tributaries.

9.2 THREATS TO WATER QUALITY

Key threats to water quality in the Lourens River catchment comprise:

- Overflows from sewer manholes or pump stations, particularly those in inaccessible areas that are difficult to police;
- Nutrient enrichment as well as possible (unmonitored) seepage or flows from agricultural areas subject to pesticide or herbicide applications;
- Runoff of hydrocarbons and/or heavy metals from roads and parking areas, particularly in the main urban centres;
- Localised wash-off from industries such as car washes; and
- Runoff or seepage from private residential gardens.



Photo 9.1 *Planting and shaping of the Lourens River floodplain in Somerset West/Strand as part of the City's flood alleviation scheme for the Lourens River.*



Photo 9.2 *Paardevlei Wetland – the City's newest (2025) wetland reserve in the Lourens River catchment. The wetland is off-channel and is not currently included in the City's Inland Water Quality Monitoring Programme.*

9.3 WATER QUALITY THROUGH THE CATCHMENT – CONDITION AND TRAJECTORY

9.3.1 MONITORING POINTS AND WATER QUALITY MAPPING

Up until the 2025 reporting period, the City collected routine water quality samples from eight sites in the catchment, all located along the main stem of the Lourens River (LOU1-LOU6; LOU8 and LOU13 (see **figure 9.2**). An additional four sites were added during the last reporting period, including:

- DTP01 (stormwater detention pond)
- GLT01 (site on the (artificial) Geelsloot channel)
- LOU14 (channel into Paardevlei off Old Paardevlei Road)
- LOU15 (main drain, just upstream of confluence with the Lourens River)

No routine monitoring points are located in Paardevlei itself.

Figure 9.1 (**A to D**) presents summary water quality data for *E. coli*, orthophosphate (as PO_4-P), dissolved oxygen and free ammonia (NH_3) for the 2024 and 2025 reporting periods. The data are shown as percentages of all of the samples collected in the 2024 and 2025 reporting period that fell into different water quality categories (as per **tables 2.1 and 2.3**).

Note, however, that given the addition of new sites in the 2025 reporting period, comparison of the percentages of samples falling within different categories between these two reporting periods is not useful, and only the 2025 data are discussed in this section.

Figures 9.2 to 9.5 present the same data on a site-by-site basis, showing spatial changes through the catchment and including trajectory analyses, comparing data from the 2025 reporting period with those of the previous year.

The following sections provide brief commentary on these findings.

9.3.2 RAW SEWAGE POLLUTION INDICATORS (*ESCHERICHIA COLI*)

Figure D5 (**appendix D**) shows that C3 reporting occurred at a relatively low intensity in the lower reaches of this catchment, increasing in frequency in the south eastern corner of the catchment, just east of the estuary.

Sewer pump station overflow data indicate pump station overflows occurred relatively often in both the middle (Somerset West) and lower reaches of the catchment (**figure D4**), with the Hillary Close pump station overflowing six times during the 2025 reporting period (**table D2**). Of the total of 27 reported pump station overflows in the 2025 reporting period, four were rated insignificant;

17 of minor significance; and six were rated medium. Cumulatively, such overflows would contribute to general nutrient enrichment of the Lourens River and, more particularly, to elevated *E. coli* concentrations and associated human health risks in receiving watercourses.

Figure 9.1 suggests, however, that at a catchment level, 76% of samples collected in the Lourens River catchment fell within the acceptable range for *E. coli*. 20% of samples were, however, rated as unacceptable (levels 1 to 3), indicating periods of very poor water quality. The generally acceptable conditions at monitoring sites in the catchment, suggested in the spatial depiction of summary mean annual data in **figure 9.2**, points to periodic sewage contamination at multiple sites, with site LOU1 and LOU13 both showing an increase in mean *E. coli* concentrations over the 2025 reporting period.

From the perspective of managing water quality in the new Paardevlei Nature Reserve, it is important that *E. coli* concentrations in stormwater runoff towards the wetland is generally low in *E. coli*, but also means that even periodic spills into these systems should be viewed with concern as they may contribute towards long-term nutrient enrichment.

9.3.3 PHOSPHORUS NUTRIENTS

Orthophosphate phosphorus data summarised in **figure 9.1** suggest that the Lourens River catchment was not as impacted by phosphorus enrichment as most of Cape Town's other catchments, with 92% of samples analysed in the 2025 reporting period being rated better than unacceptable – it is again stressed that high laboratory detection limits of 0,1 mg P/ℓ for this variable mean that no samples can be rated better than 'poor', although it is hoped that in fact water samples in the Lourens River catchment would actually have much lower concentrations than this. This is of critical importance for the ongoing sustainable management of downstream waterbodies such as Paardevlei, the condition and management challenges of which are directly tied to its degree of phosphorus enrichment (Day, 2024).

Summary data, displayed as median annual concentrations at a site level in **figure 9.3**, suggest that in fact the highest level of enrichment by orthophosphate phosphates in the monitored parts of the catchment over the 2025 reporting period was experienced at LOU15, in the downstream reaches of the main drain that drains water from the Paardevlei precinct into the Lourens River estuary. These data show median annual concentrations in the unacceptable (hypertrophic) range for this variable. The most probable source of the nutrient is assumed to be frequent overflows from a problematic sewer manhole located on the Macassar bulk sewer that runs in an east-west direction through the site, and has been noted in multiple site visits by LDC to be overflowing or showing signs of recent overflow. The manhole is not in easy sighting of passers-by, and could flow for extended periods of time without attracting attention.

Other sources of phosphorus into the main drain include stormwater from land uses, including gardens and irrigated areas outside of the Paardevlei precinct, as well as from livestock (e.g. cattle) within the precinct.

The high detection limits for orthophosphate phosphorus analyses mean, however, that subtle changes in concentrations of this important nutrient that may have major implications for ecosystem function, cannot be detected or tracked.

9.3.4 UN-IONISED (OR FREE) AMMONIA AND DISSOLVED OXYGEN

Summary data for un-ionised ammonia in the Lourens River catchment suggest that ammonia toxicity was unlikely to have been a major problem throughout the 2025 reporting period, with this variable in the unacceptable (acute toxicity) range in only 2% of samples (see **figure 9.1**). Site-specific data presented in **figure 9.4** suggest, however, some deterioration (increase) in concentrations of this variable at LOU01 and LOU02, of which LOU01 also showed deterioration in *E. coli*. This could suggest a link between exposure to raw sewage in these reaches, and its partial nitrification to ammoniacal nitrogen.

DO data showed that DO concentrations were generally not at problematic levels in this generally well-performing catchment, in which 80% of samples were within the target range for this important variable. That said, 12% of samples did fall in the unacceptable range for DO. Data in **figure 9.5** suggest that sites potentially most prone to depressed DO were LOU15 (lower main drain) and the detention pond (DTP01). Both of these are characterised by shallow, slow flows through well-vegetated areas, in which DO would be expected to be low, even without organic enrichment and its concomitant COD and BOD.

9.4 CONCLUSIONS AND RECOMMENDATIONS

Data for the 2025 reporting period support the idea that the Lourens River catchment is in relatively good condition from a water quality perspective, particularly with regard to the frequency and magnitude of sewage spills/pump station overflows and orthophosphate phosphorus availability. Nevertheless, the catchment includes important and vulnerable wetlands (e.g. the Paardevlei and Langevlei wetlands) and it is important that threats to the water quality of these systems are identified and mitigated with urgency.

This means that achieving improved resolution for orthophosphate phosphorus analyses is important. It also means that attention must be paid to mitigating the impacts of catchment activities associated only with moderate to low phosphorus enrichment risks, given that aquatic ecosystems in good condition respond to even subtle changes in nutrient availability, and nutrient enrichment is the enemy of wetland conservation in this catchment.

Finally, it is recommended that additional water quality monitoring points be included in Paardevlei itself, as well as in in-flowing watercourses (e.g. the Crescent bypass – see Day, 2024).



Figure 9.1

Summary water quality data for the Lourens River catchment, presented as compliance-type data, showing percentage of all samples that fall into preallocated categories, as per tables 2.1 and 2.3. Data include (A) (geometric) mean annual *Escherichia coli* data; (B) median annual orthophosphate phosphorus (PO_4-P) data; (C) annual ammonia (NH_3) data; (D) median annual dissolved oxygen (DO) data.

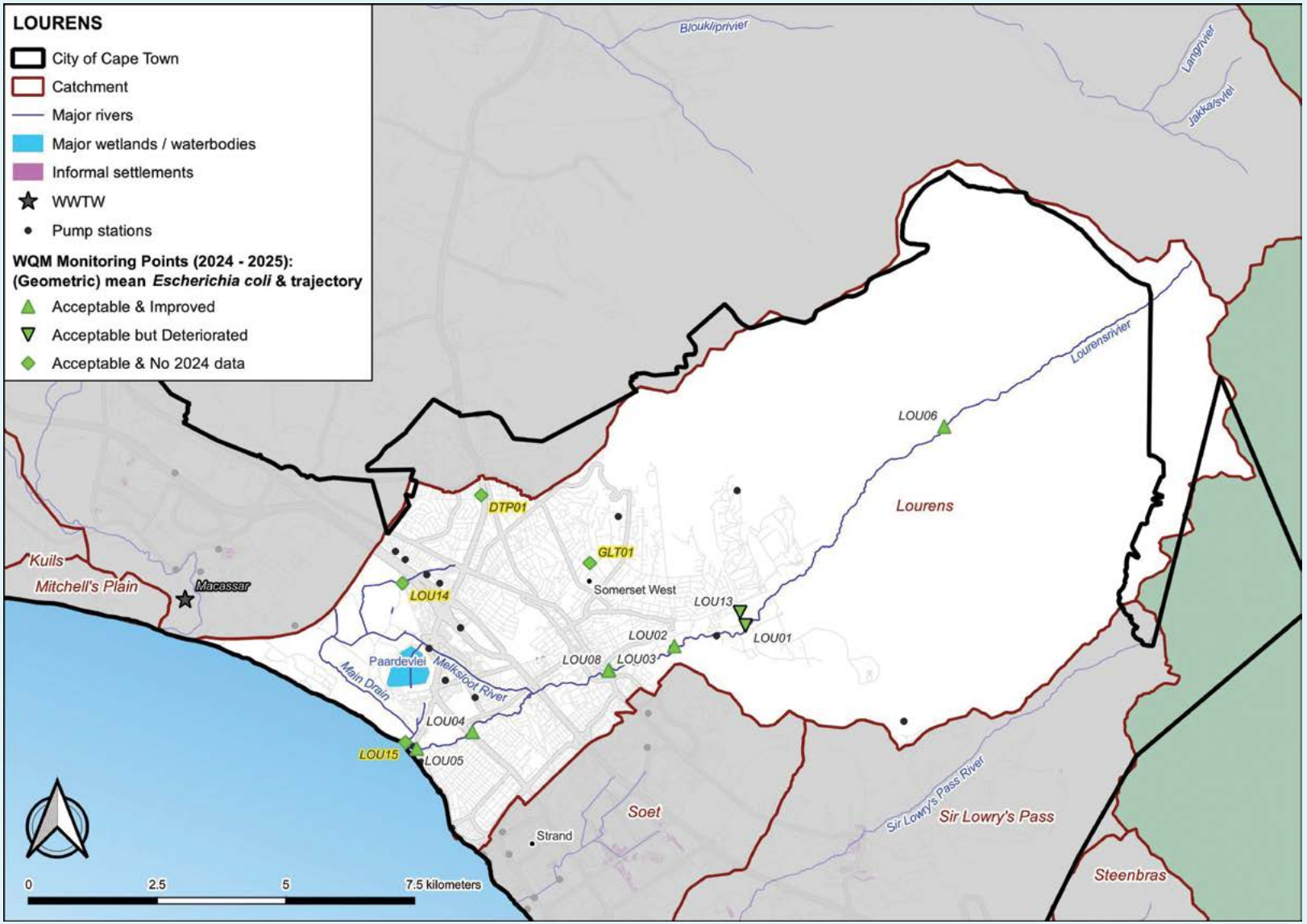


Figure 9.2

Escherichia coli data, focusing on the Lourens River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory and condition calculations explained in appendix E.

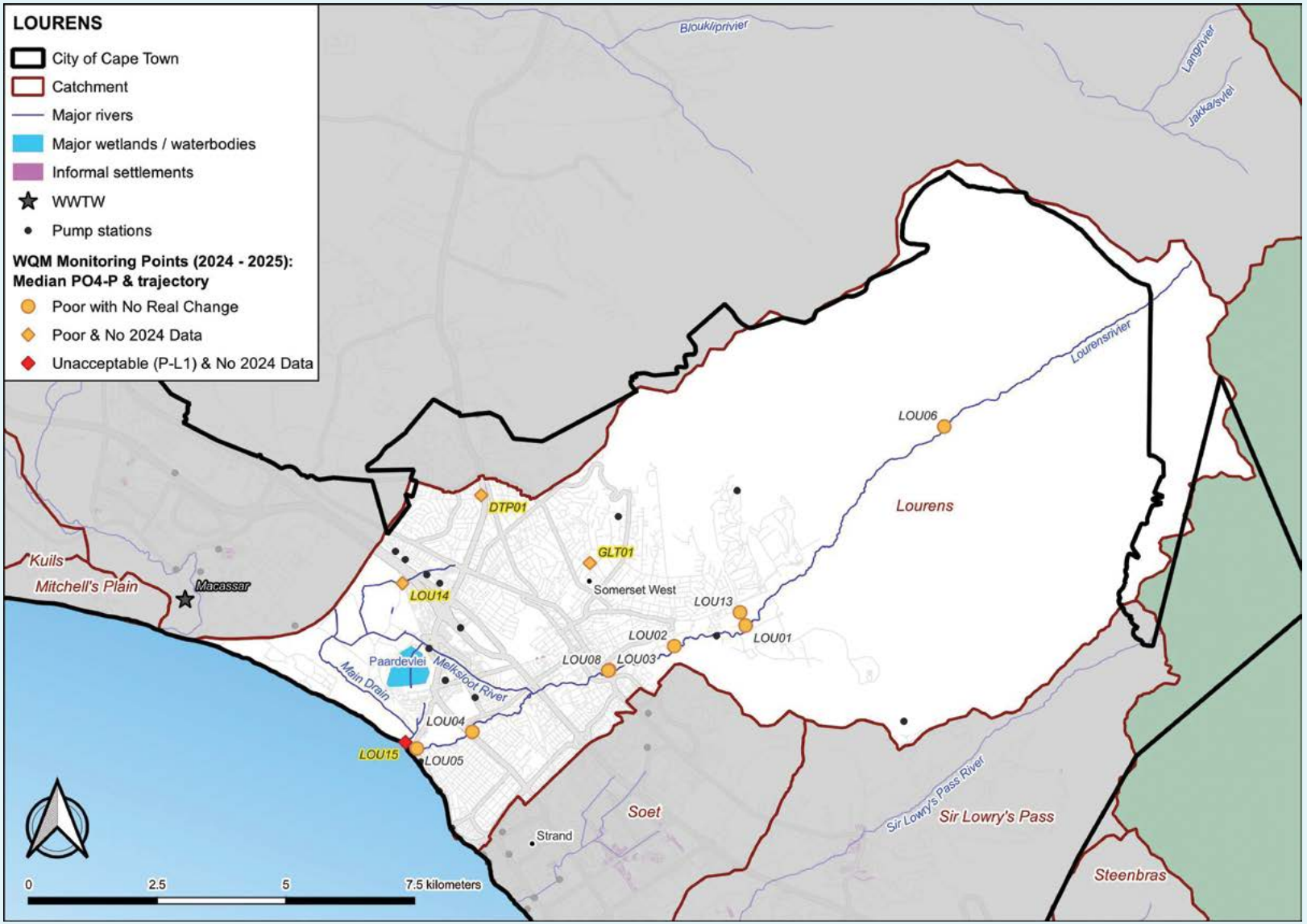


Figure 9.3

Median annual orthophosphate (PO_4-P) data, focusing on the Lourens River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

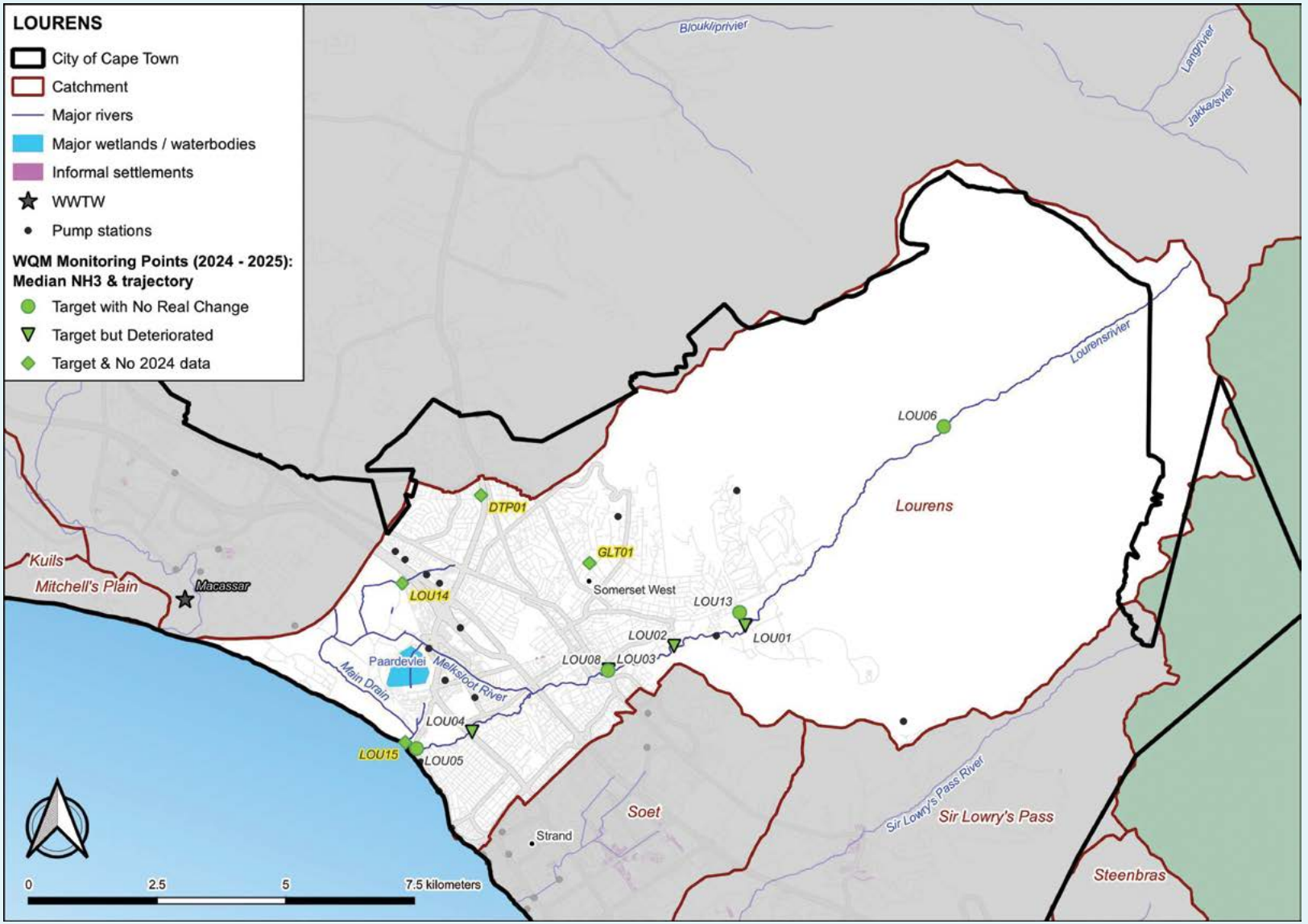


Figure 9.4

Median annual un-ionised (or free) ammonia (NH_3) data, focusing on the Lourens River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

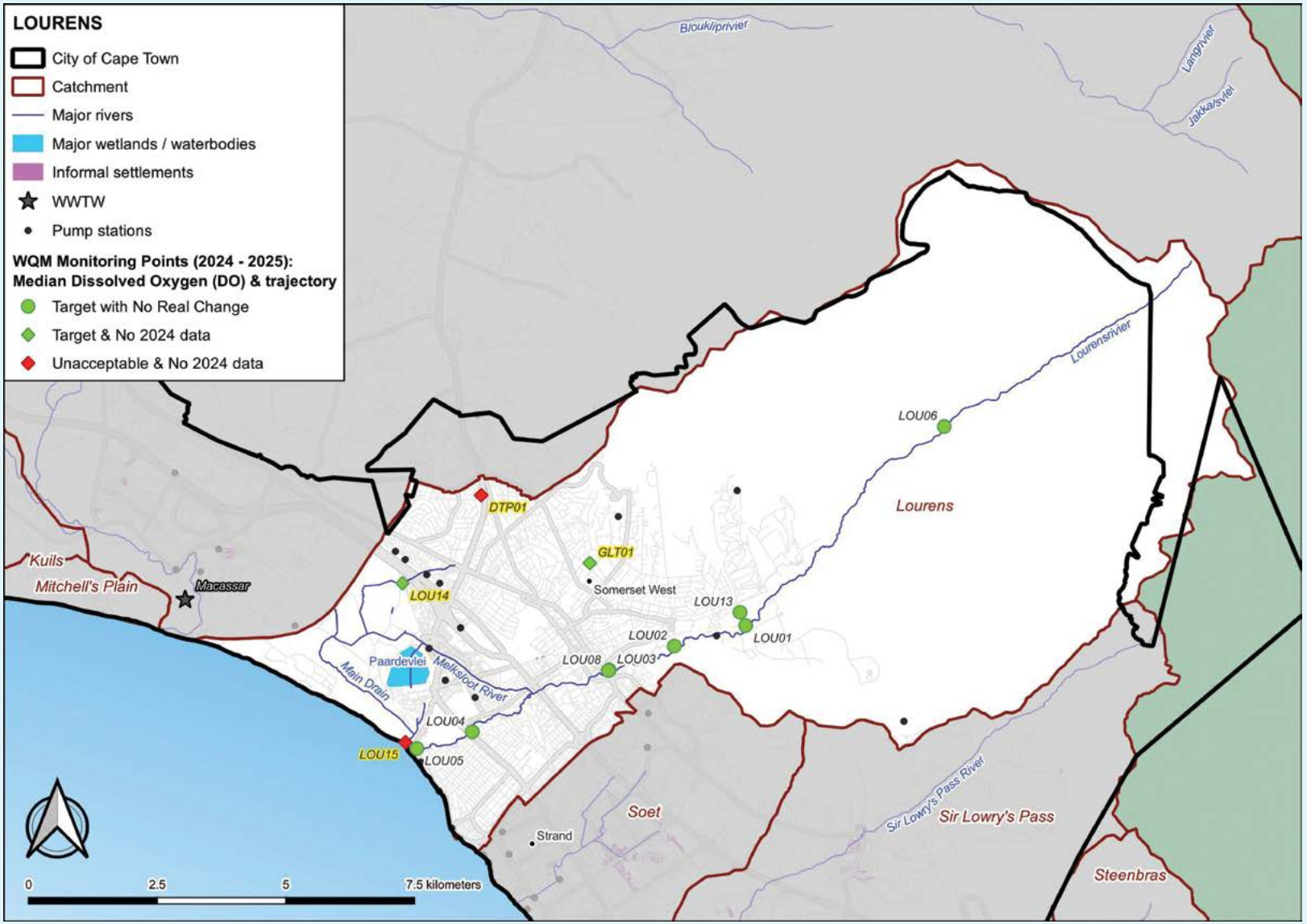


Figure 9.5

Median annual dissolved oxygen (DO) data, focusing on the Lourens River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

10. WATER QUALITY IN MITCHELLS PLAIN

10.1 CATCHMENT OVERVIEW

This stormwater system is an artefact of extensive urban development in this part of Cape Town, rather than a natural drainage/wetland system, and includes no natural rivers. Under natural conditions, it is likely that the extensive coastal dunes in this area would have facilitated infiltration of all surface runoff in this area, with coastal springs forming on the beach, where the local groundwater table was intercepted by the beach (e.g. 'Strandfontein'). Historically, the only natural river systems in this broader region were the Kuils/Eerste rivers to the east and the Lotus/Zeekoe River systems to the west. Of these, both the Lotus and the Kuils rivers are believed to have dissipated into the dunes under natural conditions, forming defined channels into the sea only after exceptional storm events.

Today, the Mitchells Plain area has been highly urbanised, with dune systems largely flattened to create large areas for housing and commercial nodes. The 'catchment' includes the Cape Flats suburbs of Strandfontein Village, Lentegeur, Mitchells Plain, Rocklands, Tafelsig and portions of Khayelitsha, including the Harare informal settlement to the east. It falls roughly (but not entirely) within the area bounded by Baden Powell Drive to the east; the N2 and R300 to the north and north-west; and Strandfontein Road to the west, south of the Philippi Horticultural Area.

10.2 THREATS TO WATER QUALITY

This catchment has been recognised in the City's previous Inland Water Quality Reports (Day et al., 2020, 2023, 2024, 2025) as one of Cape Town's most polluted catchments, characterised by numerous foul-smelling, stagnant detention ponds, many of which include large volumes of solid waste along their margins and within their interiors.

The key threats to water quality in these areas comprise:

- Runoff from areas with high levels of accumulated organic and other waste (e.g. dumped offal, vegetable produce, carcasses) – these areas occur in some places along the edges of detention ponds and their in- and outflowing channels, and extend into the ponds in some areas as well;
- Untreated sewage and greywater that enter the stormwater system from informal settlements and backyard dwellings with inadequate connections to mains sewers – the catchment includes extensive, poorly-serviced areas of informal settlements, including Mandela Park, Endlovini, Harare and Khayelitsha in the south-east and Mandalay and IKwezi Park in the north-west;
- Volumes of rags and solid waste that enter the sewers and block pump stations and manholes, causing sewage overflows and pump station failures;
- Leaking or overflowing sewers from old infrastructure;
- Nutrient-enriched runoff (e.g. phosphates) from car-washes; and
- Hydro-carbons and heavy metals from roads and car parks in highly urbanised areas.

10.3 WATER QUALITY THROUGH THE CATCHMENT

10.3.1 MONITORING POINTS AND WATER QUALITY MAPPING

The City monitors water quality from four sites in the Mitchells Plain catchment, three of which are within stormwater detention ponds (KHA01, KHA02 and KHA03) while the remaining two (KHA04 and CS23) are outlet points into False Bay via concrete headwalls on the beach.

Figure 10.1 (**A to D**) presents summary water quality data for *E. coli*, orthophosphate (as PO_4-P), dissolved oxygen and free ammonia (NH_3) for the 2024 and 2025 reporting periods. The data are shown as percentages of all of the samples collected in the 2025 reporting period that fell into different water quality categories (as per **tables 2.1 and 2.3**). **Figures 10.2 to 10.5** present the same data on a site-by-site basis, showing spatial changes through the catchment and including trajectory analyses, comparing data from the 2025 reporting period with those of the previous year.

The following sections provide brief commentary on these findings.

10.3.2 RAW SEWAGE POLLUTION INDICATORS (*ESCHERICHIA COLI*)

The Mitchells Plain WWTW discharges from this catchment into the sea via an outlet from the maturation ponds, located west of CS23. Final effluent data for this WWTW presented in **appendix C** show low levels of compliance with general limits for *E. coli* from this WWTW (only 18% compliant). However, this effluent does not appear to connect with stormwater systems in any way, and thus while it may impact on coastal water quality, has no impact on inland water quality.

Data showing the number of C3 complaints forms filed for this catchment (**figure D5** in **appendix D**) show that the whole catchment was subject to low levels of C3 reporting over the 2025 reporting year, with the Mandalay and IKwezi Park areas in the north-west being the subject of more intense reporting, suggesting more frequent or more visible surface sewage flows in this area. Sewage pump station overflow data shown in **figure D4** suggest that, of the 21 pump stations mapped in **figures 10.2 to 10.5**, the ones along Oscar Mpetha Drive (south-east of catchment) and north-west of Mandalay Park were among the most problematic. Summary data in **table D2** include three pump stations in this catchment as subject to relatively frequent overflows in the 2025 reporting year, namely Area L (14 overflows), Kuyasa (six overflows) and Joe Slovo Drive (five overflows).

While 31 of the total 39 overflows recorded in the catchment over that year were rated as insignificant to minor (**figure D3**), eight were rated as moderate, suggesting that pump station overflows, while spread out across the catchment, nevertheless may contribute to worsening water quality in detention ponds in the area. Security concerns in parts of this catchment further limit the speed at which the City can respond to breakdowns and overflows, as adequate policing needs to be sourced as well.

These data are reflected in *E. coli* data from the five routine monitoring sites in the catchment, bearing in mind that these cover only a few of the numerous detention ponds in the catchment, most of which are assumed to be impacted by similar issues of raw sewage and greywater inflows and the accumulation of solid waste.

Summary data for all five monitoring sites shown in **figure 10.1** show that all samples from the five monitored stormwater outlets and detention ponds were always rated unacceptable, with 95% and 100% of samples from the 2025 reporting period rated unacceptable level 3 for outlet sites and detention ponds respectively. The data showed a slight deterioration in outlet site water quality in the 2025 reporting period and generally extremely poor water quality, with maximum *E. coli* concentrations at the five sites ranging between 984 000 MPN/100 mℓ (CS23) and 8 164 000 MPN/100 mℓ (KHA02).

Concerningly, children play and swim in many of these systems during the hot summer months.

10.3.3 PHOSPHORUS NUTRIENTS

Orthophosphate phosphorus data for this catchment, reflected in **figure 10.1** for the four sites (KH01–KH04) showed orthophosphate phosphorus concentrations in samples from these sites that were always in the unacceptable (hypertrophic) range for this variable, reflecting high loading with the biologically available form of phosphorus. It is assumed that total phosphorus concentrations in the detention ponds at least would have been much higher, including phosphorus in its organic form, available for breakdown and oxidation to orthophosphate phosphorus. The data did, however, suggest some decrease in the number of samples falling into the unacceptable level 2 category, and dropping into the (still unacceptable) level 1 category. These high nutrients would be sufficient to promote plant growth and, in light-limiting turbid conditions, would be most likely to support phytoplankton (non-filamentous algae) and floating exotic plants such as water hyacinth.

The key source of phosphorus nutrients is assumed to be from greywater (e.g. detergents) and sewage effluent. Of the four monitored sites, KHA01 was associated with the highest concentrations of orthophosphate phosphorus, with median annual concentrations just under an order of magnitude greater than the unacceptable threshold for this variable.

10.3.4 UN-IONISED (OR FREE) AMMONIA AND DISSOLVED OXYGEN

Summary data for un-ionised ammonia in samples from the monitored sites showed that over 80% of samples in all sites fell above the acute toxicity threshold for this variable, with the likely result that these hypertrophic ponds and outlets provided a low quality habitat that would not have been suitable for colonisation by any but the most toxin-resistant fauna, despite high nutrient availability that should have made these highly productive albeit artificial ecosystems.

Biological oxygen demand for the nitrification of ammonia is likely to have been high, and explains the median annual DO concentrations at all monitored sites that fell into the range of unacceptable (low), with summary data in **figure 10.1** showing that between 55% and 62% of samples fell into the poor to acceptable categories for DO, with DO availability, not surprisingly, lowest in the standing water detention systems,

10.4 CONCLUSIONS AND RECOMMENDATIONS

The data presented below and described above highlight the fact that water quality in the Mitchells Plain catchment was highly polluted over the 2025 reporting period and has a long history of severe degradation, with high levels of bacterial pollution indicative of raw sewage sources and associated high levels of nutrients, low DO and elevated ammonia at concentrations that were usually problematic from an aquatic ecosystems perspective.

These waterbodies do not flow into rivers or pollute natural wetlands. They do, however, serve as point source outlets into the sea, contributing cumulatively to near-shore impacts. Importantly though, the poor water quality in the catchment means that the water resource itself, which could be used beneficially for irrigation and dust-control measures, for example, is effectively rendered a waste product and a human health risk, as a result of the outright failure in this catchment to separate clean stormwater from waste streams. This is a further waste of potential amenity and open space resources in densely populated areas, where well-managed detention ponds in a clean condition could provide amenity value to local residents but instead offer foul odours and risks to human health.

Targeted catchment-scale clean-ups, diversions of polluted water (sewage and greywater) to the sewerage system and the possible use of technology such as nano-bubblers in selected detention ponds could potentially improve water quality conditions and the usability of some of these open space areas. The main impact remains, however, the ongoing passage of untreated sewage and greywater into the stormwater system from growing informal settlements.



Photo 10.1 *Stormwater detention ponds in the Mitchells Plain catchment store highly polluted water from the catchment, before discharging it to the sea. Note the extensive informal settlement in this part of the catchment.*



Photo 10.2 *Mitchells Plain is a naturally sandy part of the Cape Flats, with no natural watercourses. This photo shows artificial stormwater drainage channels (arrowed) through the suburban area.*



Figure 10.1

Summary water quality data for the Mitchells Plain catchment, presented as compliance-type data, showing percentage of all samples that fall into preallocated categories, as per tables 2.1 and 2.3. Data include (A) (geometric) mean annual *Escherichia coli* data; (B) median annual orthophosphate phosphorus (PO_4-P) data; (C) annual ammonia (NH_3) data; (D) median annual dissolved oxygen (DO) data.

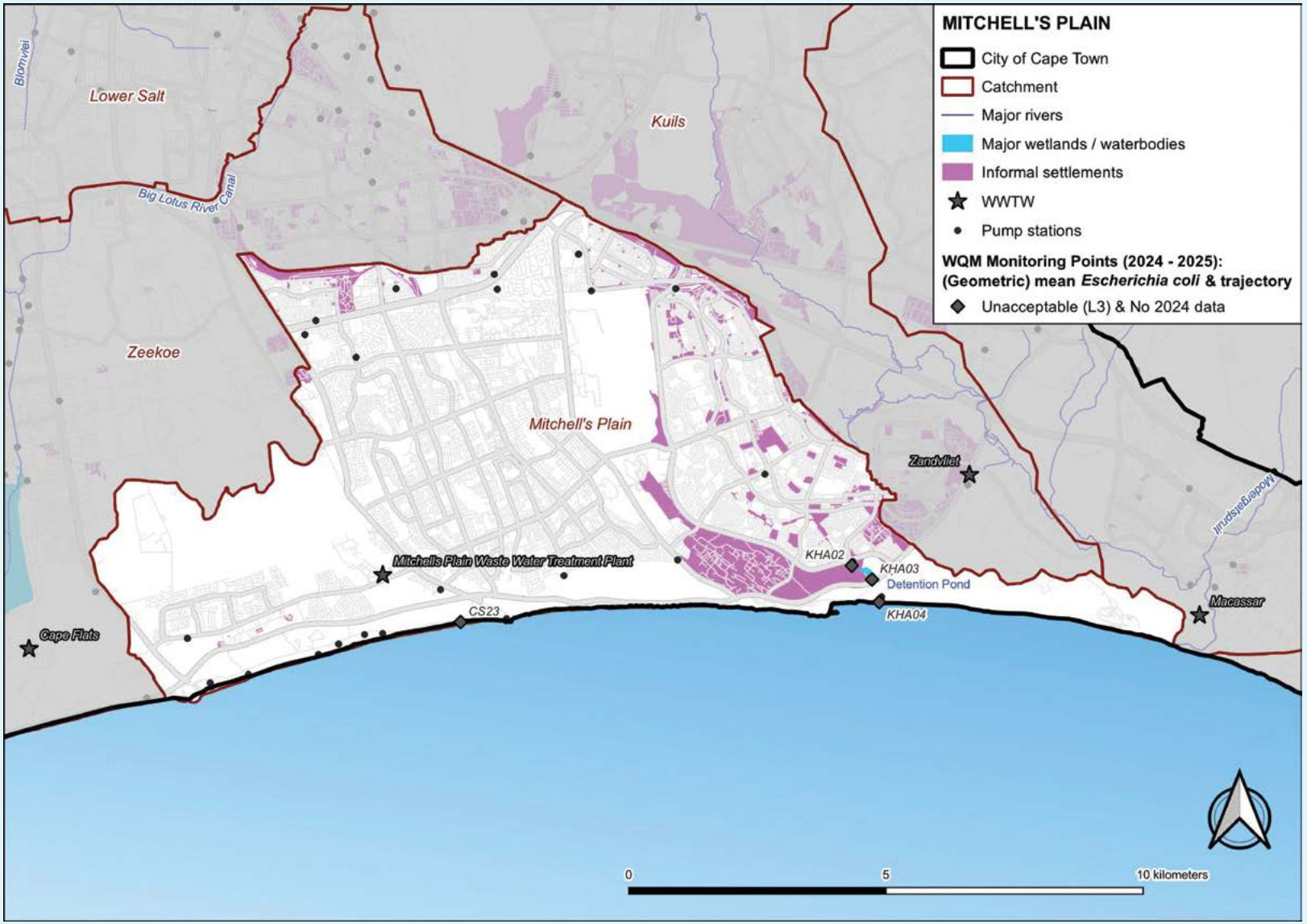


Figure 10.2

Escherichia coli data, focusing on the Mitchells Plain catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory and condition calculations explained in appendix E.

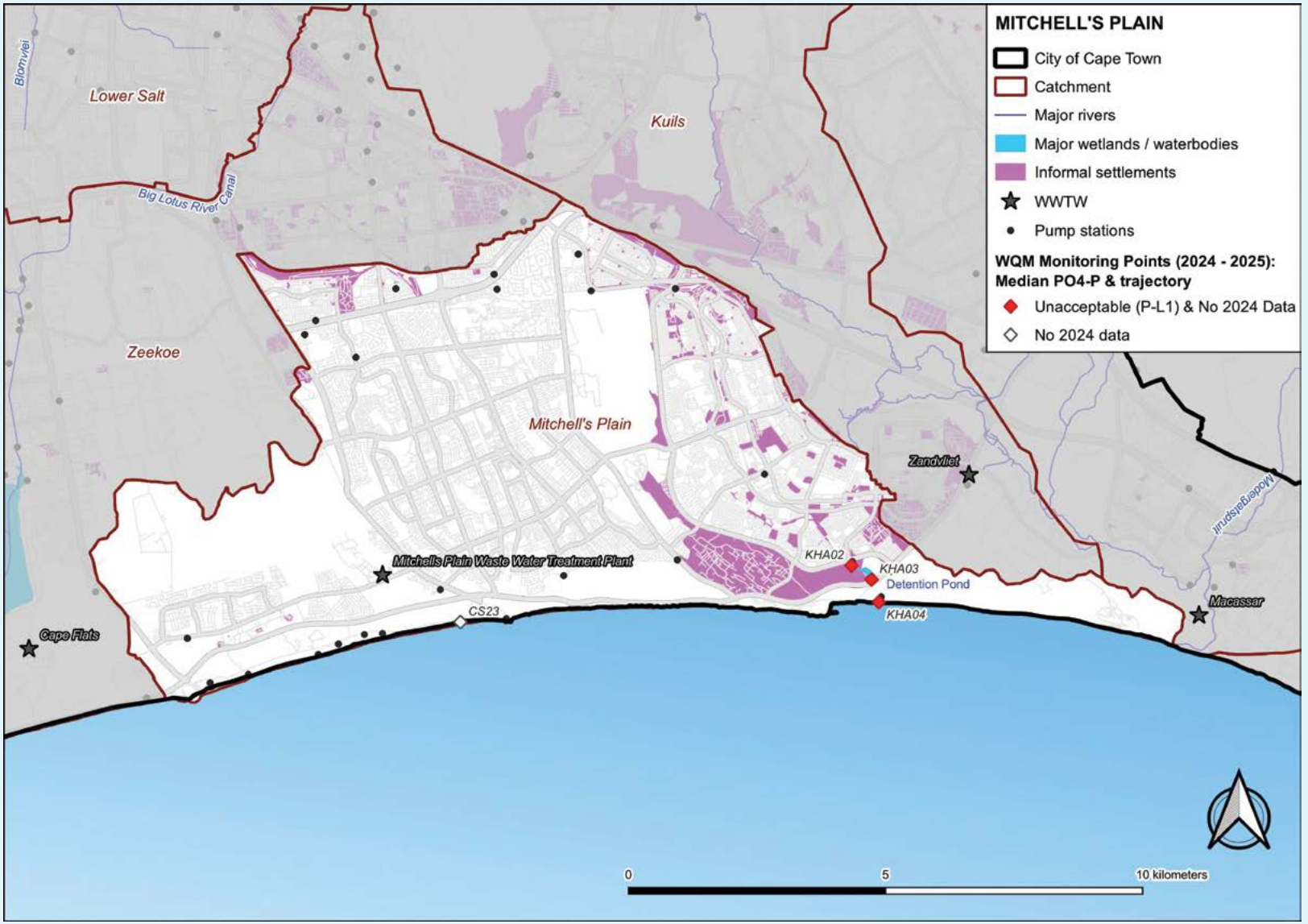


Figure 10.3

Median annual orthophosphate (PO_4-P) data, focusing on the Mitchells Plain catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

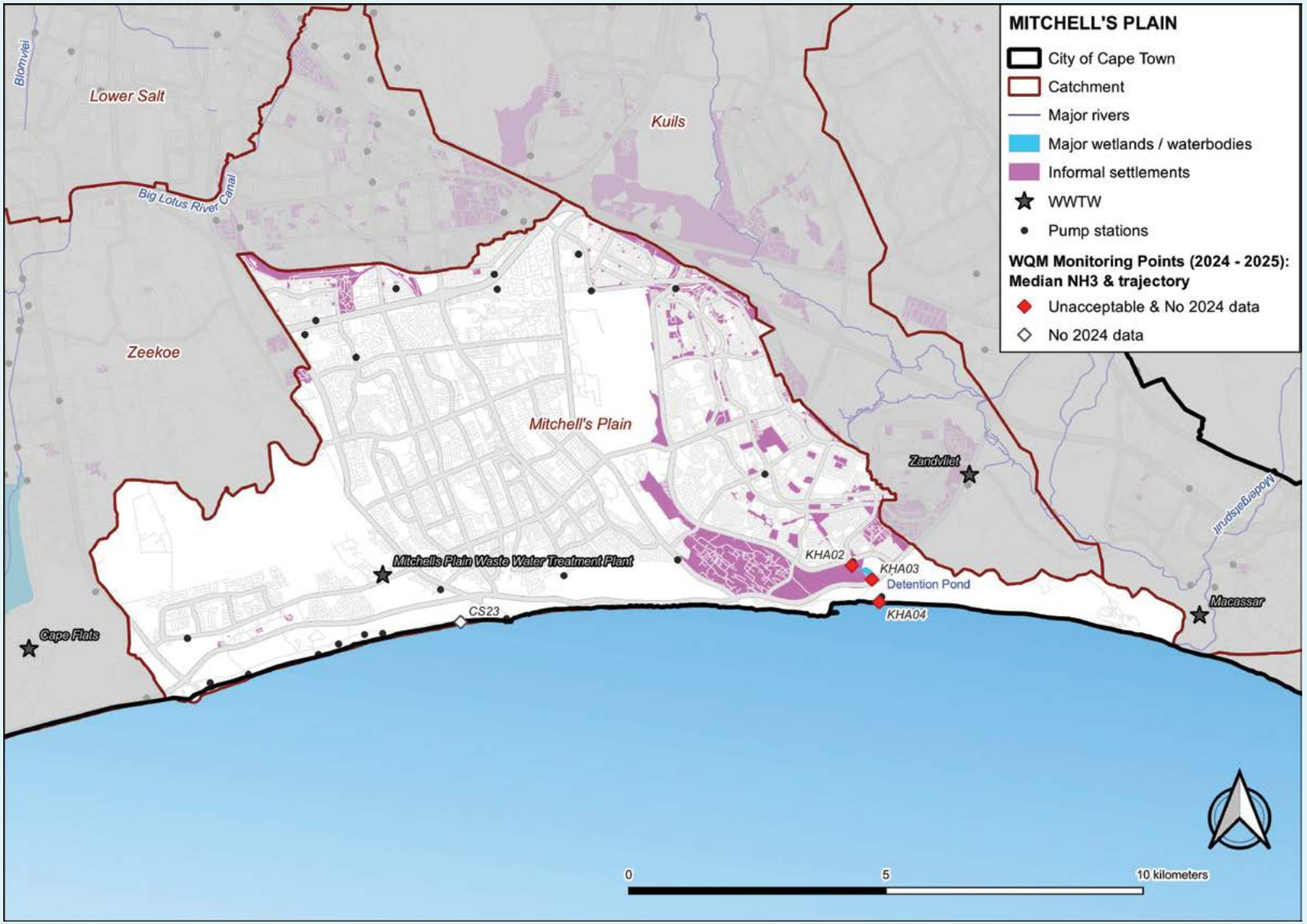


Figure 10.4

Median annual un-ionised (or free) ammonia (NH_3) data, focusing on the Mitchells Plain catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

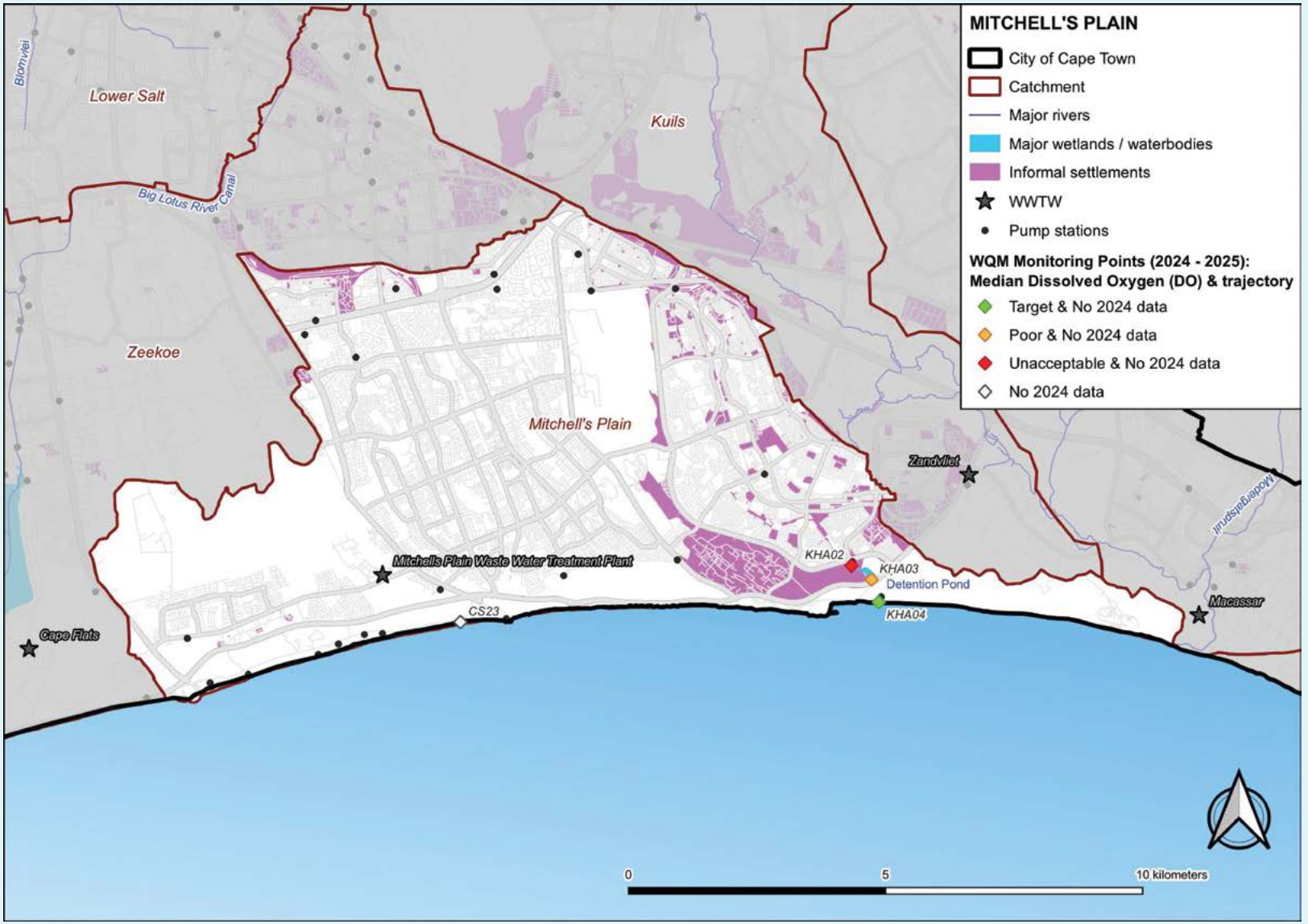


Figure 10.5

Median annual dissolved oxygen (DO) data, focusing on the Mitchells Plain catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

11. WATER QUALITY IN THE MUIZENBERG CATCHMENT

11.1 CATCHMENT OVERVIEW

The Muizenberg catchment in fact includes the catchment areas of five discrete but short, minor streams that flow off the eastern slopes of the Muizenberg mountains, entering the sea in False Bay between Kalk Bay to the south and Muizenberg beach to the north. All of these streams are piped at their outlets into the sea, and flow mainly underground throughout their reaches through the urbanised areas downstream of Boyes Drive, under which they all cross. The catchment is edged to the north by the Sand River catchment and to the south by the Silvermine catchment.

11.2 THREATS TO WATER QUALITY

The upper reaches of the rivers in this catchment are relatively natural and flow through the lower sections of the Table Mountain National Park, where they are crossed by occasional footpaths. Water quality impacts in these reaches are probably limited to periodic high TSS loads, usually after fires, and very low levels of baboon, bird and occasional human excrement.

Sources of water quality impairment in the catchment reaches downstream of Boyes Drive are assumed to comprise runoff from roads and parking areas; periodic sewer or pump station overflows that enter the stormwater system, including as a result of sewer blockages from a build-up of fatty deposits from the numerous restaurants operating in the area; some leachate/runoff from suburban gardens (although the areas concerned have a high total building footprint); and localised runoff from enclaves of homeless people, mainly between the beaches/rocky shore and railway line area.



Photo 11.1 *Recent rehabilitation activities have included bank reshaping and planting with indigenous vegetation along the lower foothill reaches of the Pecks Valley stream upstream of Main Road, Muizenberg. The river is piped downstream of Main Road. Photo: Alex Lansdowne.*



Photo 11.2 *One of several small, relatively unpolluted streams that enter False Bay in the Muizenberg-to-Kalk Bay area, by way of piped systems that daylight along the coast.*

11.3 WATER QUALITY THROUGH THE CATCHMENTS – CONDITION AND TRAJECTORY

11.3.1 MONITORING POINTS AND WATER QUALITY MAPPING

Water quality is monitored from only two of the streams passing through this area – CS018, which enters the sea at Kalk Bay harbour, and CS26, which flows as a steep, seasonal stream through Peck's Valley, flattening out to form a small foothill stream in the parkland upstream of Main Road, just west of Surfer's Corner. It flows underground from Main Road to the sea. The lower reaches of this stream have recently undergone rehabilitation, including shaping and planting of the stream banks (see **photo 11.1**).

Only *E. coli* is monitored from these stormwater outlets, and summary mean annual data are presented in **figure 11.1**.

11.3.2 RAW SEWAGE POLLUTION INDICATORS (*ESCHERICHIA COLI*)

Figure D5 in **appendix D** shows that the Muizenberg catchment as a whole was subject to a number of C3 complaints over the 2025 reporting period, although by no means constituting a major hotspot, and with most complaints centred around the Kalk Bay area rather than Muizenberg. Pump station overflows/failure were also recorded at low levels in the catchment (**figure D4**), and data summarised in **figure D3** showed a single occurrence only, rated as insignificant.

Summary data shown in **figure 11.1** show that mean annual *E. coli* concentrations were in the acceptable range at CS26, albeit deteriorating, but in the unacceptable (level 1) range at CS018, and also deteriorated over the past reporting period. Runoff from homeless enclaves in the Kalk Bay harbour area is assumed to be a factor affecting water quality there.

11.4 CONCLUSIONS AND RECOMMENDATIONS

The streams downstream of Boyes Drive are generally exposed to impacts typical of runoff through urban areas, but not to the severe impacts of runoff from informal settlements and receipt of WWTW effluent in many other catchments in the city. This means that this catchment probably provides a good example of text-book urban stormwater quality and would potentially be a candidate for retrospective establishment of SUDS-type treatment train interventions, usually not suited to more heavily impacted areas. From a human health perspective, it is noted that some people collect water from some of the streams in their reaches between Boyes Drive and Main Road, using it for drinking and/or washing water. Known *E. coli* in this water, at levels above the zero rating required for safe drinking water, suggests that signage should be erected at all known abstraction points, if not already present, warning of possible water quality risks.

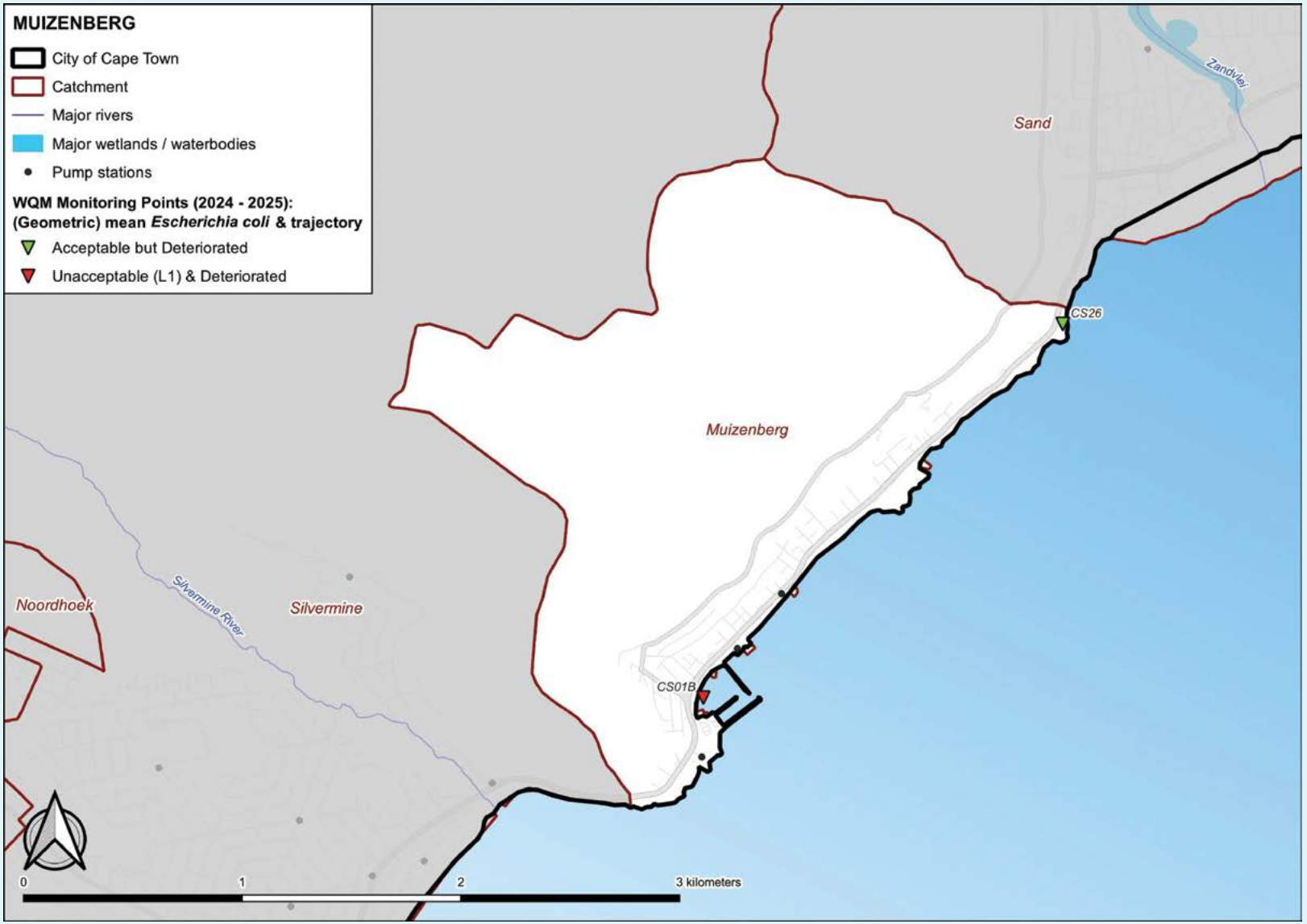


Figure 11.1

Escherichia coli data, focusing on the Muizenberg catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory and condition calculations explained in appendix E.

12. WATER QUALITY IN THE NOORDHOEK CATCHMENT

12.1 CATCHMENT OVERVIEW

Wildevoëlvlei and the Noordhoek wetlands as a whole are formed in the Noordhoek basin, where impermeable granite rock formations underlying the basin floor have resulted in a naturally high water table and the development of extensive marshland (Davies & Gassner, 1999). Historically, the Noordhoek wetlands comprised a diverse array of wetland types (Ractliffe, 2002), including the Sun Valley pans, the Noordhoek salt pan (now Lake Michelle), a *Phragmites australis* vlei (now enlarged and commonly referred to as the 'Pick n Pay reedbeds'), Wildevoëlvlei, Papkuilsvlei and numerous small pans connecting Papkuilsvlei to Wildevoëlvlei, and the backshore lagoon on Noordhoek beach (Van Wieringen, 1999; Davies & Gassner, 1999). These wetland areas were interspersed with sandplain fynbos, dune fynbos and dune thicket plant communities, creating a mosaic of habitat types within the valley. Variation in plant communities is largely determined by soil type and extent and/or period of saturation (Holmes, 1999).

The Noordhoek wetlands area includes a rich mosaic of five vegetation types – dune fynbos, sandplain fynbos, dune pioneer, dune thicket and differentiated wetland – three of which (sandplain fynbos, wetland and dune fynbos) are major conservation priorities in the Cape Peninsula, owing to their high irreplaceability and vulnerability.

A feature of the area is the absence of any natural stream or flood channels across the valley floor and indeed, within the valley as a whole (Wilkinson, 1999). This characteristic is indicative of the extremely high permeability and thus absorptive capacities of both the valley sediments and the surrounding colluvium on the lower mountain slopes (Van Wieringen, 1999). Van Wieringen (1999) suggests that subsurface water generally moves laterally through soils and below dune areas, in a seawards direction, although in places it may be influenced by subsurface barriers, such as compaction associated with road surfaces, or areas of fill comprising impermeable materials (e.g. clay). Outflows from the Noordhoek wetlands are via two outlets, namely:

- Over a weir to The Lakes and then to Papkuilsvlei via a second weir situated in the west bank of The Lakes;
- A minor earth channel at the south-western end of the reedbeds, which cuts through the raised land between the reedbeds and Wildevoëlvlei.

Ongoing urban development across the basin, and in particular along the valley slopes, has over the past decades resulted in increased volumes of stormwater runoff generated in these areas being routed to the wetlands of the basin via pipes, channels and roads. These inputs have resulted in a permanently higher water table in the flat area at the base of the basin. This has led to expansion of permanent reedbed areas (mainly *Typha capensis*) at the expense of the seasonal wetland areas that probably once dominated large areas of the basin. This change has been coupled with a lowering of the water table on the surrounding slopes, and a reduction in recharge of the deep underlying

aquifer, as a result of rapid routing of stormwater as surface flows, down to the lower basin (Van Wieringen, 1999).

Other impacts to wetlands in the basin as a whole include those resulting from inputs of poor water quality, infilling and drainage. Most significantly, Wildevoëlvlei receives treated sewage effluent discharged from the Wildevoëlvlei WWTW. Wildevoëlvlei itself comprises two interconnected pans, linked by a narrow channel, and seasonally connected to the sea by a semi-estuarine wetland channel, via a backshore lagoon (Grange, 1999). Although the pans were probably, under natural conditions, seasonal systems that largely dried out in summer, the onset of discharges into the eastern portion of the wetlands from the WWTW resulted in large sections of seasonal wetland becoming perennially inundated and, as a result, fundamentally changing their character (Day, 2005). The informal component of the Masiphumelele settlement on the edge of the 'Pick n Pay' reedbed wetland has also resulted in water quality impairment in portions of this wetland.



Photo 12.1 *Lower reaches of the Brookwood Stream downstream of the Noordhoek suburban area, within the Papkuilsvlei wetlands*



Photo 12.2 *Streams of contaminated grey- and blackwater from the informal settlement areas of Masiphumelele run with stormwater into the upper reaches of the Pick n Pay wetlands in the Noordhoek basin. In the wet season, this polluted water backs up into the settlement.*

12.2 THREATS TO WATER QUALITY

Water quality in the Noordhoek catchment is impacted by a wide range of factors, including:

- Major (but unquantified) pollution streams from unserviced and inadequately serviced portions of Masiphumelele settlement, which in places discharge raw sewage and greywater from domestic water use (washing, laundry, etc.) into the wetland (Day, 2021);

- Inflows of nutrient-enriched stormwater and seepage from suburban gardens as well as paddocks in the catchment;
- Bacterial and nutrient loading from runoff from horse paddocks, stabling and other grazing areas;
- Inflows of 'fresh' water from stormwater runoff from roads, parking areas, roofs and other hardened spaces, into naturally slightly brackish wetlands such as the Papenkuils wetlands, promoting the growth of *Typha capensis* (bulrush) at the expense of more ecologically desirable, locally indigenous wetland plants with a natural tolerance for seasonal flow regimes and brackish conditions; and
- Inflows of treated effluent from the Wildevoëlvlei WWTW into Wildevoëlvlei.

12.3 WATER QUALITY THROUGH THE CATCHMENTS – CONDITION AND TRAJECTORY

12.3.1 MONITORING POINTS AND WATER QUALITY MAPPING

Water quality is monitored from four sites in this catchment, comprising three wetland sites (WV02 and WV05 in Wildevoëlvlei itself, respectively, downstream of the WWTW outflow and inflows from a small unnamed stream that enters the western arm of the vlei from the south; WV08, at the outlet of the sea onto Noordhoek beach); and one new site, introduced in the 2025 reporting period, comprising BWS01, on the Brookwood Stream, located north of the wetlands of the Noordhoek basin, and within the Noordhoek residential suburb.

Figure 12.1 (**A to D**) presents summary water quality data for *E. coli*, orthophosphate (as PO_4-P), dissolved oxygen and free ammonia (NH_3) for the 2024 and 2025 reporting periods. The data are shown as percentages of all of the samples collected in the 2025 reporting period that fell into different water quality categories (as per **tables 2.1 and 2.3**). **Figures 12.2 to 12.5** present the same data on a site-by-site basis, showing spatial changes through the catchment and including trajectory analyses, comparing data from the 2025 reporting period with those of the previous year.

The following sections provide brief commentary on these findings.

12.3.2 RAW SEWAGE POLLUTION INDICATORS (*ESCHERICHIA COLI*)

The data in **appendix D** suggest that sewage pump station spills were not a significant issue in this catchment over the 2025 reporting period, with no pump stations reported as overflowing or otherwise failing (**figure D3**). **Figure D5** suggests, however, that raw sewage spills, as reported in the City's C3 reporting system, did however occur in the catchment, albeit at relatively low levels when compared with elsewhere in the city. The heat map in this figure suggests that areas affected by reported raw sewage overflows were primarily in the Masiphumelele to Lake Michelle/lower

Noordhoek suburban areas, although low levels of reporting occurred throughout the low-lying parts of the southern catchment.

The Wildevoëlvlei WWTW itself was also a source of *E. coli* contamination into the lower catchment, with data presented in figure C6 (appendix C) showing that, in the 2025 reporting period, *E. coli* concentrations in final effluent from the WWTW was compliant in around 75% of samples only.

The data presented in figure 12.1 show that:

- *Escherichia coli* concentrations in the Wildevoëlvlei wetland samples were generally low, with 95% of samples lying within the acceptable range, despite known upstream sources of raw sewage in the Masiphumelele area. This reflects the role of large wetlands in reducing *E. coli* concentrations through both dilution and increased retention time that allows bacterial die-back;
- The Brookwood Stream was, however, affected by significant but episodic inflows of raw sewage, resulting in 20% of samples from this site being in the unacceptable level 2 and level 3 ranges, reflecting very high *E. coli* concentrations. These could be sourced from horses, which use the paddocks above the site and also walk along Main Road immediately upstream of the monitoring site. Localised overflows from problem sewers or remnant septic tanks or conservancy tanks may also contribute to this problem at times.
- **Figure 12.2** shows, however, that despite episodic spikes in *E. coli* at BWS01, mean annual *E. coli* at this site fell within the range of acceptable for the 2025 reporting period.

12.3.3 PHOSPHORUS NUTRIENTS

Orthophosphate data presented in **figures 12.1 and 12.3** for this catchment indicate:

- Very high (level 3) enrichment of the Wildevoëlvlei wetland waterbodies by this nutrient, with 100% of samples in the 2025 reporting period lying in the unacceptable range (87% level 2 unacceptable). This showed a slight increase compared with data from the 2024 reporting period, and highlights the vulnerability of these wetlands to associated management issues, such as blue-green algal blooms, and the excessive growth of other aquatic and marginal wetland vegetation, such as reeds.
- It is noted, however, that no microcystin toxin events were recorded in Wildevoëlvlei over either the 2024 or 2025 reporting periods (table G2 in **appendix G**), although the vlei had very high mean annual chlorophyll-a concentrations in both of these periods, consistent with the high orthophosphate availability. Mean annual chlorophyll-a concentrations in Wildevoëlvlei were consistently the second highest in waterbodies across the city, exceeded only by those in Zeekoevlei and indicative of a highly phosphorus-enriched system, vulnerable to ongoing algal blooms (**table G1 in appendix G**).

- Orthophosphate phosphorus concentrations were lower in the flowing water of the Brookwood Stream, reflecting conditions where this nutrient does not accumulate but is rather conveyed to downstream receiving waterbodies (i.e. the Noordhoek wetlands). Sources of phosphorus in the stream are likely to include manure, possible sewer and/or septic tank/conservancy tank seepage and overflows as well as seepage from nurseries, gardens and agricultural areas in the upper catchment (e.g. vineyards).
- 10% of samples from the Brookwood Stream fell within the unacceptable (level 1) range for this variable, indicating real measured hypertrophic conditions. The 90% of samples rated as poor may not have been as nutrient-enriched as the data suggest, with high laboratory detection limits again reducing the usefulness of these data for identifying changes in nutrient concentrations in moderately impacted ecosystems.

12.3.4 UN-IONISED (OR FREE) AMMONIA AND DISSOLVED OXYGEN

Summary data for un-ionised ammonia in this catchment (**figures 12.1 and 12.4**) suggest that:

- Ammonia toxicity was unlikely to have been a problem in the Brookwood Stream (monitored river system), with 100% of water samples reflecting acceptable conditions for this variable;
- Ammonia toxicity was, however, a more significant problem in the Wildevoëlvlei wetland systems, with data from the 2025 reporting period showing that 80% of samples in the wetland sites were in the unacceptable range (i.e. associated with acute aquatic toxicity). This was a major deterioration in summary annual un-ionised ammonia concentrations, compared with the 2024 reporting period, when 60% of samples were flagged as in the unacceptable range for this variable, and these data are echoed in data shown in **figure 12.4**.
- The above comments generally indicate significant sources of nitrogen nutrients in their ammoniacal form, suggesting that interventions that increased nitrification processes (e.g. aeration) could be ecologically beneficial, at least in the lower Wildevoëlvlei wetlands.

Summary data for dissolved oxygen in this catchment (**figures 12.1 and 12.5**) suggest that:

- 80% of samples in the 2025 reporting period fell within the acceptable range for this variable, within the Wildevoëlvlei wetland samples – this means that at least 20% of the time in this wetland, DO concentrations were not conducive to healthy aquatic ecosystem function, varying from poor to unacceptable. Nutrient-enriched standing waterbodies are prone to low oxygenation as a result of often warm temperatures, slow flows and high rates of decomposition.
- DO concentrations in the Brookwood Stream were also generally above levels of concern, with 78% of samples lying within the acceptable range. Inflows of raw sewage are likely to have contributed to the high oxygen demand at times in this watercourse, along with slow flows through a shallow system, vulnerable to warming.

12.4 CONCLUSIONS AND RECOMMENDATIONS

This is a complex catchment, dominated by large wetland systems rather than rivers. This means that it is vulnerable to the impacts of long-term accumulation of nutrients in its standing waterbodies, as well as to the effects of catchment hardening through expanding urbanisation, leading to increased surface water flows into naturally seasonal wetlands. All of these issues are important to understand, and where possible, to mitigate against, through carefully designed stormwater management and by attention to the reduction of sources of nutrients into standing waterbodies in particular.

The performance of the Wildevoëlvlei WWTW is of key importance to the long-term condition and functioning of Wildevoëlvlei itself, while interventions to service the growing informal settlement in the Masiphumelele area are also critical, both from the perspective of human health and dignity, and the need to prevent the further passage of raw sewage into the lower Noordhoek wetlands, with its associated load of pathogens, ammonia, orthophosphates, organics and other waste.

More specifically, the source of periodic spikes in *E. coli* at BWS01 should be investigated, if found to recur in future monitoring data, with potential interventions including improved management of runoff from paddocks and equestrian trails and/or attention to domestic sewage conveyance or treatment systems in the Brookwood Stream area.



Figure 12.1

Summary water quality data for the Noordhoek catchment, presented as compliance-type data, showing percentage of all samples that fall into preallocated categories, as per tables 2.1 and 2.3. Data include (A) (geometric) mean annual *Escherichia coli* data; (B) median annual orthophosphate phosphorus (PO_4-P) data; (C) annual ammonia (NH_3) data; (D) median annual dissolved oxygen (DO) data.

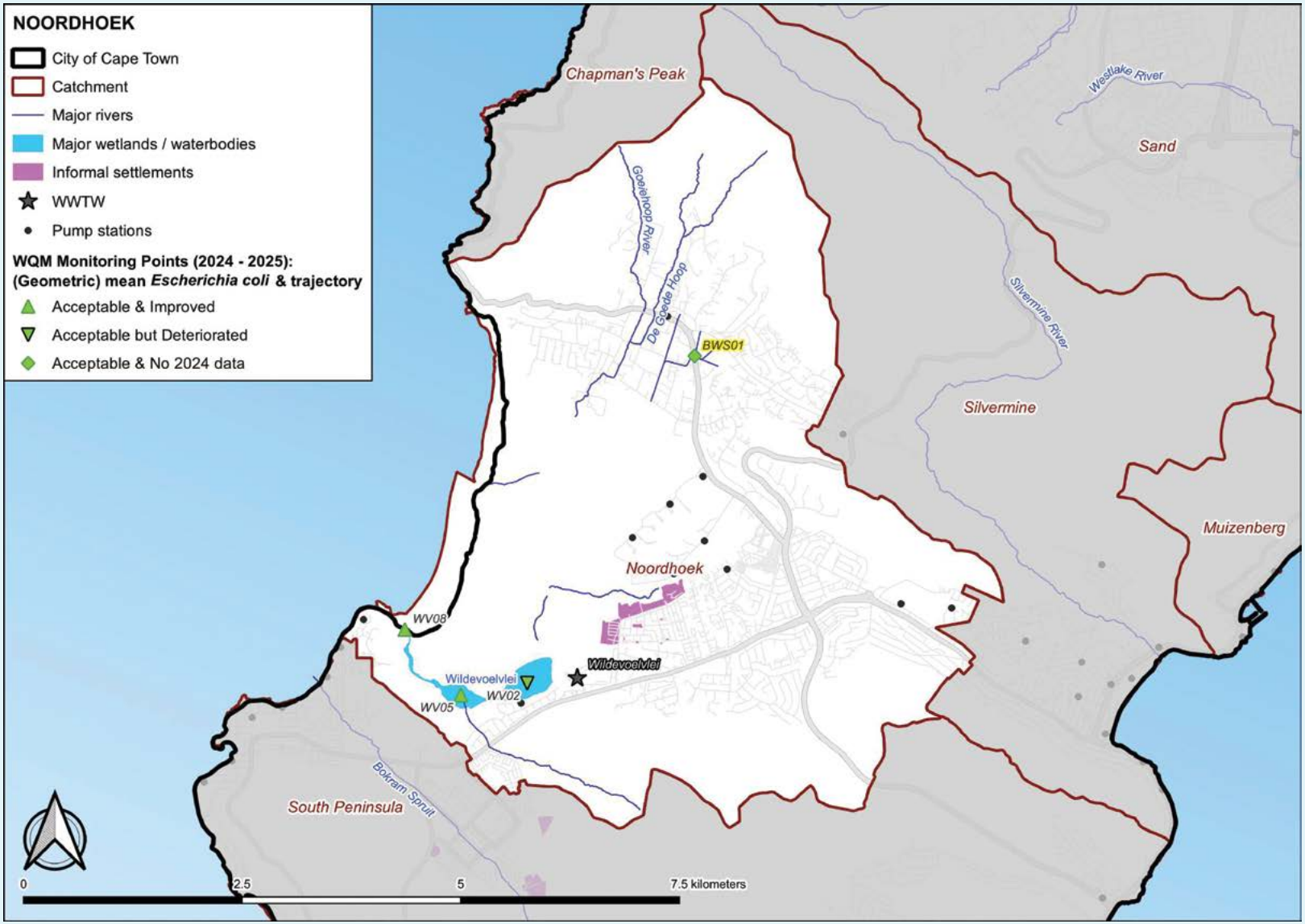


Figure 12.2

Escherichia coli data, focusing on the Noordhoek catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory and condition calculations explained in appendix E.

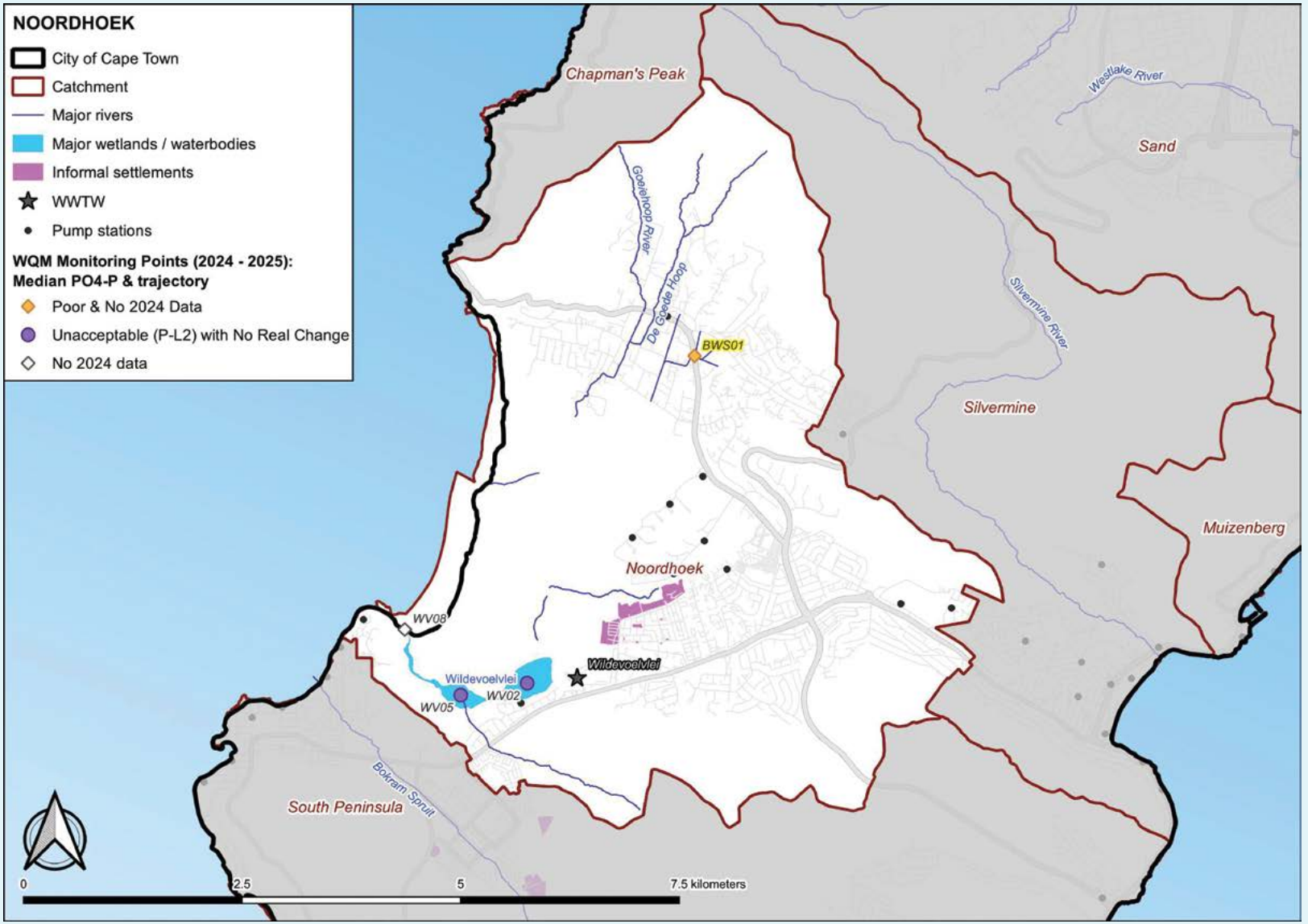


Figure 12.3

Median annual orthophosphate (PO_4-P) data, focusing on the Noordhoek catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

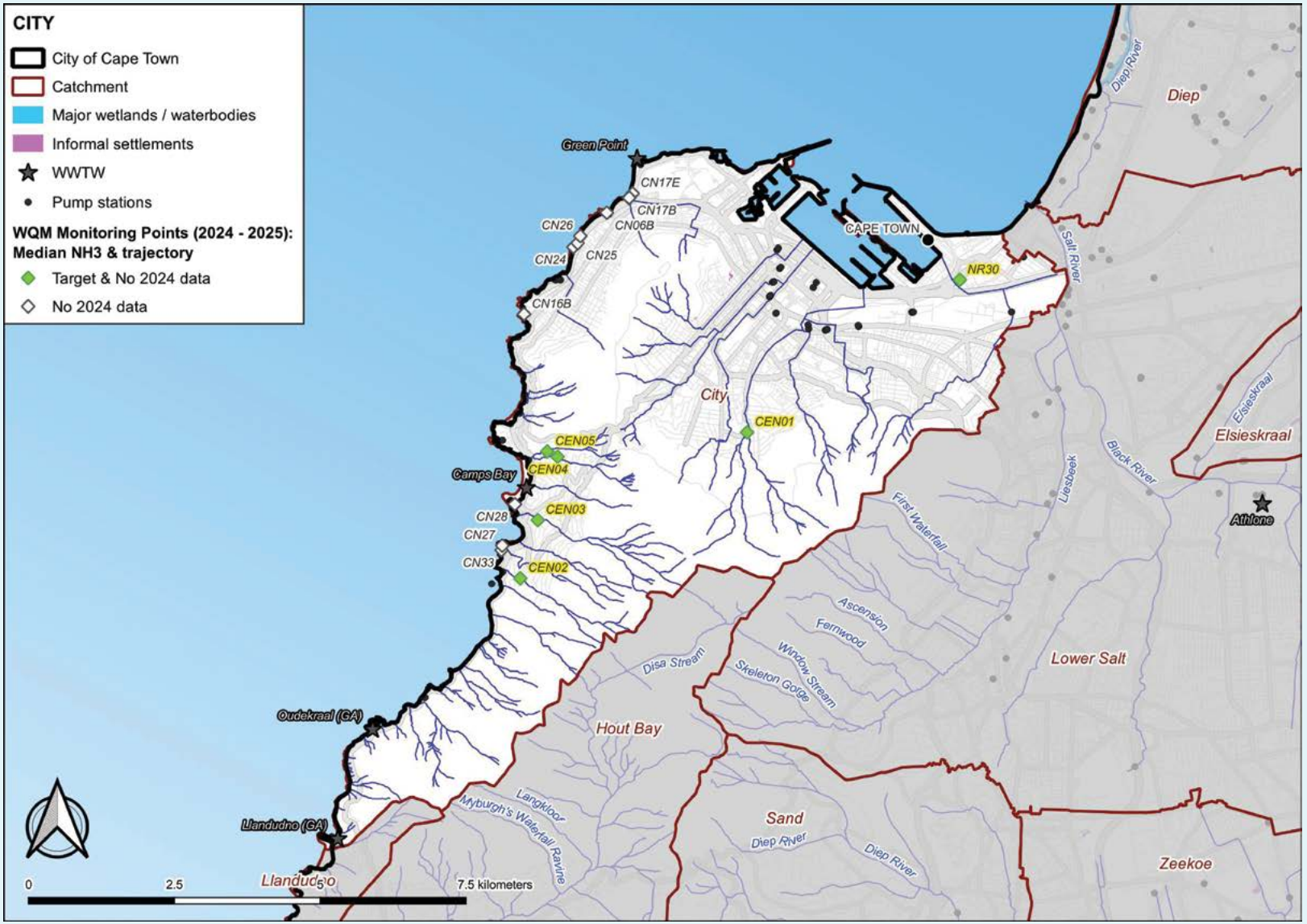


Figure 12.4

Median annual un-ionised (or free) ammonia (NH_3) data, focusing on the Noordhoek catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

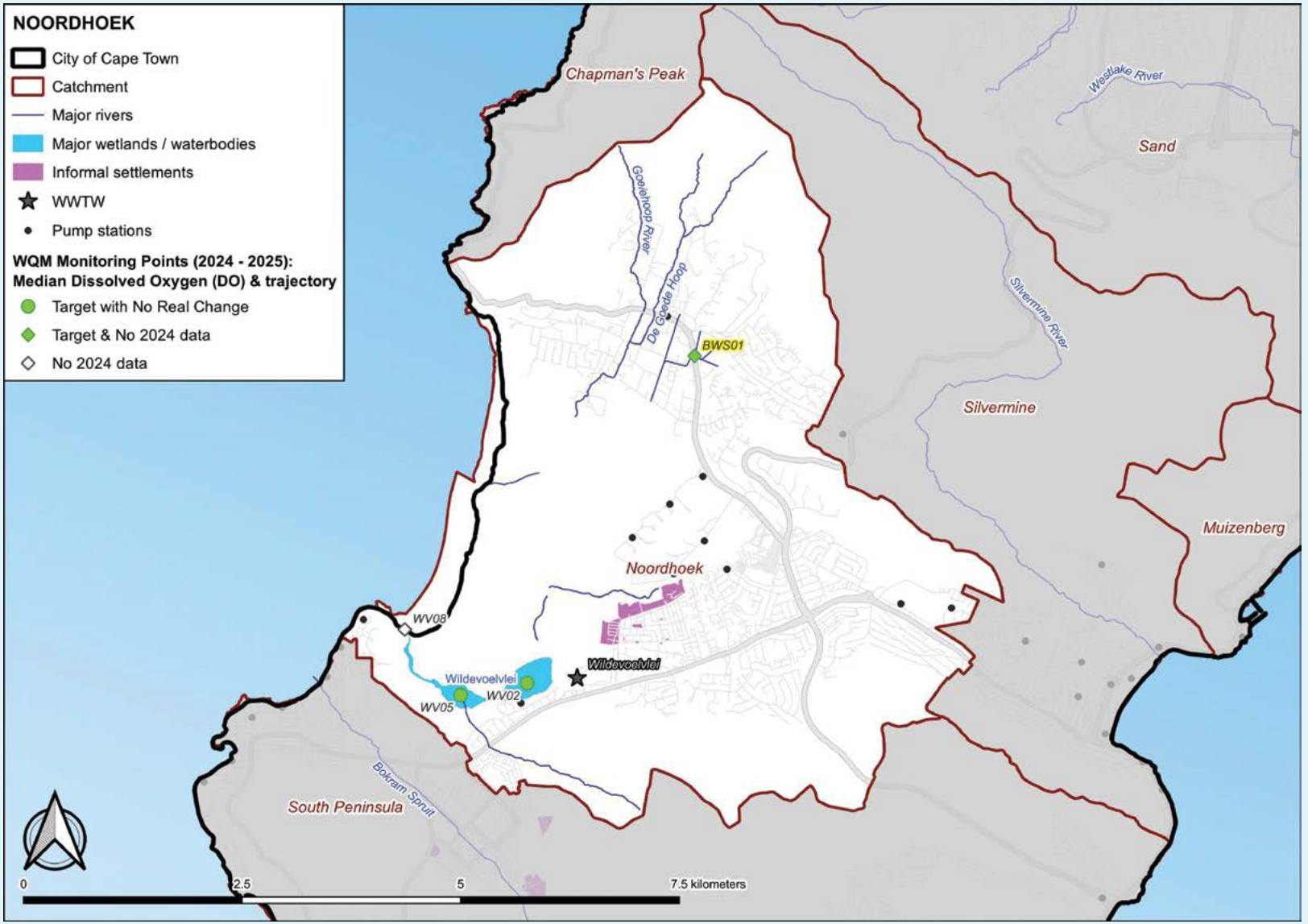


Figure 12.5

Median annual dissolved oxygen (DO) data, focusing on the Noordhoek catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

13. WATER QUALITY IN THE SALT RIVER CATCHMENT

ELSIESKRAAL AND LOWER SALT RIVER SUB-CATCHMENTS

13.1. CATCHMENT OVERVIEW[7]

The Salt River catchment is the third largest catchment in the city of Cape Town, covering an area just over 25 000 ha (Snaddon and Day, 2009). The catchment includes three major river systems: the Liesbeek, Black and Elsieskraal rivers. These three systems converge to form the Salt River itself, which exists today as a short concrete canal that drains into Table Bay just south of the Diep River outlet at Paarden Eiland. Under natural conditions, the Salt River, the Black River and the Diep River once formed a common and extensive estuary near where Paarden Eiland is today (Brown and Magoba, 2009). Today, the Salt River canal effectively constrains natural tidal flushing of the riverbed, and has severely altered the ecological functioning of the river (Day, 2019). Although wetlands at the original estuary may once have been of ecological importance, canalisation and urban development in this largely industrial area have resulted in their complete destruction.

The **Elsieskraal River** rises in the hills north of Durbanville, and flows southwards, running first through vineyards and then through the Tygerberg Valley, in the upper reaches of which it has been impounded, in order to create large open waterbodies for birdlife (Angelier Park and Doordekraal dams). Downstream of the dams, the river flows within an earth canal through a disturbed and rapidly developing area. Urban development increases in the river valley with distance downstream, and downstream of the N1 highway, the river is canalised within a concrete canal. It flows thus for the rest of its course, receiving increasing amounts of stormwater from its surrounding catchment, which includes several industrial areas. The river enters the Vygekraal River downstream of the Langa Road bridge, and the combined system merges with the Black River Canal, forming a wide, slow-flowing channel, referred to in this report as the Black River, as far as its confluence with the Liesbeek River. In these reaches, most of the summer flows comprise treated effluent from the Borcherds Quarry and Athlone WWTW, and the nutrient-enriched river supports extensive growths of aquatic alien macrophytes, including water hyacinth (*Pontaderia crassipes*), which necessitate annual removal. Downstream of the Liesbeek River confluence, the system is referred to as the Salt River Canal, and comprises a wide, concrete canal which discharges into Table Bay.

The **lower Salt River** sub-catchment is one of seven priority catchments included in the City's Water Quality Improvement Plan (WQIP) and progress in water quality improvements in this catchment is reported on to the Mayoral Priority Programme (MPP). The sub-catchment encompasses the area of the Salt River catchment downstream of the confluence of the Elsieskraal River, and includes the Liesbeek River sub-catchment. The sub-catchment is highly developed to the north, east and south, and most of the 'rivers' in these portions of the sub-catchment are in fact concrete canals, many of which were originally constructed in an attempt to drain historically extensive wetland areas on the low-lying land that are fed by the high water table associated with the underlying Cape Flats Aquifer

[7] Adapted from Day et al. (2012) and Day et al. (2025a)

(Brown and Magoba, 2009). An exception to this is the Vygekraal River, which flows within an earth channel through at least some of its reaches, including through the Nantes Park area (the site for one of the City's LUW projects), as well as the Liesbeek River sub-catchment, which includes some of Cape Town's most natural watercourses in the upper reaches of the catchment, albeit becoming rapidly channelised, canalised and impacted by other aspects of urban development within the municipal boundaries.

Many of the low-lying rivers in the sub-catchment pass through socio-economically challenged suburbs characterised by high levels of informal settlement and/or backyard settlements (e.g. in the suburb of Langa and surrounds, and the north-western edge of the KTC informal settlement), which are often plagued by high levels of crime and gang activity, affecting both local communities and the ability of the City to conduct routine monitoring and implement effective interventions. These rivers all join the Black River in the vicinity of the N2, and flow from there until just downstream of the confluence with the Liesbeek River in Observatory. Permanent flows of nutrient-enriched water support the growth of water hyacinth, which requires ongoing management by the City. Downstream of the railway bridge, the river channel is canalised to its outlet into Table Bay and is referred to as the Salt River Canal.

Rivers draining into the sub-catchment from the west form part of the catchment area of the Liesbeek River, which flows into the Black River in the downstream reaches of the lower Salt sub-catchment. These rivers drain the eastern slopes of Table Mountain. Their upper reaches lie within the Table Mountain National Park, where they flow as mountain streams first through relatively unimpacted fynbos in the areas above former forestry plantations, Kirstenbosch Botanical Gardens and high-lying affluent suburbs on the lower mountain slopes. With distance downstream into densely urbanised areas such as Newlands, Claremont and Rondebosch, most of the rivers are canalised or in some cases piped. The recent Riverlands Development has seen significant rehabilitation of the lower reaches of the Liesbeek River, including removal of a previous concrete canal and the re-establishment of wide wetland and riparian areas, planted with indigenous vegetation.

The Borcherds Quarry WWTW and Athlone WWTW are both located in the lower Salt sub-catchment. The former discharges treated effluent into the Jakkalsvlei Canal flowing immediately north of and along the N2, through the southern edge of Langa, before joining with the Vygekraal River opposite the Athlone WWTW, and passing under the N2. Treated effluent from the Athlone WWTW is discharged into the Vygekraal River, which is then known as the Black River. Sludge is also disposed of at times into the Cape Flats WWTW via the Cape Flats main sewers.

Apart from being exposed to inflows of treated effluent, the Black River is also subject to very high levels of solid waste as well as inflows of raw sewage from adjacent, inadequately serviced settlements, and periodic inflows of untreated sewage from the Borcherds Quarry WWTW (see Day et al., 2025a).

13.2 THREATS TO WATER QUALITY

Drawing on the above, the main sources of water pollution in this catchment appear to comprise:

- In the Elsieskraal sub-catchment:
  - Localised inflows of polluted water from enclaves of homeless residents and (limited) informal settlements in the Elsieskraal River, mainly downstream of Elizabeth Park in the Bellville CBD (Day and Uys, 2024);
  - Periodic inflows from overflowing pump stations or sewer manholes, many of which along the river corridor have low visibility and are poorly visited;
- In the lower Salt River sub-catchment:
  - Poorly treated effluent from the under-performing Athlone WWTW (discharging into the Vygekraal River, just upstream of its confluence with the Black River) – this is one of the largest WWTW in Cape Town in terms of discharge volume, and one of its worst-performing in the 2024, 2025 and 2026 reporting periods (see Day et al., 2025a and **appendix C – figures C1 to C4**);
  - Inflows of raw sewage from adjacent, inadequately serviced settlements (e.g. Langa informal settlement);
  - Periodic inflows of untreated sewage from Borcherds Quarry WWTW, which while performing better than the Athlone WWTW, showed generally poor compliance with general effluent limits for TSS, chemical oxygen demand and *E. coli* (see **appendix C – figures C1 to C4**);
  - Sewer spills into watercourses, resulting from blockages (typically caused by high levels of uncollected solid waste entering stormwater and sewerage infrastructure; and/or sewer pump station failures as well as leakages from an ageing sewerage network in many parts of the sub-catchment);
  - Inflows of solid waste from parts of the catchment exposed to serious levels of dumping adjacent to and within watercourses, with the Jakkalsvlei, Vygieskraal and Kalksteen canals being particularly exposed to dumping;
  - Runoff of contaminants from the limited industrial areas in the sub-catchment, mainly around Epping, Ndabeni and Maitland, and from numerous roads through the highly urbanised sub-catchment; and
  - Runoff of nutrient-enriched water from fertilised lawns and extensive gardens (including Kirstenbosch Botanical Garden) in the more affluent suburbs into the Liesbeek River portion of the sub-catchment – these inputs are low compared with the highly contaminated inflows into other tributaries of the Black River, but may have a more significant ecological impact, in moving ecological ecosystems from mesotrophic to eutrophic or even (lower) hypertrophic conditions (Day et al., 2025).



Photo 13.1 *The canalised Black River upstream of the N2, through Keurboom Park*



Photo 13.2 *Accumulation of solid waste in the Bokmakierie Canal just upstream of the Black River confluence, despite the City's attempts to reduce access for dumping by the installation of fences.*

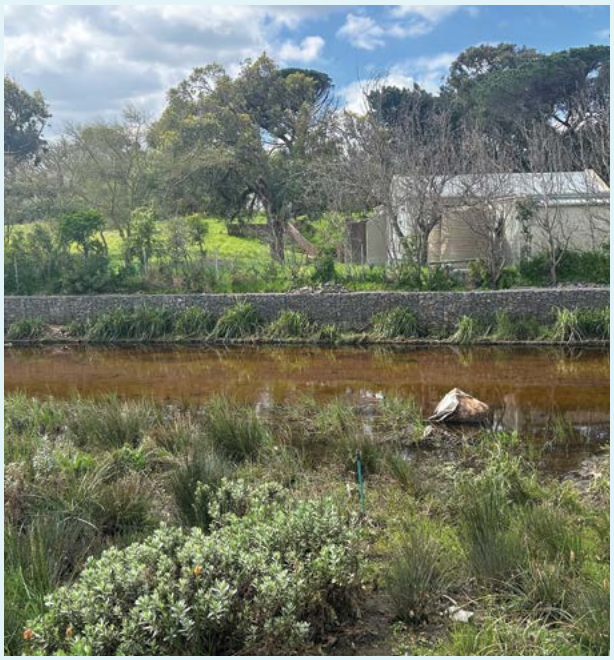


Photo 13.3 *Rehabilitated lower reaches of the Liesbeek River, through the Riverlands Development*



Photo 13.4 *Confluence of the Bokmakierie (LHS) and Vygekraal (RHS) rivers immediately south of the M5 and downstream of inflows from the Athlone WWTW*

13.3 WATER QUALITY THROUGH THE CATCHMENT – CONDITION AND TRAJECTORY

13.3.1 MONITORING POINTS AND WATER QUALITY MAPPING

The City currently collects routine water quality samples from 13 sites in the Elsieskraal sub-catchment (seven on ponds/dams including the Doordekraal and Angelier Park dams) and six in rivers, and 21 from river or stormwater channels in the lower Salt catchment. Of these, ten are new sites, added in the 2025 reporting period, and comprising ELS04, ELSGW, ELS11, ELS32–35 and ELS 37, as well as NR31 and NR32 in the lower Salt sub-catchment. ELS32–34 are located on the upper reaches of previously unmonitored tributaries of the Elsieskraal River. NR31 and NR32 are located on the upper reaches of the Kromboom and Liesbeek rivers respectively within suburban areas.

Figure 13.1 (**A to D**) presents summary water quality data for *E. coli*, orthophosphate (as PO_4-P), dissolved oxygen and free ammonia (NH_3) for the 2024 and 2025 reporting periods. The data are shown as percentages of all of the samples collected in the 2025 reporting period that fell into different water quality categories (as per **tables 2.1 and 2.3**). **Figures 13.2 to 13.5** present the same data on a site-by-site basis, showing spatial changes through the catchment and including trajectory analyses, comparing data from the 2025 reporting period with those of the previous year.

The following sections provide brief commentary on these findings.

13.3.2 RAW SEWAGE POLLUTION INDICATORS (*ESCHERICHIA COLI*)

Figure D5 (appendix D) shows that the lower Salt and Elsieskraal sub-catchments were both hotspots for sewage overflows in the city during the 2025 reporting period, as indicated by C3 reporting, with the Gugulethu, Manenberg, Hanover Park and Heideveld areas being particularly problematic, along with Elsies River, Ravensmead and Bellville CBD areas. Figure D4 highlights the fact that pump station overflows also occurred with high frequency in these areas. Of these, seven are included among pump stations that overflowed frequently during the 2025 reporting period, with Beach Road (Maitland area), Beaconvale and Bridgetown pump stations experiencing ten (Beach Road) and eight overflows each. **Figure D3** does, however, suggest that these were all minor, with most spills rated as insignificant and none rated higher than moderate. The data do show, however, that the frequency of pump station spills was second highest in the lower Salt sub-catchment, exceeded only by the highly problematic Diep catchment, and this points to a high potential cumulative impact, affecting downstream receiving waterbodies and helping to account for the exceedingly poor condition of the lower Black River near the outlet of this catchment.

Despite the above indicators of high levels of sewage pollution in many areas of the catchment, **figure 8.1**, read in conjunction with the map in **figure 8.2**, highlights the fact that the dams monitored

in the upper Elsieskraal sub-catchment were relatively unimpacted by sewage pollution, and in the 2025 reporting period had no incidences of measured pollution, showing an improvement over the previous year, and *E. coli* levels remained within the acceptable range over this period at least as far as the N1 (ELS10) crossing. In the downstream reaches, however, through the Bellville CBD and Elizabeth Park areas, sources of *E. coli* increase, with large numbers of homeless people occupying the area and periodically overflowing sewers in some areas. Water quality from ELS35 (downstream of the Tinie Meyer bypass) was of poor quality, with annual geometric mean data all rated as unacceptable level 2 or 3, indicative of a dirty catchment with high levels of sewage inflows throughout its lower reaches, stemming from (low levels) of informal settlement, and primarily, it is assumed, from overflows from the sewage reticulation system. Nevertheless, figure 13.1 suggests some improvement in the number of river samples rated in an acceptable condition in the sub-catchment compared with the previous year's data (40% to 55%), but with a high magnitude of sewage in other samples. This 'positive' impact must be considered with caution – the data include sites ELS32 and ELS34, both in the upper reaches of tributaries and both scoring well with regard to *E. coli* thresholds.

Data for the lower Salt sub-catchment show that 85% of samples were rated unacceptable in the 2025 reporting period – which shows a slight improvement over the previous year's data that are not explained simply by the addition of new points, with NR32 scoring well but with annual NR31 data lying in the unacceptable (level 2) range. The only parts of the lower Salt sub-catchment, where *E. coli* levels were unlikely to pose a risk to intermediate contact use, were in the upper Liesbeek sub-catchment, although water quality in that system deteriorated too with distance downstream, to a (deteriorating) unacceptable level 1.

13.3.3 PHOSPHORUS NUTRIENTS

Not surprisingly, orthophosphate data shown in **figures 13.1 and 13.3** followed similar patterns to those shown for *E. coli*, noting again that no samples could be rated better than poor because of analytical limitations (see **appendix F**). That said:

- 80% of samples analysed from sites in the lower Salt sub-catchment fell into the unacceptable category for this nutrient, with 60% of these rated as unacceptable level 2, showing very high nutrient enrichment, up to nearly two orders of magnitude above the lower threshold for unacceptable. By contrast, a much lower 38% of samples from the Elsieskraal sub-catchment were rated as unacceptable;
- Median annual orthophosphate concentrations were lowest in the Liesbeek sub-catchment (all sites); the upper Black River and in the upper reaches of the Elsieskraal River and its tributaries. Importantly, concentrations of this generally problematic nutrient were also not elevated above poor in the dams in the upper catchment, making them less susceptible to algal blooms and invasion by alien vegetation than other hypertrophic systems in the city;

- Concentrations of this nutrient increased in the middle to lower Elsieskraal River, and median values fell within the unacceptable level 1 range; showed annual deterioration in the lower reaches; and are assumed to have derived from sewer overflows and localised outflows of water with detergents and other phosphorus sources;
- With the exception of the sites along the Liesbeek River and upper Black River mentioned above, and the Blomvlei and Kromboom rivers rated as unacceptable level 1, mean annual data for all of the sites in the lower Salt sub-catchment fell into the unacceptable level 2 category, indicating high levels of ongoing nutrient supply. Downstream of the points of inflows from the poorly-performing Athlone and Borcherds Quarry WWTW, orthophosphate concentrations are indicated as deteriorating over the past reporting period. It should be noted that even if these WWTW met their effluent limits in summer, when treated and untreated effluent comprise the full source of water into this system, other than occasional rain, this water would still be rated as unacceptable level 2 or level 3, highlighting the problem posed to aquatic ecosystems by the high levels of phosphorus permitted in treated effluen; and
- High orthophosphate nutrient availability in the lower, slow-flowing parts of the catchment promote the growth of nuisance water hyacinth in the Black River.

13.3.4 UN-IONISED (OR FREE) AMMONIA AS A TOXIN

Summary data for free ammonia (NH_3) are shown in **figures 13.1 and 13.4**, and suggest the following patterns and trends:

- Of concern is the deterioration shown in data for the dams in the upper Elsieskraal sub-catchment, with 35% of samples rated poor to unacceptable and suggesting potential periods of exposure to concentrations above acute toxicity thresholds and longer-term chronic exposure. Given that these dams are generally in a relatively good condition, they are likely to support relatively diverse populations of aquatic macroinvertebrates as well as fish and some amphibians. This means that these systems could be more sensitive to ammonia toxicity than those in perennially highly polluted and canalised systems that do not provide habitat of much quality in any case; and
- The middle and lower reaches of the (mainly canalised) Elsieskraal River all showed median annual concentration above acute toxicity thresholds (i.e. rated unacceptable), as did the lower Salt River main stem sites, which showed unacceptable and often deteriorating free ammonia concentrations, with the exception of the least impacted Liesbeek, Black and Kromboom River sites in the cleaner southern suburb areas.

13.3.5 DISSOLVED OXYGEN

Adequate dissolved oxygen in aquatic ecosystems is critical for non-air-breathing life in these systems, as well as for many of the essential chemical processes that take place in them and help to ameliorate water quality (often involving living bacteria as well). The dissolved oxygen (DO) data shown in summary form in figures 13.1 and 13.5 suggest the following patterns:

- Periods of moderately low (poor) DO concentrations in the upstream dams – this may partially explain the elevated free ammonia at times in these systems, as DO is required for nitrification of ammonia to nitrites and nitrates. Low DO could be a function of elevated temperature or decaying organic material such as vegetation – it is unlikely to result from sewage inflows, given the low *E. coli* data for these sites;
- DO concentrations were higher in a greater proportion of samples in the Elsieskraal than the lower Salt sub-catchment, with much of the river characterised by fast flows, often along confined canals, which would favour oxygenation; and
- Median annual DO concentrations were all rated as unacceptable and within the chronic to acute effect range for this variable at all sites in the slow-flowing lower Salt sub-catchment, again excluding the Liesbeek and Black rivers, and surprisingly, the Kalksteenfontein River just north of the N2. Very low DO concentrations would be expected in the visibly polluted waters of many of the rivers in the lower Salt sub-catchment, where they are impacted by assumed high biological and chemical oxygen demands that will contribute to oxygen depletion.

13.4 CONCLUSIONS AND RECOMMENDATIONS

Drawing on the water quality data presented here for the Salt catchment, the following conclusions and recommendations can be drawn:

- The cumulative impact of multiple small but repeated sewage overflows and pump station failures is highlighted in contributing to a deteriorating water quality in the catchment, with data showing that orthophosphate and free ammonia concentrations are tightly linked to areas with high levels of *E. coli*.
- WWTW contribute significant nutrient loads into river systems – where they are consistently failing to produce effluent within at least general limits, as in the case of the Athlone and often the Borcherds Quarry WWTW, they are effectively releasing little better than large volumes of raw sewage into the river systems, with significant ecological impacts and knock-on management costs (e.g. ongoing needs to remove organic sediments and water hyacinth from the Black River).
- Solid waste management is a serious issue in the lower Salt sub-catchment, in particular along the lower Black River, Blomvlei, Vygieskraal, Kalksteenfontein and other systems, and contributes to river management problems.
- The least-impacted rivers, comprising the upper Elsieskraal River and its tributaries; the Liesbeek River and its tributaries; the (upper) Black River; and the Kromboom River are all relatively unimpaired in terms of water quality and should be valued for this reason, with any deterioration rigorously investigated. These systems would all be better candidates for ecological rehabilitation projects than the rivers that are extremely adversely affected, further downstream, where water quality amelioration should be prioritised.



Figure 13.1

Summary water quality data for the Salt River catchment, presented as compliance-type data, showing percentage of all samples that fall into preallocated categories, as per tables 2.1 and 2.3. Data include (A) (geometric) mean annual *Escherichia coli* data; (B) median annual orthophosphate phosphorus (PO_4-P) data; (C) annual ammonia (NH_3) data; (D) median annual dissolved oxygen (DO) data.

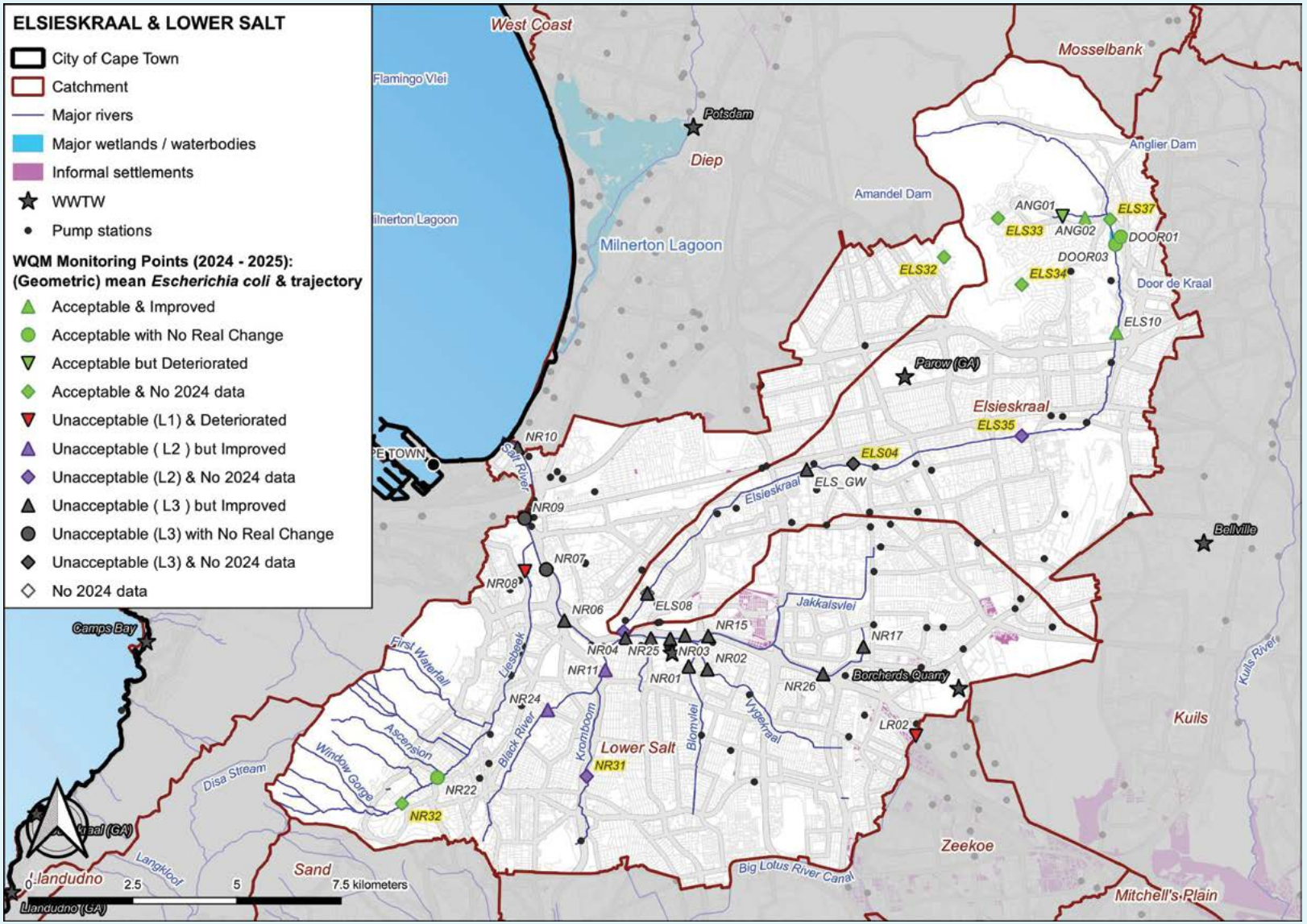


Figure 13.2

Escherichia coli data, focusing on the Salt River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory and condition calculations explained in appendix E.

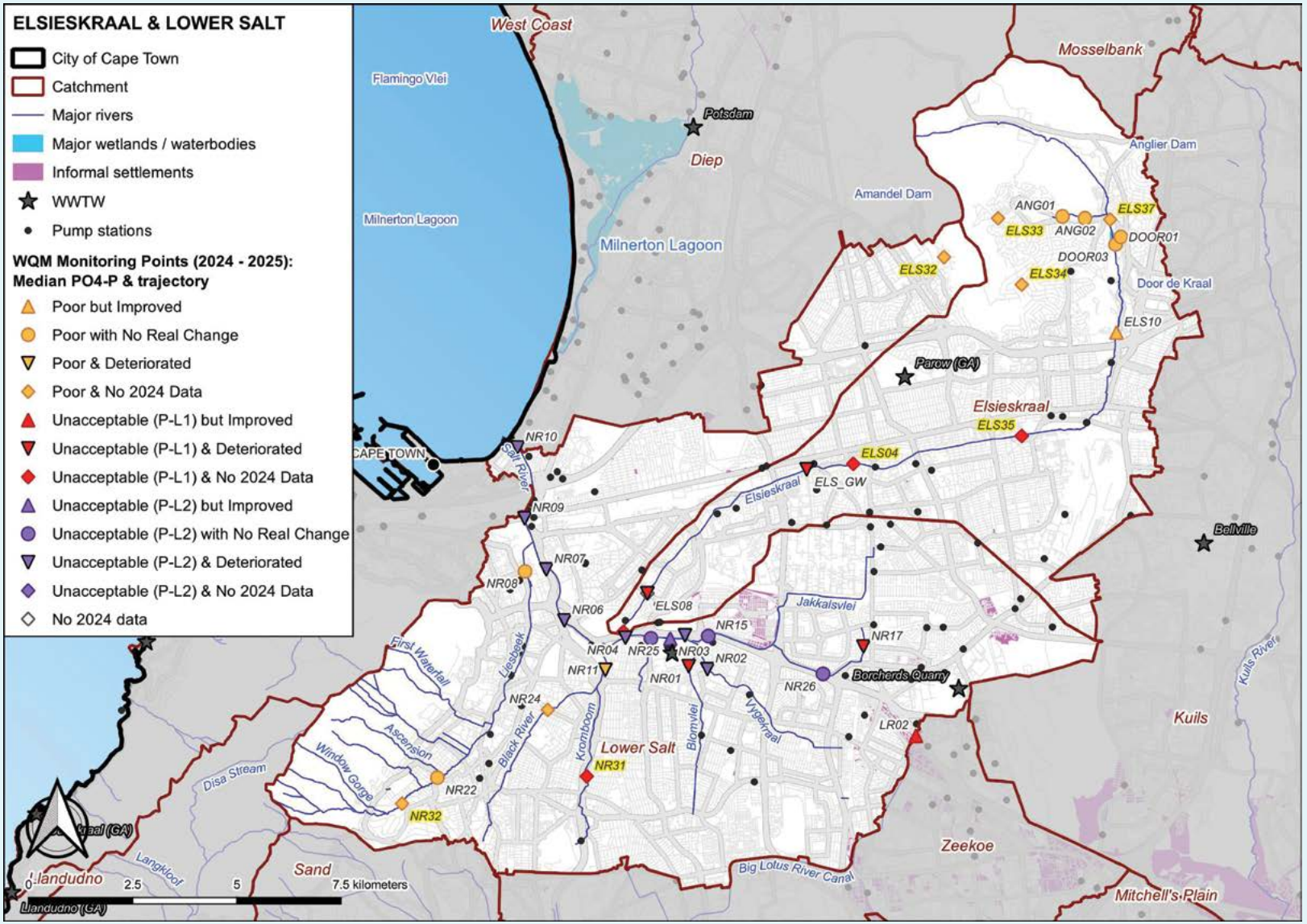


Figure 13.3

Median annual orthophosphate (PO_4-P) data, focusing on the Salt River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

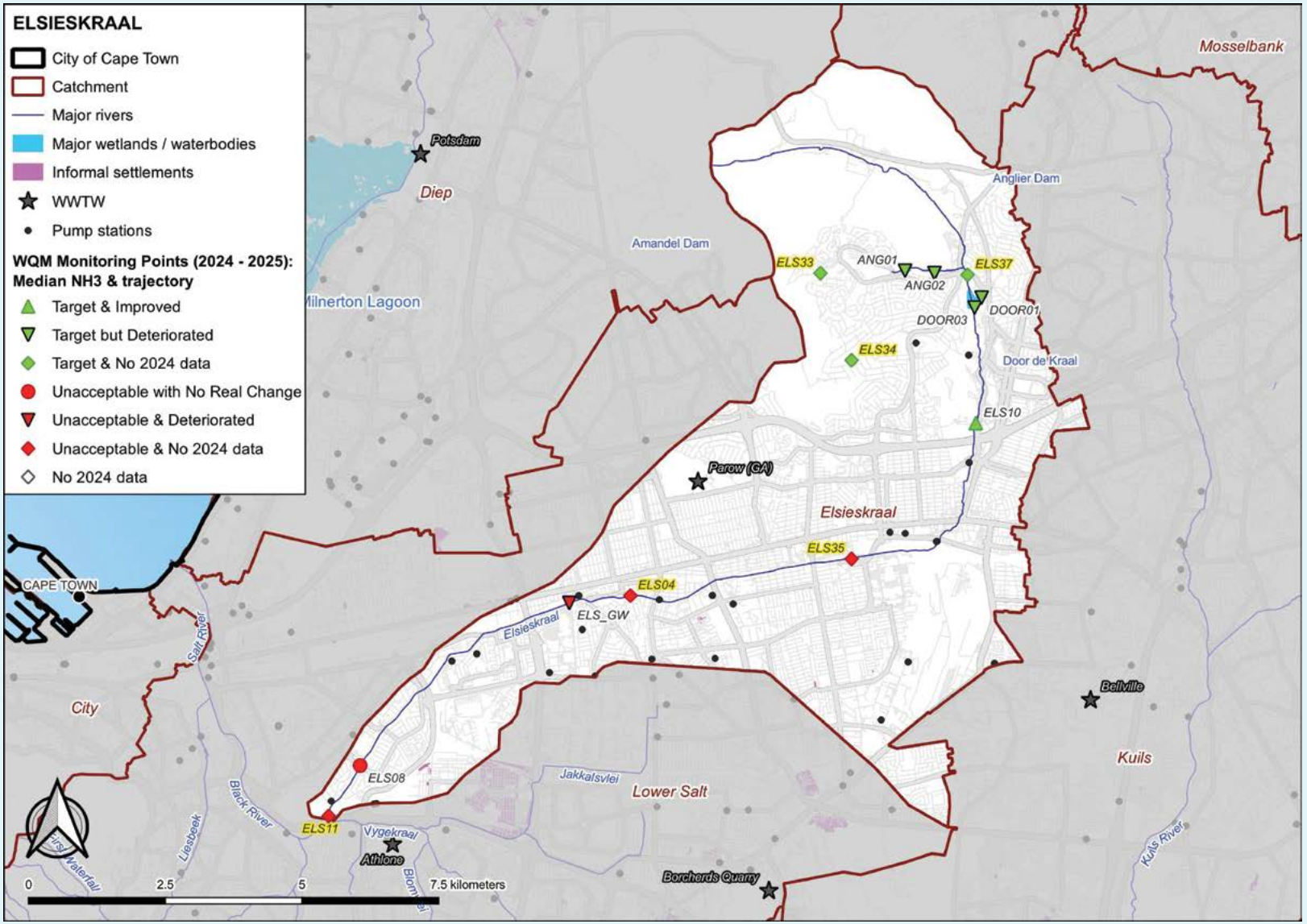


Figure 13.4

Median annual un-ionised (or free) ammonia (NH_3) data, focusing on the Salt River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

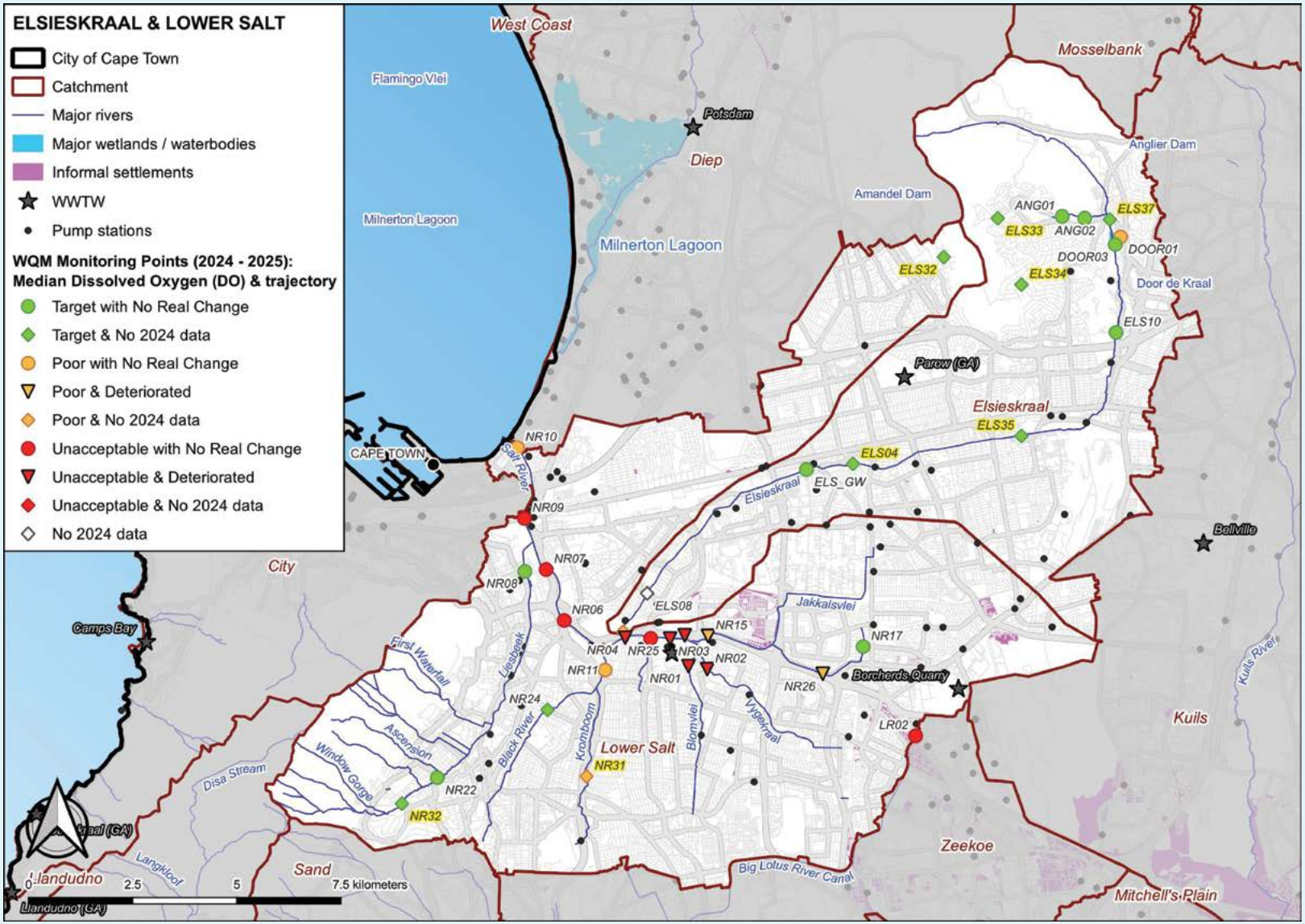


Figure 13.5

Median annual dissolved oxygen (DO) data, focusing on the Salt River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

14. WATER QUALITY IN THE SAND RIVER CATCHMENT

INCLUDING ZANDVLEI

14.1 CATCHMENT OVERVIEW

The Sand River catchment receives the bulk of its fresh water from three river systems originating on the east-facing slopes of the Table Mountain-Constantiaberg mountain chain. These are the Sand/Diep, Keysers and Westlake rivers. Zandvlei, an estuarine vlei, is situated at the downstream end of the catchment and is one of the City's major recreational waterbodies.

The Diep River rises above Constantia and flows through several green belts and open spaces before discharging into Little Princess Vlei. In addition to the Diep River itself, the sub-catchment includes a number of tributaries, of which the most significant comprise the Wynberg, Klaasenbosch, Brommersvlei, Burgersboskloof and Cecilia Forest Streams, all of which enter the Diep River upstream of Main Road. The Diep River is canalised downstream of Main Road, and flows into the lower reaches of Little Princessvlei. A small informal settlement has developed along the river margins, just upstream of Roscommon Road.

Little Princessvlei is an open waterbody that also receives flows from the Mocke River. Its outlet is the Sand River, a canal that flows southwards and then in a south-westerly direction from the outlet of Little Princessvlei to Zandvlei. The canal is prone to high levels of accumulation of solid waste, particularly downstream of Retreat Road.

The Langvlei system, which enters the Sand River just upstream of its confluence with Zandvlei estuary, is also canalised throughout its reaches to its confluence with the Sand River Canal. The Langvlei itself is an open waterbody (or vlei) fed by the Langvlei Canal in Retreat.

The Keysers River rises on the east-facing slopes of the Constantiaberg mountain as a series of small streams, including the Grootbosch, Spaanschemat and Prinskasteel rivers. The upper reaches of the Grootboschkloof and Prinskasteel rivers are located within the undeveloped Table Mountain National Park. Upstream of the M3 freeway, the tributaries of the Keysers River flow through forestry, agricultural (vineyards) and residential land uses in Constantia and Tokai. From the confluence of all the tributaries just to the west of the freeway, the Keysers River flows south-eastwards under the freeway and through urban open space (old farmland) in Dreyersdal until it reaches Main Road where commercial land use dominates. After passing under Main Road, the river turns southwards and flows through an industrial area and a portion of the high-density residential suburb of Steenberg before reaching the wetland area on the north-western fringes of Zandvlei.

Die Oog is a spring-fed open waterbody (historically an excavated water storage reservoir dating to the early 18th century) located in the Bergvliet area, which drains to the Keysers River.

The Westlake River has its source on the lower slopes of the Constantiaberg mountain, within the Steenberg agricultural estate below Silvermine Nature Reserve. It flows through the gardens of the Norval Foundation, under Steenberg Road and past a commercial node (Steenberg Village shopping centre), before turning eastward and flowing alongside the Westlake low-income settlement and then through the agricultural fields of Pollsmoor Prison into the Pollsmoor Dam. Downstream of the dam, the Westlake River flows under the M3 freeway and then south-eastwards through the residential suburb of Kirstenhof via the Kirstenhof Wetlands Park before turning sharply southwards to flow via a canal under Steenberg Road. Downstream of Steenberg Road, the river turns south-eastward again and flows under Main Road, straight into the Westlake wetland area on the north-western fringes of Zandvlei.

Zandvlei is a large estuarine vlei approximately 2,5 km in length and up to 500 m in width, with its mouth opening onto the False Bay coast east of Muizenberg. Zandvlei is a popular recreational waterbody and open space, with its water level, salinity, and flushing regime being tightly controlled through manipulation of conditions at the estuary mouth. The mouth is managed by breaching and reinstating a sand berm (mound) with a bulldozer or tracked excavator. Improved mouth management has resulted in increased salinities and has improved the overall estuarine conditions in recent years, with increased indigenous fish diversity and reduced proliferation of Stuckenia pectinatus (pondweed) (Rose et al., 2023b). The vlei is connected to the constructed Marina da Gama canal system to the east of the main waterbody by two narrow channels.



Photo 14.1 *Lower reaches of the Westlake River, in Lakeside*

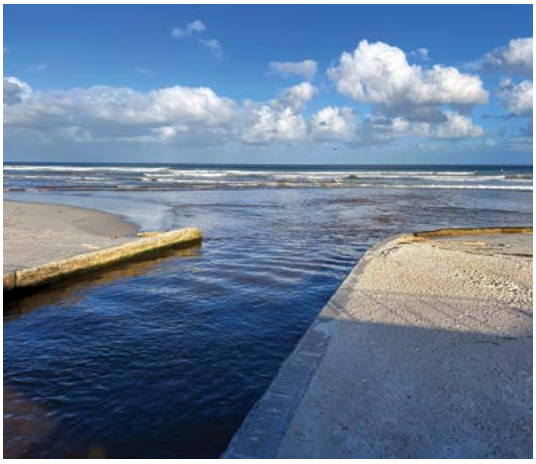


Photo 14.2 *Canalised (and artificially managed) outlet of Zandvlei into False Bay at Muizenberg beach*



Photo 14.3 *Attenuation ponds in Wynberg Park (upper reaches of Wynberg Stream/Krakeelwater Stream)*



Photo 14.4 *Relatively unimpacted water quality in the upper reaches of the Diep River (Alphen train area)*



Photo 14.5 *Incised section of the Diep River downstream of the M3.*



Photo 14.6 *Canalised Diep River downstream of Main Road*



Photo 14.7 *Langvlei wetland.*



Photo 14.8 *Langvlei Canal – relatively unimpacted in terms of water quality (Day, 2024)*

14.2 THREATS TO WATER QUALITY

The Sand catchment is one of only a few of Cape Town's catchments that is not impacted by any WWTW or major informal settlements. This means that its water quality is impacted primarily by overland and stormwater runoff, along with episodic sewage spills that make their way into watercourses. Catchment land use includes extensive agricultural areas (vineyards on the Constantiaberg mountains); suburban areas; small areas of informal and back-yarding settlements; commercial areas (shopping centres and parking lots); and light industrial areas.

The most significant sources of pollution in this priority sub-catchment are outlined as follows:

- The catchment of Zandvlei includes some of Cape Town's few remaining agricultural areas, primarily under vineyards in the Constantia and Tokai areas. Runoff from this part of the catchment is a source of excess nutrients, pesticides, herbicides and sediment, all of which pass into Zandvlei (Rose et al., 2023).
- The catchment also includes two golf courses, both of which make use of treated effluent water for irrigation. This part of the catchment is most heavily enriched with phosphorous, rather than nitrogen.
- Stormwater runoff from suburban areas, including extensive affluent suburbs to the west and northwest – stormwater from formal residential areas may contain fertilisers, salts and pathogens, as well as heavy metals.
- Runoff from parts of the catchment such as Steenberg and Westlake, which have formal housing but may be considered underserviced given the high prevalence of backyard shacks. Greywater, untreated sewage and solid waste are often discharged to stormwater in the absence of sufficient formal drainage.
- Overflows and spills of raw sewage into watercourses via the stormwater system occur frequently as a result either of blockages in the sewer infrastructure in the catchment or malfunctions of sewer pump stations.

14.3 WATER QUALITY THROUGH THE CATCHMENT – CONDITION AND TRAJECTORY

14.3.1 MONITORING POINTS AND WATER QUALITY MAPPING

The City currently collects routine water quality samples from 35 sites in the Sand River catchment, including 13 in Zandvlei and Marina da Gama, 10 in the Langvlei and Little Princessvlei sub-catchments, seven in the Keysers River sub-catchment (including one in Die Oog), and five in the Westlake River sub-catchment.

Of the above, five are new (2025 reporting period) sites, as follows:

- Four in the Keysers River sub-catchment: CR31 downstream of Grootboschkloof and Pagasvlei Stream; CR32 on the Prinskasteel River; CR11 at the downstream confluence of Grootboschkloof and Belsiebos Stream; and CR33 on the Spaanschemat River at Spaanschemat Road; and
- LVC on the Langvlei Canal before confluence with the Sand River.

Figure 14.1 (A to D) presents summary water quality data for *E. coli*, orthophosphate (as PO_4-P), dissolved oxygen and free ammonia (NH_3) for the 2024 and 2025 reporting periods. The data are shown as percentages of all of the samples collected in the 2025 reporting period that fell into different water quality categories (as per **tables 2.1 and 2.3**). **Figures 14.2 to 14.5** present the same data on a site-by-site basis, showing spatial changes through the catchment and including trajectory analyses, comparing data from the 2025 reporting period with those of the previous year.

The following sections provide brief commentary on these findings.

14.3.2 RAW SEWAGE POLLUTION INDICATORS (*ESCHERICHIA COLI*)

The data in appendix D demonstrate that the Sand catchment had a relatively low rate of sewage pump station spills, with fewer than 25 spills during the reporting period and most of these classified as 'insignificant' or 'minor'. The worst-performing pump station was Timour Hall, with six spills. Data on C3 reports for sewer spills or overflows, heat-mapped in figure D5, show a concentration of spill or overflow events around the eastern part of the catchment in the Sand and Langvlei sub-catchments.

Figure 14.1 highlights the differences in the intensity of sewage pollution among the various sub-catchments draining to the Zandvlei:

- Sites in the Sand and Langvlei canals, in particular, had a high proportion of sampling events with *E. coli* counts in the 'unacceptable' risk range, contributing significantly to the approximately 30% of samples across all rivers that were in the unacceptable range.
- The Little Princessvlei and Langvlei waterbodies both had between 20% and 30% of samples in the unacceptable risk range, remaining at similar rates since the 2024 reporting period, but with a slight increase in the number of samples falling into the unacceptable level 3 category indicative of the highest risk to human health.
- The Westlake wetland showed improvements in the 2025 reporting period, with a reduction in the number of samples in the unacceptable range from approximately 18% in 2024 to zero in the current period.
- Zandvlei showed a slight improvement in microbiological compliance rates from the 2024 to the 2025 reporting period, as did Die Oog, with the latter having no incidences of *E. coli* elevated above acceptable risk thresholds in the current period.

The data shown on the map in figure 14.2 show that:

- Mean *E. coli* counts were within the acceptable risk range for this variable at most sites in the upper catchment and in the estuary and associated waterbodies.
- Watercourses in the unacceptable risk range for this parameter included sites at and upstream of the Sand-Langvlei Canal confluence (CR21 and CR29), a new site in this vicinity on the Langvlei Canal (LVC), and the Mocke River inflow to the Little Princessvlei, where frequent sewage spills are known to occur. These sites are in areas prone to discharges from problem sewage pump stations and manholes, or affected by informal settlement or backyard densification along river corridors.
- Site CR06 in Soetvlei on the Spaanschemat River also had mean counts in the unacceptable risk range, having deteriorated markedly since the 2024 reporting period. This may be related to a small informal settlement established along the M3 in this vicinity, or simply to contamination by horse and dog faeces along this popular public open space.
- Site CR33 was monitored for the first time in the 2025 period, and had mean counts in the unacceptable risk range due to elevations during the winter months. A small informal settlement (Die Gatjie) has become established near this sampling point.
- The Westlake River downstream of the Westlake residential area and Pollsmoor was no longer subject to the high rates of bacterial pollution reported there in the 2024 reporting period.

14.3.3 PHOSPHORUS NUTRIENTS

Figure 14.1 indicates that the number of samples in the Langvlei with orthophosphate concentrations in the unacceptable range was both the highest relative to the rest of the catchment, and showed an increase from about 35% to nearly 50% year on year. Sample sites located in rivers also had a relatively high proportion of samples in the unacceptable range, with this overall compliance figure driven primarily by high orthophosphate concentrations in the lower reaches of the Langvlei Canal, Keysers River and Westlake River. In the Little Princessvlei and Zandvlei, approximately 5% of data were in the unacceptable category. The remaining samples were all rated as poor, but it must be noted this classification is confounded by the City's current lower limit of detection for this variable of < 01, mg/ℓ, which is higher than the threshold for the poor rating.

The map in figure 14.3 indicates that all sites monitored, with the exception of the inflow to the Langvlei, were in the poor category. As above, this is indicative rather of the relatively high limit of detection, than of any certainty that all parts of the catchment are enriched for this nutrient, and no conclusions can thus be drawn. Notably, no real change was observable in the median data between 2024 and 2025 reporting periods at any site, other than slight improvements at CR20 south of Military Road on the Keysers River.

14.3.4 UN-IONISED (OR FREE) AMMONIA AS A TOXIN

Summary data presented in figure 14.1 suggest that:

- The number of samples collected at river sites during the 2025 reporting period, which were in the poor or unacceptable ranges for un-ionised ammonia concentrations, reduced relative to the 2024 reporting period, but this may simply be indicative of the increase in the number of upstream/relatively unimpacted sites within the Diep sub-catchment sampled during the 2025 reporting period.
- Slight improvements in the number of samples in the unacceptable range indicative of ammonia toxicity were observed in the Langvlei, Little Princessvlei and Die Oog waterbodies during this period.
- Zandvlei conversely showed an increased number of samples indicative of ammonia at concentrations in the unacceptable/acutely toxic range, albeit still fewer than 5% of samples.

Spatially, **figure 14.3** illustrates that all but two sites in the sub-catchment remained within the target range during the 2025 reporting period, with the Mocke Road inflow to the Little Princessvlei (LPVMR) and the Langvlei outflow (LVO) being the only sites to have median un-ionised ammonia concentrations within the poor range. Most sites in the Westlake River sub-catchment and the Keysers River sub-catchment had median values that were better than or showed no change relative to the 2024 reporting period, while sites in the Little Princessvlei and Sand River catchments showed deterioration year on year for this parameter. Wetlands and rivers within the broader Sand catchment were not, in general, subject to ammonia concentrations that would pose an acute toxicity risk to aquatic organisms.

14.3.5 DISSOLVED OXYGEN

Across the Sand catchment, the majority of samples fell in the target range for DO, with most waterbodies showing ~75–95% compliance. Other trends in figure 14.1 include:

- The waterbody most frequently subject to low oxygen saturations in the poor/unacceptable range was the Little Princessvlei, where nearly 60% of samples were below target saturations, and a 20 percentage-point decline was apparent between the 2024 and 2025 reporting years.
- The Langvlei also showed a deterioration in respect of this parameter, with an approximately ten percentage point decrease in the number of samples within the target range for DO. This waterbody also had at least one major algal bloom event in the reporting period, with microcystin toxin data presented in appendix G showing that approximately 5% of samples in the Langvlei were in the 'extreme risk' category for this algal-derived toxin.
- The Zandvlei had a slight year-on-year deterioration in respect of DO saturations, with just over 20% of samples falling outside the target range, and a marked increase in the number of samples in the unacceptable (high) range where conditions would have been – at least temporarily – unsuitable for aquatic organisms.

- River sites showed an improvement in compliance for this parameter, although it is not certain whether this reflects actual water quality improvements or simply the addition of four new relatively unimpacted sites.
- Dissolved oxygen at Die Oog appears to have fluctuated more strongly than in the 2024 reporting period: although more samples overall fell within the target range (approximately 75%, up from 60% year on year), there was also a marked increase in the number of oxygen saturations within both the unacceptable (low) and unacceptable (high) ranges. This is likely to be indicative of increased algal growth leading to photosynthesis-mediated supersaturation, and corresponding, mean annual chlorophyll-a concentrations in this waterbody actually declined between 2024 and 2025.

Spatial data in **figure 14.5** illustrate that:

- Sample sites within the catchment generally performed well in terms of measured DO concentrations, with most sites within the target range for this variable. This is indicative of relatively low levels of eutrophication and low chemical and biological oxygen demand, and suggest that river ecosystem health was likely to have been good from a water quality perspective over the assessment period.
- Site CR20 at Military Road, on the lower reaches of Keysers River, remained within the poor range in 2025 as did site CR01 in the upper reaches of the Westlake River.
- Other sample sites affected by median DO in the poor range in 2025 were in the Little Princessvlei and at the Langvlei Canal upstream of its confluence with the Sand River.

14.4 CONCLUSIONS AND RECOMMENDATIONS

Overall, the data show that the Sand catchment continued to experience localised but persistent water quality pressures, largely driven by stormwater-borne pollution, nutrient enrichment from suburban and agricultural runoff, and episodic sewage inflows. While the upper tributaries of the Keysers and Westlake rivers generally maintained good ecological condition, the Little Princessvlei and Langvlei systems remained the most vulnerable, with recurring low dissolved oxygen events, elevated orthophosphate, and frequent microbiological contamination linked to nearby informal settlement expansion, backyard discharges, and pump station failures. Conditions in Zandvlei itself remained broadly stable, although episodes of low DO and occasional ammonia toxicity highlight its sensitivity to fluctuating nutrient loads and upstream inflows. Zandvlei remained the only recreational waterbody in Cape Town not to be subject to extremely compromised water quality during the reporting period, and despite episodic closures linked to sewage spills, did not experience any microcystin toxicity events. Meaningful improvement across the catchment will require targeted interventions in the Langvlei–Sand canal corridor and at key inflow points to Little Princessvlei, strengthened management of stormwater and greywater discharges, and continued optimisation of Zandvlei mouth operations to sustain flushing and ecological resilience.

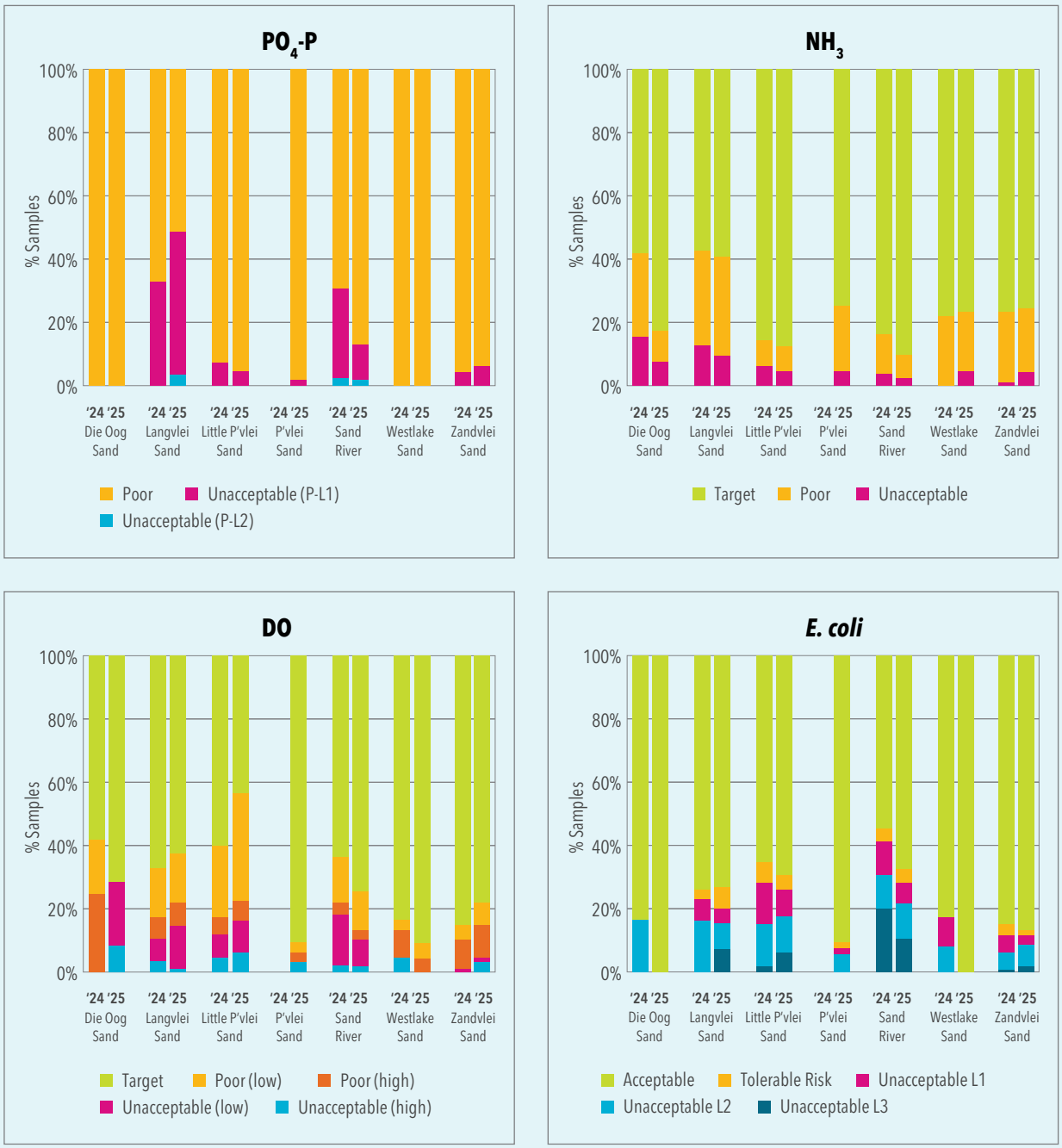


Figure 14.1

Summary water quality data for the Sand River catchment, presented as compliance-type data, showing percentage of all samples that fall into preallocated categories, as per tables 2.1 and 2.3. Data include (A) (geometric) mean annual *Escherichia coli* data; (B) median annual orthophosphate phosphorus (PO_4-P) data; (C) annual ammonia (NH_3) data; (D) median annual dissolved oxygen (DO) data.

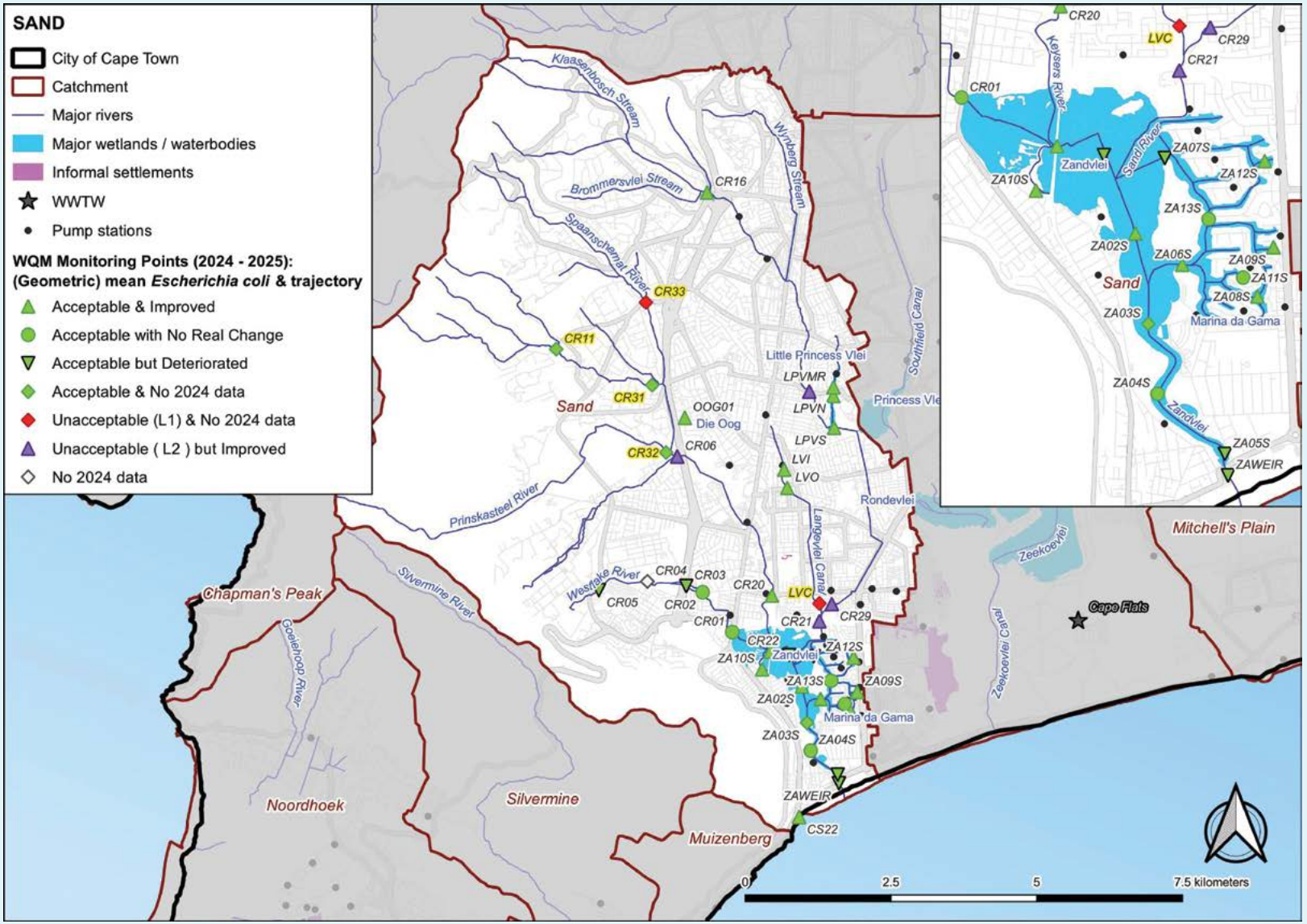


Figure 14.2

Escherichia coli data, focusing on the Sand River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory and condition calculations explained in appendix E.

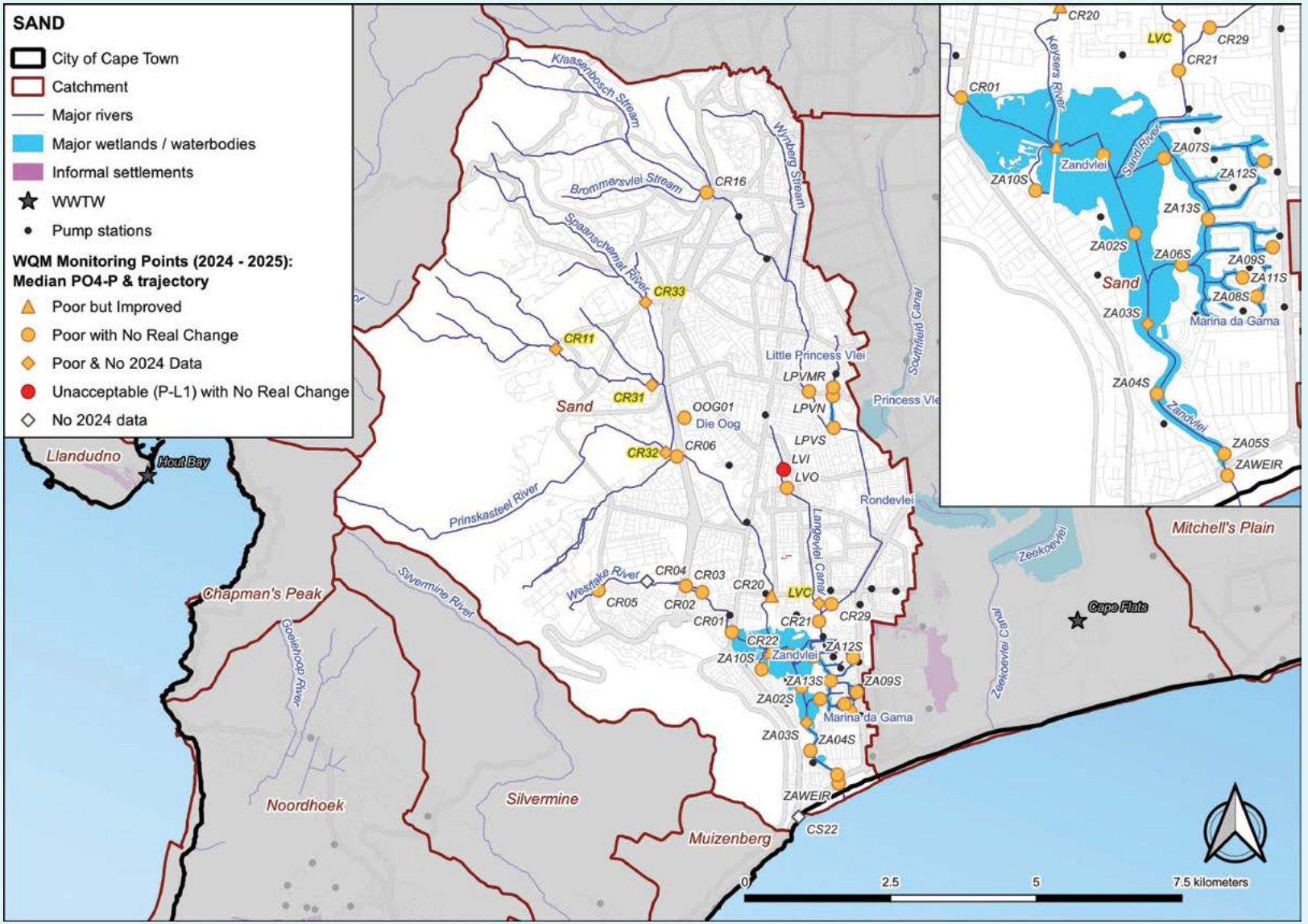


Figure 14.3

Median annual orthophosphate (PO_4-P) data, focusing on the Sand River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

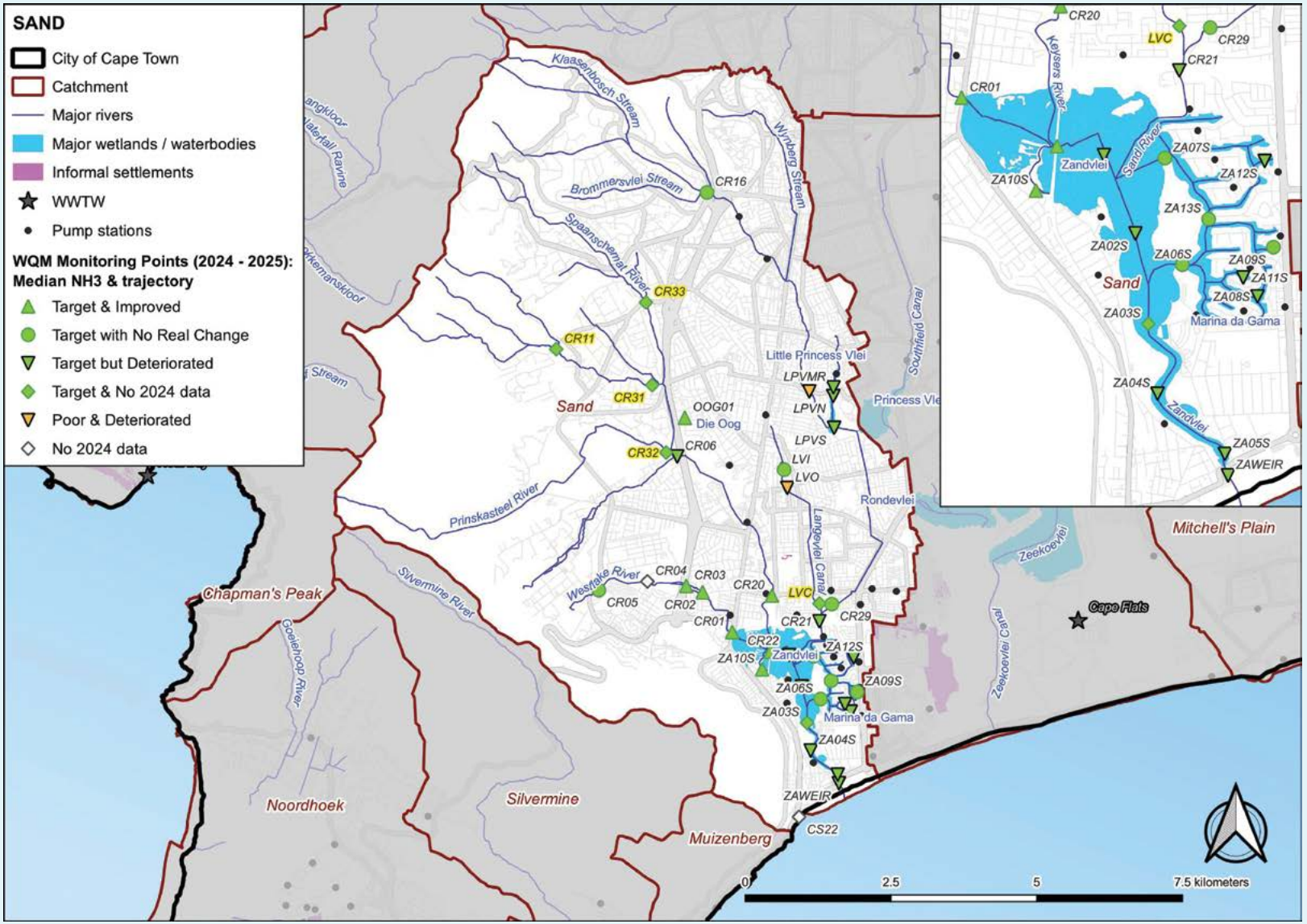


Figure 14.4

Median annual un-ionised (or free) ammonia (NH_3) data, focusing on the Sand River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

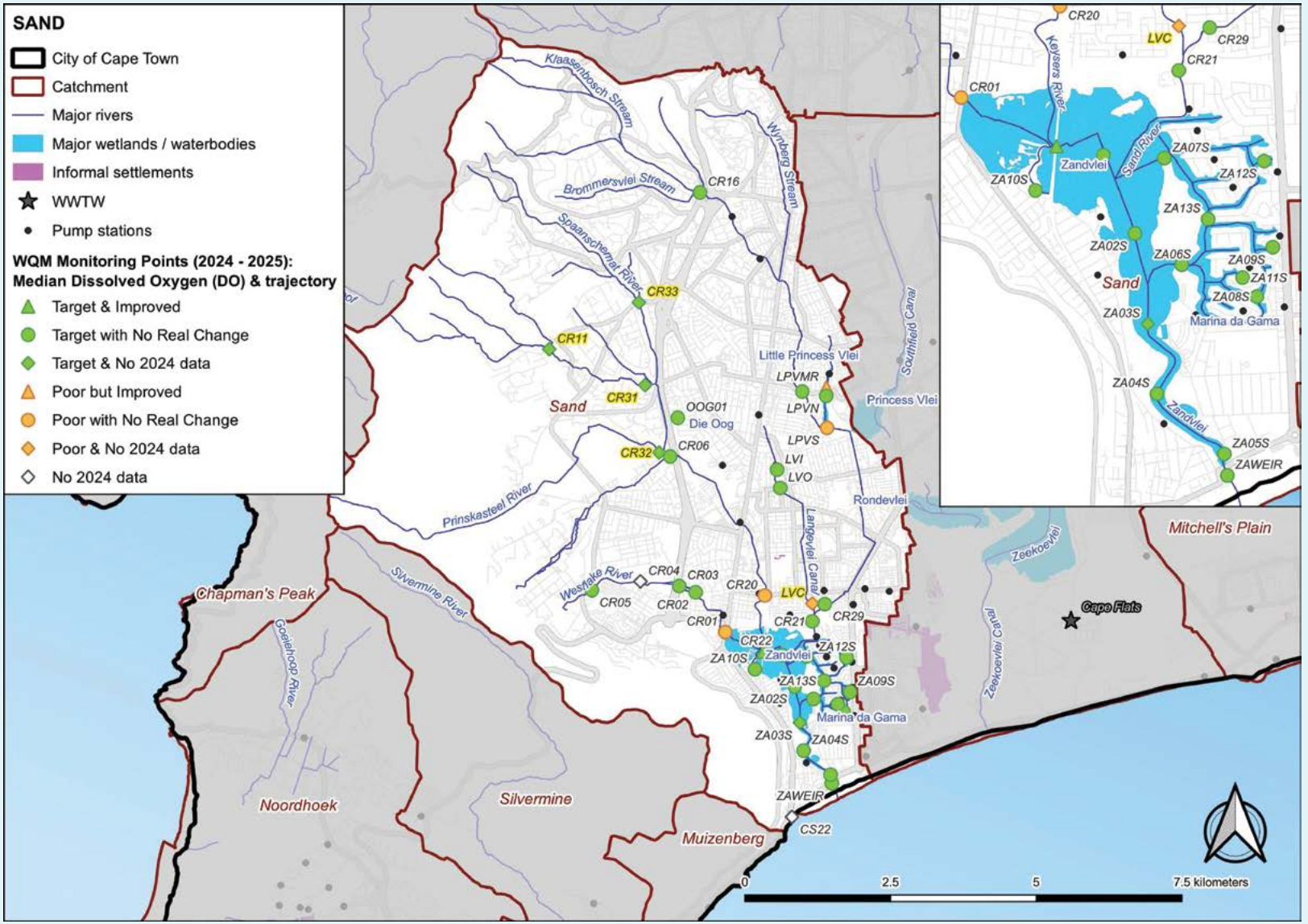


Figure 14.5

Median annual dissolved oxygen (DO) data, focusing on the Sand River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

15. WATER QUALITY IN THE SILVERMINE RIVER CATCHMENT

15.1 CATCHMENT OVERVIEW[8]

The Silvermine River is a short, naturally perennial river of about 12 km in length with a catchment area of approximately 21 km². The river rises in the Table Mountain National Park as a series of broad seeps on the upper slopes of the Constantiaberg. From here, it flows down the south eastern slopes of the mountain and through the Fish Hoek Valley as a relatively small perennial stream. Grenfell (2026) confirms that the upper catchment is the main runoff generating area for the Silvermine River. This area is relatively undeveloped, which means that the catchment offers opportunities for flushing of downstream water quality pollutants with cleaner inflows from upstream.

In the middle valley, the lower mountain slopes consist of wind-blown sands and shelly material, which overlay weathered Cape Granite (Heinecken, 1982). These were originally blown up the valley from the lower-lying sand dunes, forming a deeper mixed soil (Reinecke, 2008). The river in these reaches is disturbed, flowing within an incised sandy channel vulnerable to further erosion. From here, it flows along the southern boundary of the Clovelly Country Club (CCC) towards its outlet into False Bay at the northern end of Fish Hoek beach at Clovelly.

The lower reaches of the Silvermine River were naturally unconfined, with the channel migrating over a wide coastal plain that is assumed to have been characterised by seasonal pans and vleis (Heinecken, 1982). Between ca 1890 and 2000, however (see Grenfell, 2026), the construction of the railway line across the river just upstream of its beach outlet; dune stabilisation; the construction of flood protection berms between the river and the expanding urban areas of Fish Hoek to the south; and the general construction of roads and bridges confined the river to a narrow channel, allowing expansion of the town of Fish Hoek and the residential areas of Clovelly into the floodplain (Southern Waters, 2001). Periodic flooding of parts of Fish Hoek, effectively lower lying than the managed course of the river, was, however, an occurrence of increasing concern. In 1999, a flood alleviation strategy was introduced in the lower river (Day and Ractliffe, 2002). This entailed the creation of a broad wetland/flood detention area (the Silvermine River wetland), designed as multi-stage terraces, separated by two gabion weirs. Extensive landscaping and rehabilitation in and adjacent to the river formed part of the project, which resulted in the creation of broad areas of seasonally inundated wetlands, giving way to a wide pooled area in the lower reaches, just above the estuary, where the water table was intercepted by the works. Over the last ± 25 years, sedimentation of the lower detention areas has, however, occurred, along with extensive invasion of open water areas by reeds (*Typha capensis, Phragmites australis* and *Scirpoides littoralis*). Maintenance activities are undertaken periodically by the City, comprising excavation of sediment and vegetation, mainly from areas

[8] This section was adapted from Day (2026)

immediately downstream of the weir spillways (see Grenfell, 2016). The river opens onto the beach via a relatively narrow culvert under Main Road, and forms a shallow, seasonal lagoon behind a sand bar on the beach. The dune sands in this area are currently undergoing stabilisation through a programme of indigenous planting.

Natural water quality in the Silvermine River throughout its reaches upstream of the estuary would have been acid, low-nutrient waters with low EC. The catchment as a whole has been noted as one of Cape Town's least-polluted catchments in best condition, since the City's 2019 Inland Water Quality Report (Day et al., 2020, 2023, 2024, 2025).

15.2 THREATS TO WATER QUALITY

The main threats to water quality in the Silvermine River in this catchment comprise:

- Periodic overflows of raw sewage from manholes in the lower catchment, and its passage into the lower Silvermine River wetland via stormwater outlets into the wetland;
- Similar routings of overflows from occasionally blocked or otherwise failed pump stations into the wetland;
- Seepage of nutrient-enriched water from adjacent gardens and the irrigated CCC golf course, which closely abuts the river;
- Elevated TSS during rainfall events as a result of sediment transport from eroding areas upstream – these processes (and the downstream sedimentation) are exacerbated by fires in the catchment; and
- Reduced low flows (and thus reduced dilution opportunities for inflows of contaminated water during summer) as a result of invasion by woody alien plants, particularly along the riparian zone.

Threats to stormwater quality passing out of the catchment and into the sea off Fish Hoek beach via stormwater outlets comprised:

- Runoff from roads and parking areas, particularly along Fish Hoek Main Road and the area between Main Road and the railway line – this water is likely to contain heavy metals and hydrocarbons from vehicles and fuelling stations;
- Raw sewage and other material from periodically overflowing sewers or pump stations; and
- Solid waste, washed or blown off streets or parking areas and entering the stormwater system.



Photo 15.1 *Sedimentation of the lower Silvermine wetland following severe erosion in 2024*



Photo 15.2 *Extensive reedbeds have established in the lower Silvermine wetland in response to nutrients and permanent saturation.*

15.3 WATER QUALITY THROUGH THE CATCHMENTS – CONDITION AND TRAJECTORY

15.3.1 MONITORING POINTS AND WATER QUALITY MAPPING

The City undertakes routine water quality monitoring at five sites in the Silvermine catchment as part of its Inland Water Quality Monitoring Programme. Three routine monitoring points are located along the Silvermine River/Silvermine River wetland and estuary, namely SIL02, SIL04 and SIL06 (see **figures 15.2 to 15.5**), while an additional two points monitor stormwater outflows into the estuary downstream of Main Road (SRE and SRW).

Two stormwater outlets onto Fish Hoek beach (FHC and FHLH) are monitored for *E. coli* only, and reflect raw sewage pollution in their immediate catchments. They are not included in summary catchment data (e.g. **figure 15.1**), because they do not impact on water quality in the Silvermine River, but they do indicate pollution sources that might impact on beach users.

Figure 15.1 (A to D) presents summary water quality data for *E. coli*, orthophosphate (as PO_4-P), dissolved oxygen and free ammonia (NH_3) for the 2024 and 2025 reporting periods. The data are shown as percentages of all of the samples collected in the 2025 reporting period that fell into different water quality categories (as per **tables 2.1 and 2.3**). Figures 15.2 to 15.5 present the same data on a site-by-site basis, showing spatial changes through the catchment and including trajectory analyses, comparing data from the 2025 reporting period with those of the previous year.

The following sections provide brief commentary on these findings.

15.3.2 RAW SEWAGE POLLUTION INDICATORS (*ESCHERICHIA COLI*)

The Silvermine catchment is one of a few of Cape Town's catchments that is affected neither by WWTW effluent nor by informal settlements of any significant extent, although there are small enclaves of homeless people within the catchment. Sources of sewage (treated or otherwise) are thus largely limited to localised street wash-off of faucal material from localised homeless residents, domestic animals and birds.

With regard to sewage overflows from the sewerage reticulation network, including pump stations, C3 data shown in **figure D5** (**appendix D**) indicate low to medium levels of reporting of sewage spills in the lower Silvermine catchment (downstream of the CCC and within the Fish Hoek and Clovelly urban areas). Figure D5 by contrast shows the relative number of reported pump station overflows at a city level, showing that the lower catchment was subject to periodic overflows, but was not one of the City's hotspots for such breakdowns. In fact, none of the 11 pump stations in the catchment (locations shown in **figures 15.2 to 15.5**) were recorded as overflowing at all during the 2025 reporting period. The fact that they do overflow at times is, however, attested to by the past perceived need to construct a temporary holding area for contaminated flows from stormwater outlets into the Silvermine River wetland from the southern (Fish Hoek) side.

These data (or lack of overflow data) are reflected in *E. coli* data from routine monitoring sites in the Silvermine River as well, with (geometric) mean annual concentrations in river samples all lying within the acceptable range, and all showing improvement since the previous year. Summary data for all three river sites shown in **figure 15.1** show that 95% of samples from the three river water quality monitoring sites fell within the acceptable range for this variable, indicating generally safe conditions, suitable for paddling, fishing and other intermediate recreational activities.

By contrast, and highlighting how disparate different parts of catchments can be, data for the two stormwater outlets that enter the channel on the beach (SRE and SRW) both showed increased mean *E. coli* concentrations since the previous year, both at unacceptable levels (unacceptable level 1 and unacceptable level 2) for inflows from the Fish Hoek and Clovelly sides of the river respectively.

The two seawater outfalls onto Fish Hoek beach (FHC and FHLH) showed variable annual patterns, with the former being on an improving trajectory, but within the unacceptable level 1 range, while the latter was deteriorating compared with the previous year but within the acceptable range.

15.3.3 PHOSPHORUS NUTRIENTS

Orthophosphate data (reflecting biologically available phosphorus in its dissolved form) were also generally low, with 95% of samples from the three river sites being within the poor (but lowest

measurable) range for this nutrient (**figure 15.1**). The data moreover showed an improvement over 2024 reporting period data, where 90% of data were in the poor range. This improvement probably reflects the reduction in frequency of sewage overflows into the wetland via the stormwater system (see section 5.3.2).

While the 2025 data did not indicate phosphate nutrient enrichment as a major issue in the catchment, it is noted that even at the limits of detection of current analyses (< 0,1 mg P/ℓ), an aquatic ecosystem could in fact lie in the hypertrophic range for this nutrient (i.e. be severely enriched for an aquatic ecosystem and thus prone to rapid plant productivity). Assumed nutrient sources in the catchment include runoff from the CCC golf course and periodic inflows from overflowing sewage via the stormwater system. It is also important to note that, for catchments in which orthophosphate phosphorus is relatively low, even minor additional inflows could tip these fragile systems into eutrophic or hypertrophic states.

15.3.4 UN-IONISED (OR FREE) AMMONIA AND DISSOLVED OXYGEN

Summary data in figure 15.1 suggest that un-ionised ammonia (NH_3) was unlikely to have been at concentrations of concern from an acute or even chronic toxicity perspective during the 2025 reporting period, with 100% of samples falling within the acceptable range, although deterioration was noted at SIL04 in the upper reaches of the Silvermine River wetland (see figure 15.4). These data were despite the fact that the lower two sample points were both positioned in a wetland, usually associated with slow shallow flows of water through areas of high vegetation. During 2023/24, however, management interventions in the wetland by the City resulted in the unintended consequence of diversion of riverine low flows through the wetland, resulting in a defined channel through former wetland areas, along with extensive upstream erosion (upstream of SIL04) and sedimentation downstream (see Day, 2026, for further descriptions of these interventions).

The low NH_3 concentrations in part reflect naturally low pH in these waters, with mean pH ranging between 5,3 and 6,0 at SIL02, reflecting acid waters from a mountain-fynbos dominated catchment with high levels of humic acids and geology dominated by Table Mountain sandstone. pH levels increase with distance through the wetland, with mean pH at SIL04 lying between 6,6 and 7,5 and increasing at SIL06 (estuarine zone) to between 7,0 and 7,5. At pH < 8,0, only a very small proportion of total ammoniacal nitrogen is likely to be in its NH_3 form (DWAF, 1996 notes that, at a temperature of 20°C, the proportion of total ammonia comprising NH_3 increases from 1,2%, to 3,8% to 11%, for changes in pH from 7,5 to 8,0 to 8,5).

Dissolved oxygen (DO) data suggest, however, that low DO concentrations occurred at least at times in the system over the 2025 reporting period, particularly in the Silvermine River wetland, as represented by SIL04 and SIL06, with 10% of river samples lying in the unacceptable range for this variable (figure 15.1), reflecting a slight deterioration over data for the 2024 reporting period. Such low DO concentrations are most likely to have occurred in summer, when water levels are low, the water is stagnant, and temperatures are elevated. Figure 15.5 suggests that they were confined to the lower river reaches (SIL06).

15.4 CONCLUSIONS AND RECOMMENDATIONS

The water quality data summarised and presented in this section highlights the Silvermine River catchment as one of Cape Town's least-impacted river systems with regard to water quality, an accolade due primarily to its relatively large areas of natural open space in its upper catchment; urban development mainly in the downstream part of the catchment; absence of WWTW discharges in the catchment; no expansive informal settlements; and large (artificial) wetlands in the lower catchment, believed to play a role in polishing the slightly to moderately impacted water quality passing into the system, at loadings that the wetland can probably comfortably ameliorate.

That said, the catchment must also be regarded as one of Cape Town's most sensitive catchments, since even small changes (increases) in nutrient availability could tip the system into a eutrophic or hypertrophic state. Thus:

- Pump stations and sewers must be stringently monitored, and urgent actions taken to address poor performance as it becomes apparent, with measures to include being telemetry (if not available already) and bunding;
- Wetland ecosystem services in the form of water quality amelioration should be optimised in considering maintenance measures for the Silvermine River wetland; and
- Catchment-wide best practice measures such as low-fertiliser gardening; establishment of filter strips between the river and the golf course; and the retrospective introduction of sustainable urban drainage systems (SUDS) in the Fish Hoek and Clovelly urban areas to improve the quality of stormwater runoff should all be flagged as positive interventions to consider.



Figure 15.1

Summary water quality data for the Silvermine River catchment, presented as compliance-type data, showing percentage of all samples that fall into preallocated categories, as per **tables 2.1 and 2.3**. Data include (A) (geometric) mean annual *Escherichia coli* data; (B) median annual orthophosphate phosphorus (PO_4-P) data; (C) annual ammonia (NH_3) data; (D) median annual dissolved oxygen (DO) data. Data exclude stormwater outlets.

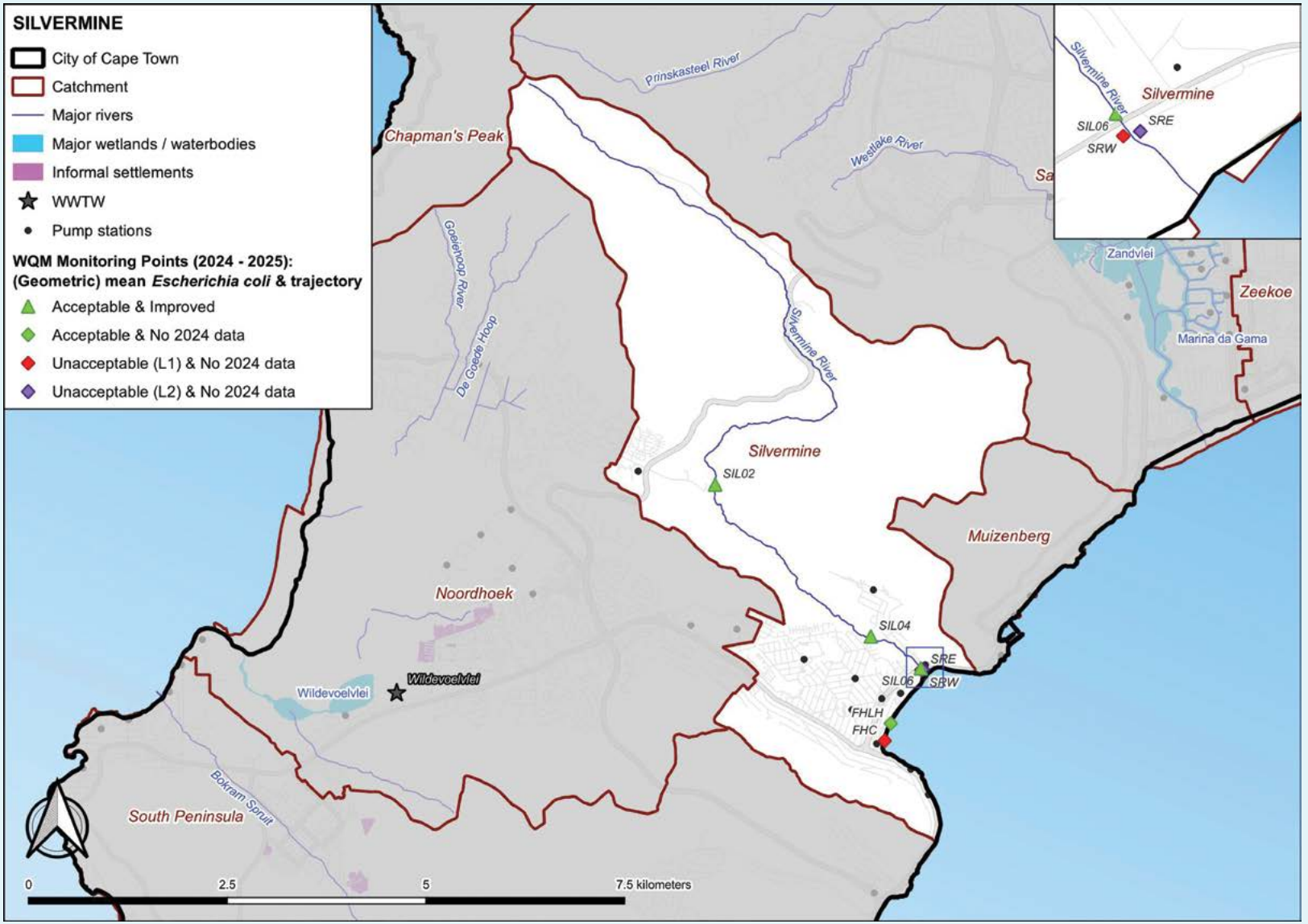


Figure 15.2

Escherichia coli data, focusing on the Silvermine River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory and condition calculations explained in appendix E.

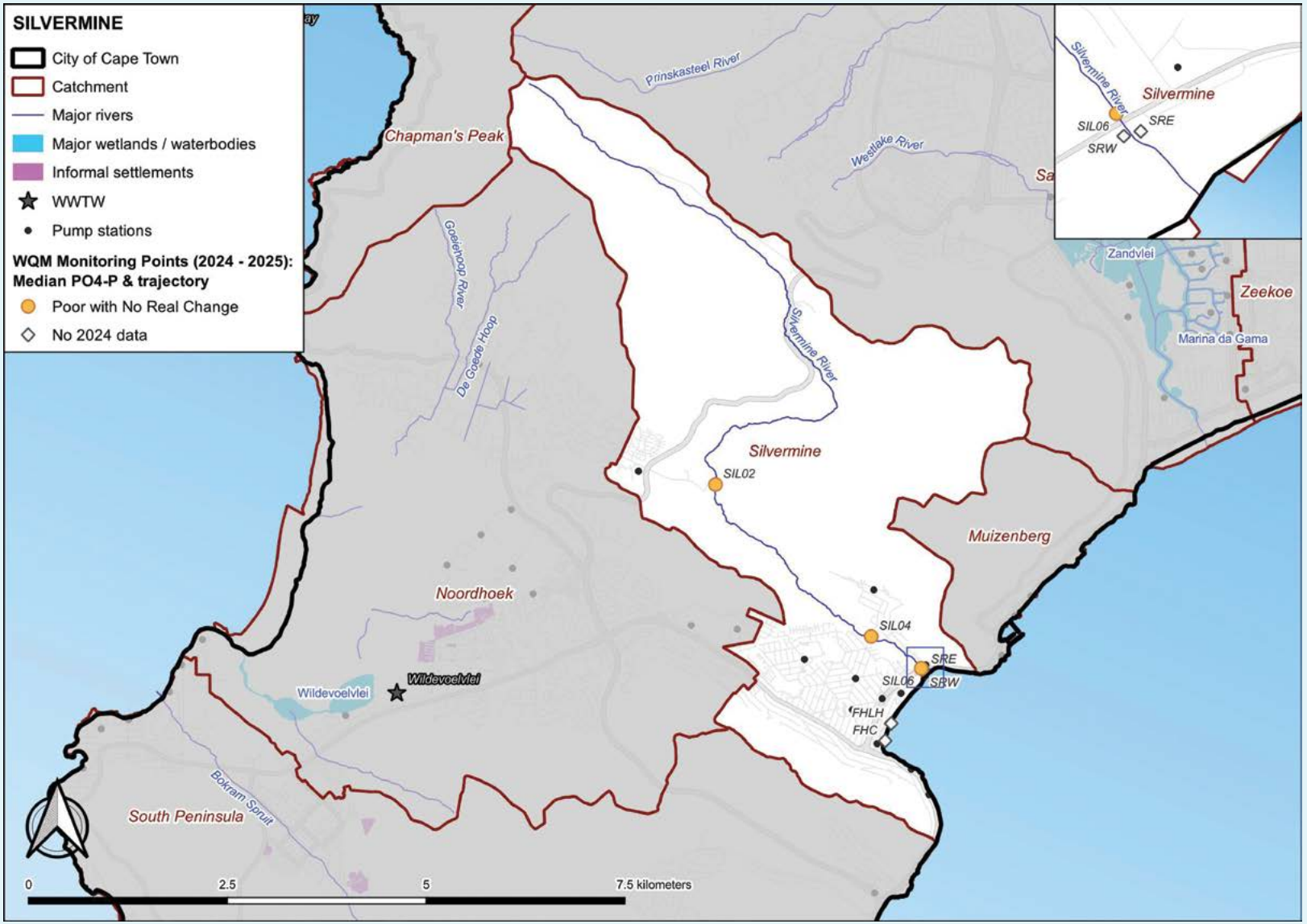


Figure 15.3

Median annual orthophosphate (PO_4-P) data, focusing on the Silvermine River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

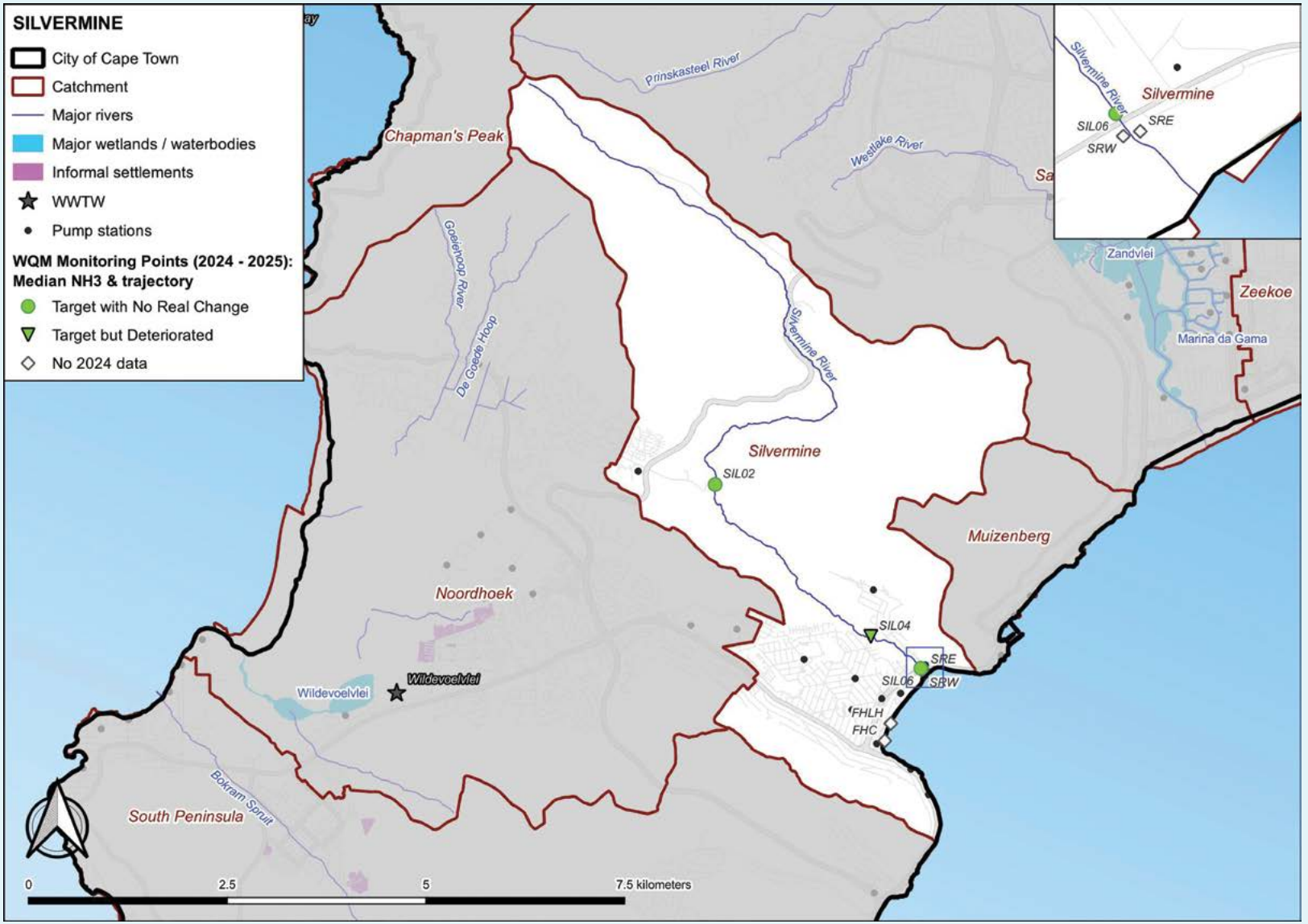


Figure 15.4

Median annual un-ionised (or free) ammonia (NH_3) data, focusing on the Silvermine River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

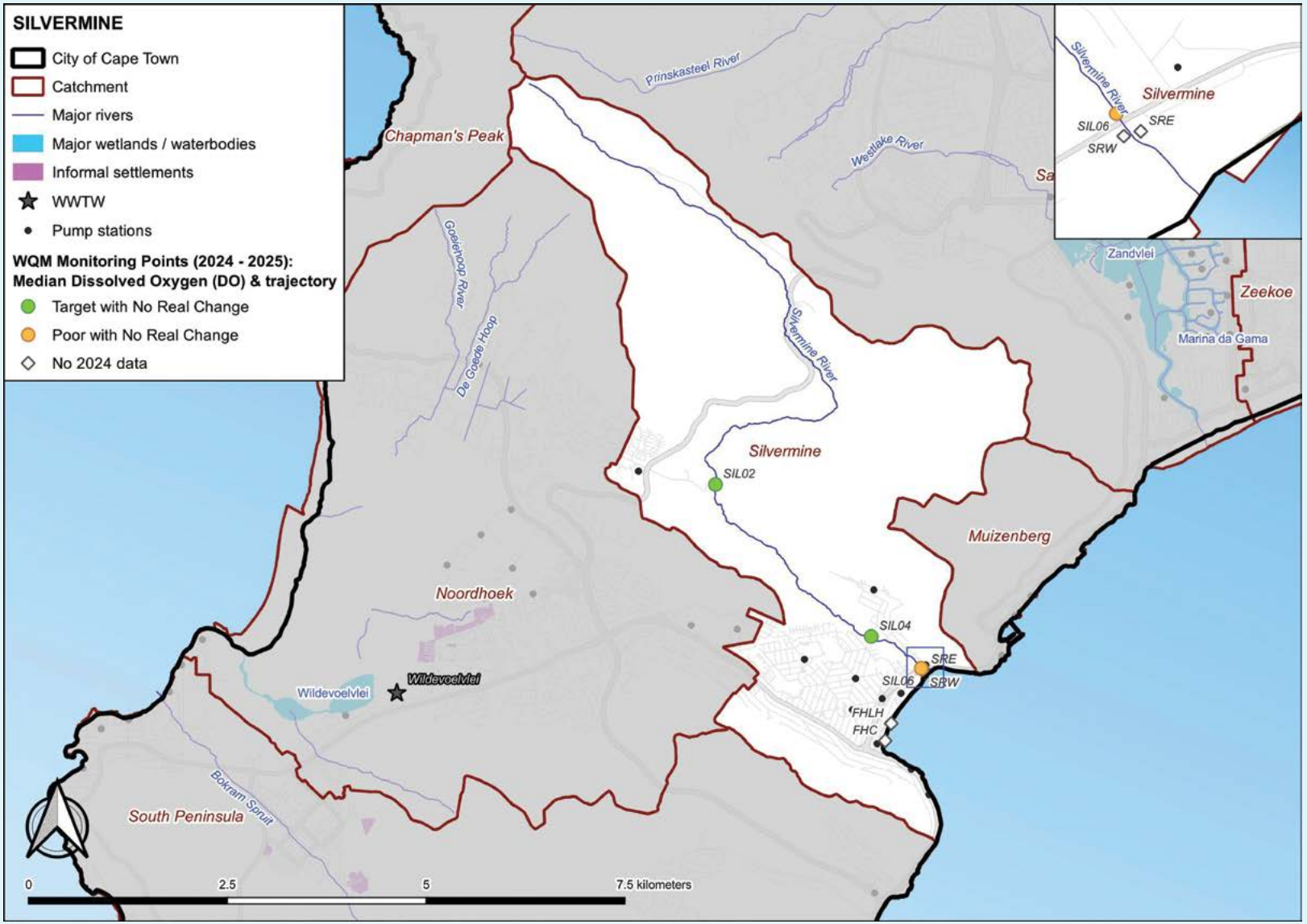


Figure 15.5

Median annual dissolved oxygen (DO) data, focusing on the Silvermine River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

16. WATER QUALITY IN THE SIR LOWRY'S PASS RIVER CATCHMENT

16.1 CATCHMENT OVERVIEW

The Sir Lowry's Pass River rises in the Hottentots Holland Mountains, and flows as a mountain stream through undeveloped areas in the Hottentots Holland Nature Reserve, then passes through extensive farmland in the mountains above Sir Lowry's Pass Village. In these reaches it is joined by several tributaries, the largest of which is Cottage Stream.

Further downstream, the river passes into the Sir Lowry's Pass Village as a steeply graded cobble foothill stream. Within the urban area, the river is highly channelised, and in places canalised. It receives runoff from this hardened urban area via a number of stormwater outlets, as well as inflows from a number of smaller, also channelised tributaries, passing through both formal and informal housing settlements, with the latter in particular being associated with water of a visibly poor quality, high levels of accumulation of litter and sediment in the channels, and bank and bed erosion. Encroachment by settlements and infrastructure right to the top of the channelised stream banks has occurred throughout the river in these reaches, and flooding of several areas is reportedly a common occurrence.

Downstream of Sir Lowry's Pass Village, the river flows as an unlined foothill stream through a number of farms, before crossing beneath the N2 (more accurately referred to as the T2 in this section). Until recently, the river flowed downstream of the T2 in a shallow channel that overflowed in flood conditions onto the broad alluvial plain that extended across large areas of Broadlands and Admirals Park, between the T2 and a berm constructed roughly parallel with the T2, and immediately upstream of the Gordon's Bay WWTW. This extensive area lies within the 1:100-year floodplain of the Sir Lowry's Pass River. The berm, however, was constructed to protect the downstream settlements of Gordon's Bay and associated suburban areas from flooding, by concentrating flows into a concrete diversion canal that discharges flood flows into False Bay, west of the natural channel entrance into the sea, further to the west. These interventions are fully outlined in Day, 2015a and 2015b. Following an extensive design, water use licence application (WULA) and environmental impact assessment (EIA) process, authorisation was, however, given for the consolidation of the Sir Lowry's Pass channel and its flood flows up to the 1:100-year return interval, into a wide (105 m-wide) constructed channel, designed so as to include a low flow channel, with lower and upper floodplain wetlands. Gradient will be controlled by four ogee weirs, designed to flatten the channel gradient end prevent incision. Construction commenced in 2023 and was ongoing at the time of this report.

The 'new' channel will discharge flows up to a predetermined maximum into the natural river channel to the east, while flood flows will discharge mainly into the diversion channel to the west. The

Gordon's Bay WWTW discharges into the western canal.

16.2 THREATS TO WATER QUALITY

The main threats to water quality in this catchment stem from untreated raw sewage and greywater from informal settlements in the Sir Lowry's Pass Village area, which pass directly into the river channels/canals, as well as from ongoing and/or frequently repeated overflows from sewer manholes in the catchment just upstream of the T2. These pollution sources have all been flagged as issues of concern in the ongoing construction programme (e.g. minutes of the November 2025 Environmental Management Committee for the Sir Lowry's Pass River upgrade project). Sewer overflows often stem from blockages of rags and solid waste in the sewer system.

Other threats to water quality include low-level seepage of nutrients and other contaminants from suburban gardens (mainly downstream of the diversion berm) and construction-related impacts,



Photo 16.1 *Low-flow channel through the construction works downstream of the T2 – ultimately, this channel must be landscaped and planted as a natural-appearing channel through a similarly landscaped and planted lower and upper floodplain to allow flood conveyance through the area without losing ecosystem function and connectivity. Frequent sewage overflows into the channel jeopardise its condition and rehabilitation potential.*



Photo 16.2 *Lower reaches of the Sir Lowry's Pass River channel, downstream of all of the current flood alleviation construction works.*

16.3 WATER QUALITY THROUGH THE CATCHMENT – CONDITION AND TRAJECTORY

16.3.1 MONITORING POINTS AND WATER QUALITY MAPPING

The City currently collects routine water quality samples from seven sites in the Sir Lowry's Pass River catchment (SIR01–SIR07) as part of its Inland Water Quality Monitoring Programme. The most upstream of these sites (SIR01) lies on the Sir Lowry's Pass River immediately downstream of Wedderwill Estate, upstream of Sir Lowry's Pass Village. SIR02 lies downstream of the Sir Lowry's Pass Village and its extensive informal settlements, immediately upstream of the T2. SIR03 lies within the current construction area for consolidation/upgrading of the Sir Lowry's Pass River channel downstream of the T2, while sites SIR04 and SIR05, and SIR06 and SIR07 are located, respectively, in the natural channel to the east and the diversion canal to the west. Additional water quality sampling points are monitored as part of the construction phase monitoring programme – these are not reported on here.

Figure 16.1 presents summary water quality data for *E. coli*, orthophosphate (as PO_4-P), dissolved oxygen and free ammonia (NH_3) for the 2024 and 2025 reporting periods. The data are shown as percentages of all of the samples collected in the 2025 reporting period that fell into different water quality categories (as per **tables 2.1 and 2.3**). **Figures 16.2 to 16.5** present the same data on a site-by-site basis, showing spatial changes through the catchment and including trajectory analyses, comparing data from the 2025 reporting period with those of the previous year.

The following sections provide brief commentary on these findings.

16.3.2 RAW SEWAGE POLLUTION INDICATORS (*ESCHERICHIA COLI*)

The Gordon's Bay WWTW discharges treated effluent into the diversion canal. Final effluent data presented in appendix C suggest that this WWTW generally performed well during the 2025 reporting period with regard to most variables, when assessed against general effluent limits.

With regard to inflows of untreated sewage and greywater, **figure D5** (**appendix D**) shows that C3 reporting of sewage spills occurred at a relatively low intensity in the lower catchment. These data are surprisingly low, given the known (and observed by the present authors) frequent overflows and spillages of raw sewage in the Sir Lowry's Pass Village area, possibly pointing to reporting fatigue among local communities or increasing acceptance of unacceptable water quality conditions.

Sewer pump station overflow data (**figure D4 in appendix D**) show low to medium levels of pump station overflow in the lower catchment over the 2025 reporting period, with the Cayman Beach pump station associated with the highest frequency of overflows (five in the 2025 reporting period), albeit all overflows being rated by the City as insignificant or minor (**figure D3**).

With regard to actual indicators of raw sewage in the catchment, figure 16.1 highlights the fact that overall, on a catchment basis, > 68% of samples taken in the 2025 reporting period were rated as unacceptable with regard to *E. coli* concentrations, with 60% rated as unacceptable level 1 or level 2 for this variable, and only 32% of samples rated as acceptable. These data suggest that pump station overflows were probably not the main sources of raw sewage overflows, and the low levels of C3 reporting suggest that overflows at sewer manholes were possibly not readily visible, but that (as suggested above) reporting fatigue and increasing acceptance of polluted conditions may also have played a role in the generation of reporting on conditions on the ground, versus actual data.

The data shown on the map in figure 16.2 show that:

- Mean annual *Escherichia coli* levels were in the acceptable range in the river reaches upstream of the Sir Lowry's Pass Village (SIR01);
- Downstream of Sir Lowry's Pass Village (SIR02 onwards), mean annual *E. coli* concentrations were always in the unacceptable range in the river and diversion canal, ranging between unacceptable level 2 and level 3, but were however in the range for poor and acceptable in the reaches of the natural channel (SIR04 and SIR05). This reflects the fact that most raw sewage appears to have entered the system immediately upstream of the T2 via overflowing manholes, and resulting in high *E. coli* counts in downstream reaches, which largely connected to the diversion canal. However, during summer low-flow periods, water was diverted through the natural channel, allowing construction works to proceed in the diversion canal; and
- These data suggest systemic problems in the sewer reticulation system in the lower catchment, with sewer overflows routinely reported by contractors engaged in the river upgrade/ reconfiguration project downstream of the T2.

16.3.3 PHOSPHORUS NUTRIENTS

Orthophosphate phosphorus concentrations in this catchment, summarised in **figure 16.1**, suggest an increase in the proportion of samples falling within unacceptable (levels 1 and 2) of this biologically available nutrient, compared with the 2024 reporting period. It is assumed that this links to the apparent increase in sewer manhole overflows noted in the catchment between the T2 and Sir Lowry's Pass Village. Only 45% of samples from this catchment fell within the acceptable range for orthophosphate phosphorus,

Median annual data for this variable, shown in **figure 16.3**, showed, however, that the sites where concentrations exceeded the lowest attainable ratings of poor for this variable, driven by high laboratory limits of detection, were SIR02 (at the T2 culvert); SIR04 and SIR06, with the data showing lower median annual concentrations at the downstream sites (SIR07 and SIR05), presumably driven by plant nutrient uptake, sedimentation and extended detention time. SIR06 lies downstream of the inflows from the Gordon's Bay WWTW, and elevated orthophosphate concentrations would be expected there. SIR04 lies in the natural channel, and experiences low flows of nutrient-enriched water from upstream areas.

16.3.4 UN-IONISED (OR FREE) AMMONIA AND DISSOLVED OXYGEN

Summary data for un-ionised ammonia, shown in **figure 16.1**, showed that only 36% of samples from this catchment lay within the acceptable range for this variable, with an 18% increase in the number of samples falling into the unacceptable range for this variable, associated with acute aquatic ecosystem toxicity. The spatial data shown in **figure 16.4** suggest, however, that concerns around ammonia toxicity effects applied primarily to the river channel downstream of the T2, within the construction works, and in the diversion canal downstream of inflows from the WWTW. Although WWTW effluent was generally compliant with general limits, effluent concentrations were at concentrations generally well above chronic toxicity concentrations for aquatic ecosystems. Flows in the natural channel were, by contrast, within the acceptable range for this variable, suggesting that ammonia toxicity in the natural channel is unlikely to pose a threat to the planned rehabilitation of this part of the river system.

Summary DO concentrations (shown in **figure 16.1**) suggest that DO was at unacceptable (low) levels in 40% of samples from this catchment in the 2025 reporting period, with a deterioration since the previous year's data where only 8% of samples were in the unacceptable range. Periods of low DO concentration were likely to coincide with warm, slow flow conditions and would have been exacerbated by an increased frequency of exposure to raw sewage with an assumed high (but unmeasured) biological oxygen demand, as shown in **figure 16.1**. Summary median annual data in **figure 16.5** suggest that periods of low DO were not confined to a few problematic sites only, but occurred at times at all monitored sites in the catchment, with sites in the natural river channel showing some improvement over data for the previous reporting period.

16.4 CONCLUSIONS AND RECOMMENDATIONS

The lower reaches of the Sir Lowry's Pass River catchment are currently undergoing major upgrades/realignment in order to secure developable land in what was the natural, wide alluvial fan floodplain of the river system. The scheme currently being implemented by the City aims to confine the 1:100-year floodline within a 105 m-wide corridor. Integral to both the DEADP environmental authorisation and the water use licence for this project, is the need to establish high-quality seasonal floodplain wetland and low-flow channel habitat in the area thus created, with water quality having been recognised in the project EIA (Day, 2016) as a major threat to achieving the required levels of impact compensation. In particular, inflows of raw sewage and greywater from informal settlements in the Sir Lowry's Pass Village area pose a risk to the establishment of high-quality riverine and floodplain habitats, as do frequent overflows from sewers upstream of the T2. The latter are not readily visible, and thus prolonged overflows are possible.

Given the important development context of this river catchment, it is strongly recommended that additional effort be put into regular inspections of known problem sewer manholes, and consideration of diversions of polluted low-flows to sewer, as close to source as possible.



Figure 16.1

Summary water quality data for the Sir Lowry's Pass River catchment, presented as compliance-type data, showing percentage of all samples that fall into preallocated categories, as per tables 2.1 and 2.3. Data include (A) (geometric) mean annual *Escherichia coli* data; (B) median annual orthophosphate phosphorus (PO_4-P) data; (C) annual ammonia (NH_3) data; (D) median annual dissolved oxygen (DO) data.

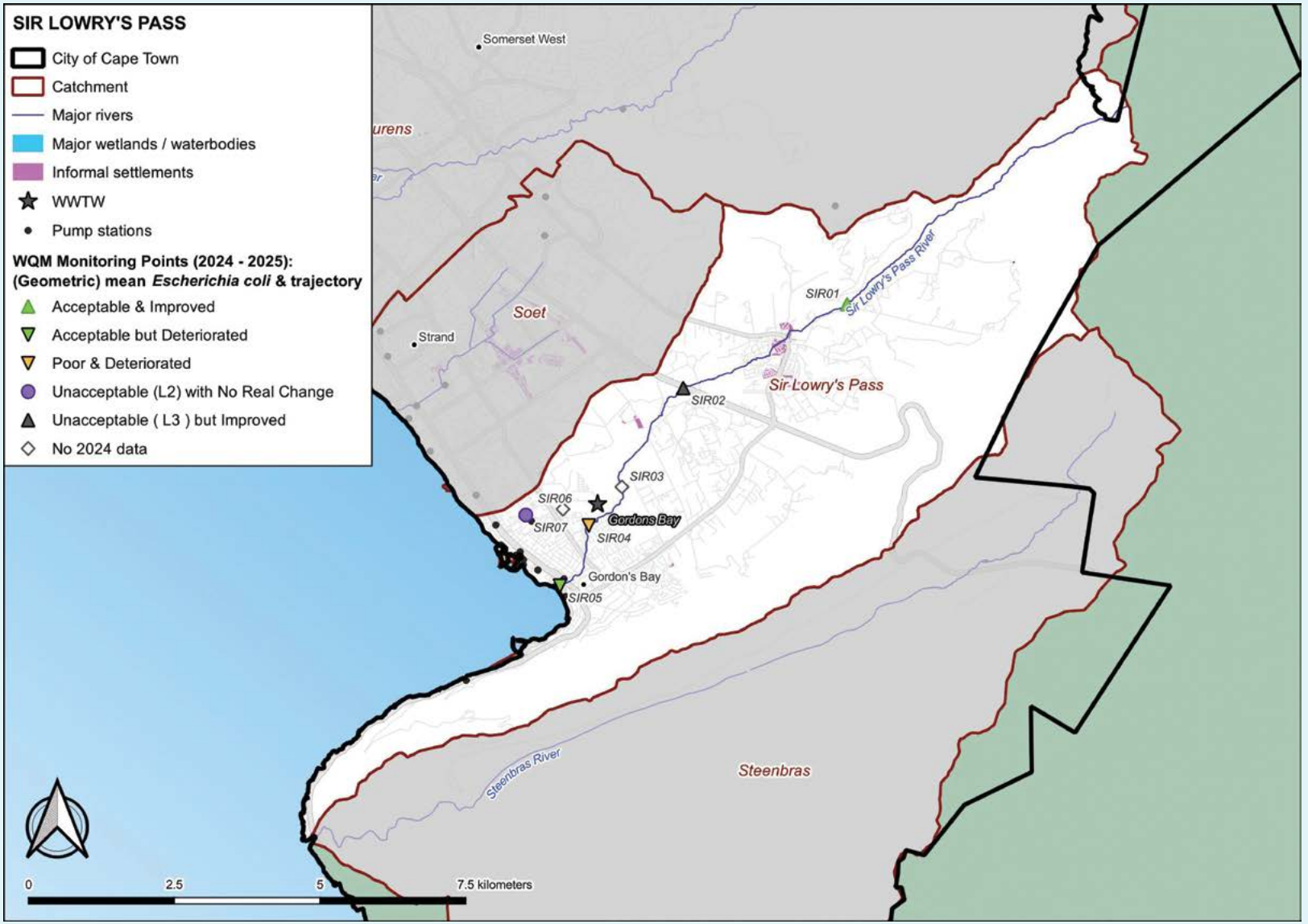


Figure 16.2

Escherichia coli data, focusing on the Sir Lowry's Pass River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory and condition calculations explained in appendix E.

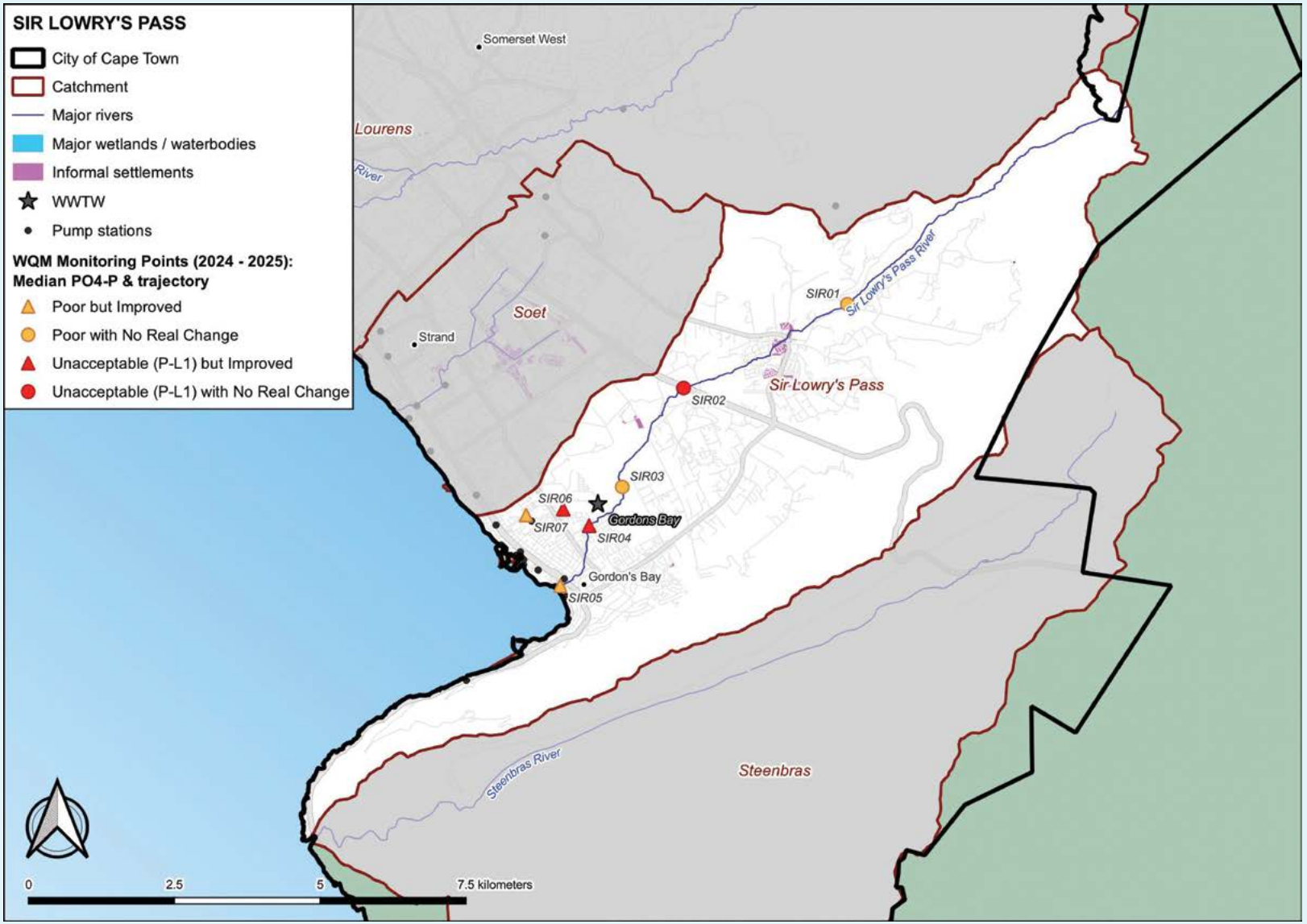


Figure 16.3

Median annual orthophosphate (PO_4-P) data, focusing on the Silvermine River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

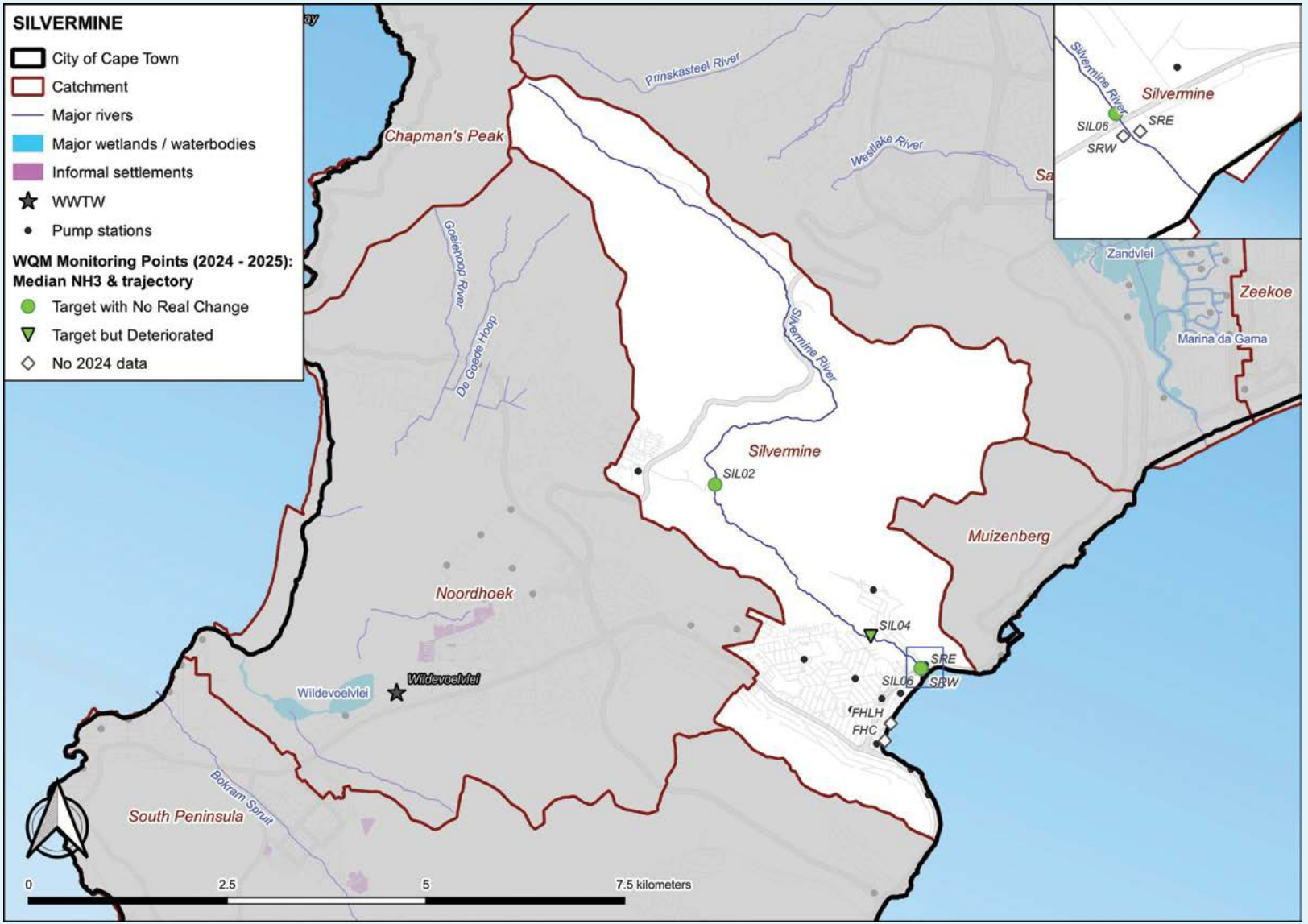


Figure 16.4

Median annual orthophosphate (PO_4-P) data, focusing on the Sir Lowry's Pass River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

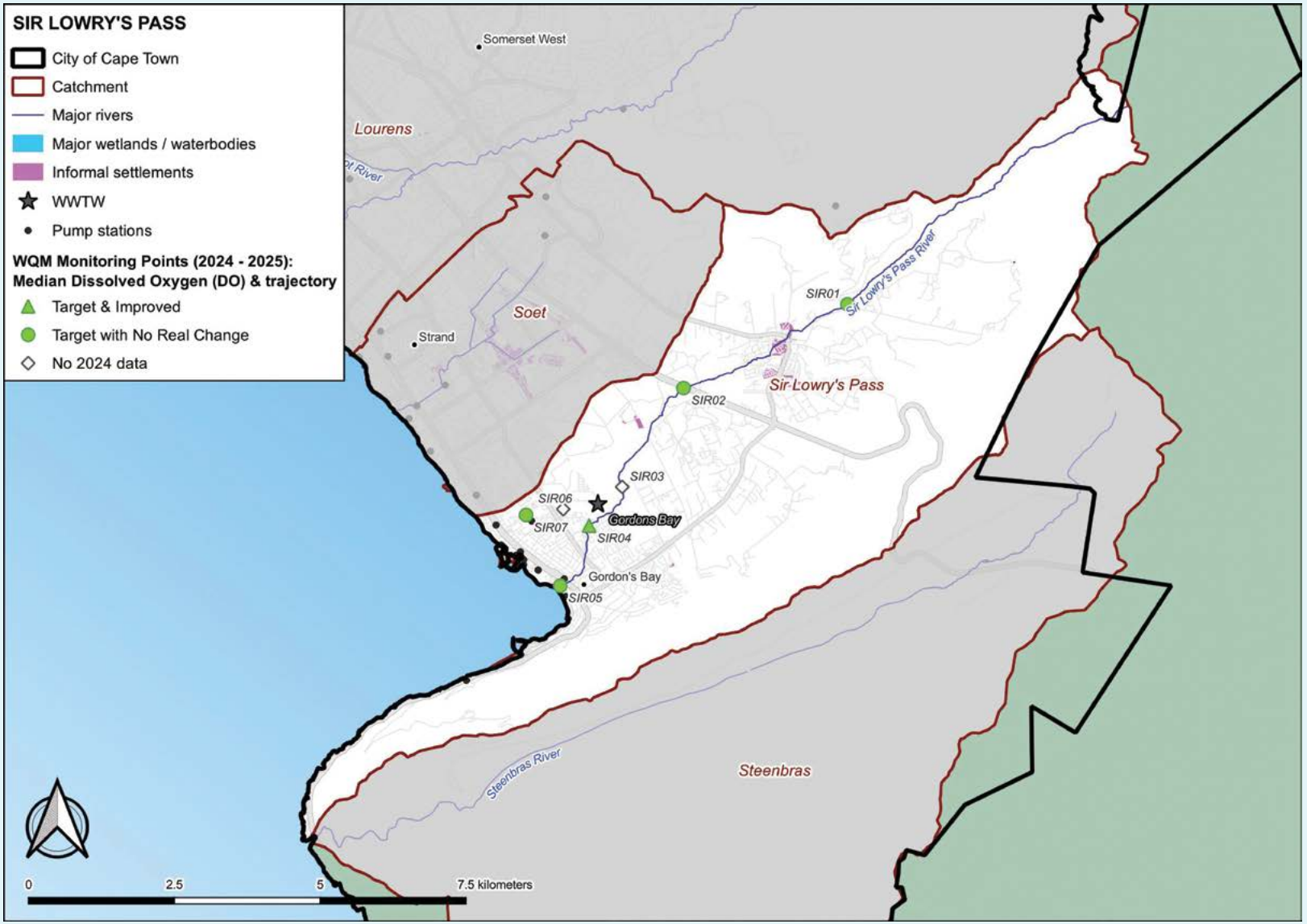


Figure 16.5

Median annual dissolved oxygen (DO) data, focusing on the Sir Lowry's Pass River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

17. WATER QUALITY IN THE SOET RIVER CATCHMENT

17.1 CATCHMENT OVERVIEW[9]

The Soet River is a small stream that rises in the Schapenberg Hills above (and north of) the suburb of Dennegeur in Somerset West, forming a small catchment, wedged between the Lourens and Sir Lowry's Pass River catchments, within the City's Eastern stormwater planning region. Watercourses in the catchment area have been highly altered, from a long history of agriculture, followed by urbanisation (Day, 2004).

Several minor tributaries feed into the main Soet watercourse from the hill slopes to the north, and the river and its remnant associated seeps today pass through a number of large housing developments upstream of the N2, including Heritage Park Estate, where flow from these streams as well as stormwater generated in Heritage Park and other nearby developments are managed in a series of large detention ponds. Upstream erosion results in significant sedimentation at times in catchpits, both upstream of Heritage Park and in the detention ponds immediately upstream of the N2.

The other main tributaries of the Soet River lie some 500 m further southeast, and are conveyed downslope, east of Chris Nissen Village, and under the N2, from where they pass through the Asanda and Nomzamo settlements. These comprise high-density suburbs with large numbers of informal settlements and backyard dwellings. Accumulation of solid waste in open space areas is high.

A small remnant wetland (Asanda wetland) remains between the N2 and Asanda Village. This wetland was previously subject to infilling, dumping of solid waste, including abattoir waste, and encroachment by informal settlement, urban agriculture and livestock. In early 2021, following extensive community engagement, the City initiated a community-driven rehabilitation project in the wetland. The rehabilitation project was completed in 2023 as the first of the City's LUW programme projects (see section 2.1).

The Asanda wetland itself is fed mainly by one of the Soet tributaries, channelled along the edge of Heritage Park. Downstream of the wetland, these flows are piped through the Asanda and Nomzamo settlements, as are the other stream flows. They emerge downstream of these settlements, and converge to flow within a single, wide, mainly earth channel between more formal developments. In these reaches, the open channel is visibly polluted, with high levels of organic waste, raw sewage from the informal settlement upstream, as well as from overflowing manholes, and high levels of solid waste. These polluted flows are piped from Naomi Street, daylighting again as a polluted stream downstream of the R44.

[9] Adapted from Day et al., 2025

From here, the river flows through Greenways Golf Estate – a private golf course and housing development, before it passes into False Bay. Since December 2023, the estate has been applying, through their supplier Blue Planet, a combined bioremediation and nano-bubbler intervention in the channel in its reaches through the estate, with reportedly excellent results (Mr D Walker, Soet River CMF Chair, personal comment to Liz Day).

17.2 THREATS TO WATER QUALITY

Major sources of pollution in this priority sub-catchment comprise the following:

- Overflows from sewage pump stations – in the event of pump station failure, three of the four pump stations located in this catchment discharge directly into the Soet River, while the fourth discharges into the ocean. None of the pump stations have emergency ponds or bund walls (City, 2023b);
- Unmonitored inflows from private sewage package plants located in the catchment;
- Runoff of raw sewage and greywater from informal settlements in the N2 and other road reserves as well as from backyard developments in the Nomzamo/Lwandle and Asanda settlements;
- Runoff from activities such as car washing, open-air cooking, informal butcheries into the adjacent canals;
- Seepage from piled solid waste, including offal, dead dogs and other waste along pavements and in the roads in these areas (personal observation), while the City of Cape Town (2023b) notes that there is no door-to-door solid waste removal;
- Sewer overflows – these are often not reported and may persist for long periods of time;
- Illegal dumping into wetlands and canals, and windblown pollution;
- Pollution from oil and toxic substances, disposed of into grid inlets, catchpits or road surfaces; and
- Inadequate solid waste removal compared with daily loading, particularly in the informal settlements.

At the same time, the Soet Catchment Management Forum, working with the City, has motivated for and overseen the successful installation of one heavy-duty waste interceptor in the Soet River, along with a litter boom, with additional ones planned for repair or new installation (Mr D Walker, Soet River CMF Chair, personal comment to Liz Day).

In addition, upgrading of the problematic Trappies sewer that runs through the area and frequently discharges into the Soet River has commenced, and this should reduce pollution frequency and magnitude when this upgrade comes fully online.



Photo 17.1 *Fast flows from a steep erosion-prone upstream catchment bring sediment via the upper Soet, depositing it in stormwater ponds and channels upstream of the T2 (Heritage Park area)*



Photo 17.2 *The rehabilitated Asanda wetland, showing the spread of stormwater flows through the wetland, using a gabion weir structure*



Photo 17.3 *Polluted water in the Soet River downstream of Asanda and Nomzamo informal settlements*



Photo 17.4 *Off-channel recirculated flows through nano-bubbler and biochar treatment works on the lower Soet River, funded by Greenways Golf Estate. The technology appears to have yielded improved water quality in this highly*

17.3 WATER QUALITY THROUGH THE CATCHMENTS – CONDITION AND TRAJECTORY

17.3.1 MONITORING POINTS AND WATER QUALITY MAPPING

The City currently collects routine water quality samples from five sites in the Soet River catchment – an increase over the single site previously reported on in the 2022, 2023 and 2024 reporting periods. The five sites (shown in maps in figures 17.2 to 17.5) comprise:

- SOEAH06: New site, located upstream of the N2 and upstream of the Asanda Wetland – this is one of the upstream monitoring sites. Note that the actual channel on the ground is not as shown in the City's river dataset, and flows do not pass under the T2 at this site and flow south-west, as suggested in the maps that follow. Rather, flows are routed north-west among the T2 and then pass under the T2 and flow through Asanda Wetland Park, exiting the park in its lower reaches and flowing underground through the extensive, mainly informal settlements of Asanda Village, before being diverted south-east so as to enter the main channel immediately downstream of the informal settlements;
- SOEAH12: New site, downstream of SOEAHO6, and downstream of extensive informal/backyard dwellings;
- SOEAH11: New site, on Broadlands Road – this is one of the upstream monitoring sites, which receives runoff mainly from an industrial site to its north-east, between the T2 and Broadlands Road, as well as from upstream of the T2;
- SOEAH10: New site, downstream of SOEAH11, and downstream of extensive informal/backyard dwellings. It is assumed to lie on the concrete-lined drainage line represented by SOEAH11 upstream; and
- SOE02: Long-term site on the Soet River immediately upstream of Greenways Road – this is the most downstream site on the system and reflects runoff from all of the above drainage lines as well as an additional unmonitored watercourse through the Heritage Park development (upstream of the T2) similarly.

Figure 17.1 (**A to D**) presents summary water quality data for *E. coli*, orthophosphate (as PO_4-P), dissolved oxygen and free ammonia (NH_3) for the 2024 and 2025 reporting periods. The data are shown as percentages of all of the samples collected in the 2025 reporting period that fell into different water quality categories (as per **tables 2.1 and 2.3**). **Figures 17.2 to 17.5** present the same data on a site-by-site basis, showing spatial changes through the catchment and including trajectory analyses, comparing data from the 2025 reporting period with those of the previous year.

The following sections provide brief commentary on these findings.

17.3.2 RAW SEWAGE POLLUTION INDICATORS (*ESCHERICHIA COLI*)

The Soet has a reputation for being one of Cape Town's smallest but most polluted catchments (Day et al., 2025). This is borne out by pump station data, with **figure D5** (**appendix D**) showing that the lower catchment (downstream of the T2) was among the hotspots for sewage overflows in the city during the 2025 reporting period, as indicated by C3 data. It is in fact likely that these data underestimate the frequency of incidences of sewage overflows, as under-reporting is probably more likely in areas with sustained overflows and generally high background pollution levels (e.g. solid waste).

Pump station overflow data (**figure D4**) also show a high frequency of flows among the seven pump stations located in the catchment downstream of the T2, and it is assumed that the high levels of solid waste visible on streets and open spaces in this part of the catchment contribute towards pump station blockages and breakdowns. The pump station subject to the most frequent overflows/breakdowns in this catchment comprised the Naomi Street pump station, shown in **table D2** to have experienced seven spill episodes over the 2025 reporting period, contributing to the high pollution loads in the lower catchment and coastal area, notwithstanding that **figure D3** suggests that the significance levels of most of these were rated as minor, with the rest being rated insignificant.

Escherichia coli data for the catchment indicate, however, that there are sustained and highly significant inflows into the river/canal systems in this catchment, at least downstream of the T2. These are likely to be supplemented at times by pump station failure but are probably linked to both sewer overflows from at least the non-coastal problematic sewers identified above, as well as ongoing discharges of night-soils and other domestic waste from numerous dwellings in the poorly serviced informal settlement, with limited access to formal sanitation.

Summary data across all samples and sites in the catchment, shown in figure 17.1, suggest some improvement in the catchment between the 2024 and 2025 reporting periods, with the former showing samples only in the unacceptable level 2 and level 3 categories, whereas the 2025 data include some samples rated as acceptable (15%) and unacceptable level 1 (7%). This is, however, an artefact rather of the inclusion of samples from less-impacted sites upstream, as shown in **figure 17.2**, which clearly indicates that the only samples associated with *E. coli* concentrations of acceptable risk were likely to have been those upstream of the dense informal settlements (SOEAH06) and, to some extent, SOEAH11, which, located downstream of the T2, was clearly also exposed to runoff from contaminated streets as well runoff from Chris Nissen Village upstream of the T2.

All the other sites downstream of the T2 showed that mean annual *E. coli* counts were within the unacceptable level 3 range, with no change shown in data from the long-term site SOE02 at the downstream end of the catchment. In fact, the data themselves show that the sites downstream of SOEH06 and SOEAH11 all had maximum annual counts in the 2025 reporting period that were ≥ 14 360 000 MPN/100 mℓ, indicating highly contaminated flows, at least at times.

One of the sources for such flows at times is the problematic Trappies sewer in Strand. This sewer has been prone to collapse over the last few years, and at such times its flows enter the Soet catchment by way of road runoff into the stormwater system. This system is currently being upgraded by the City.

17.3.3 PHOSPHORUS NUTRIENTS

Orthophosphate phosphorus data followed similar patterns to those of *E. coli*, with the key sources of orthophosphate in this catchment assumed to stem from decomposing raw sewage and other domestic waste in greywater, including water from car washes, disposed of into, or otherwise entering, the stormwater system.

Summary data in **figure 17.1** showed that all data were rated unacceptable level 1 or level 2 (85%) in the 2024 dataset but seemingly improved to 28% poor in the 2025 period (noting that poor is the best rating possible with current laboratory detection limits). However, again, as shown in **figure 17.3**, median annual orthophosphate phosphorus data were all in the unacceptable level 2 range for all sites downstream of the T2 at SOEAH06 and SOEAH11, with the latter two sites being the only ones to lie upstream of the main bodies of informal settlements in this catchment. The only sites where median annual data reflected poor conditions for this variable were again the two recently added upstream sites.

The impacts of the Greenways nano-bubbler and enzyme application project on phosphorus availability cannot be gauged by data from the present monitoring programme, with all sites located upstream of the application point.

17.3.4 UN-IONISED (OR FREE) AMMONIA AND DISSOLVED OXYGEN

Given the known high levels of raw sewage in the canals and channels of the lower catchment, downstream of the T2, it is not surprising that data shown in figure 17.4 show elevated un-ionised ammonia at sites exposed to these sewage flows in the lower catchment. The elevated ammonia concentrations (all within the unacceptable range, albeit showing improvement at SOE02 in 2025) are assumed to derive from the partial nitrification of organic nitrogen to ammoniacal nitrogen, a portion of which comprised the potentially toxic un-ionised ammonia. A high chemical oxygen demand (COD) relative to available dissolved oxygen concentrations would have limited further complete nitrification, as shown by the also low (unacceptable (low) DO concentrations at the same lower sites (**figure 17.5**).

The only monitored sites where median annual DO and un-ionised ammonia (NH_3) data reflected acceptable conditions for these variables were in the upper sites SOEAH06 and SOEAH11 for NH_3, while the latter site had median DO concentrations within the unacceptable range, presumably reflecting high organic pollution loads and slow flows in this already-polluted part of the upstream catchment.

17.4 CONCLUSIONS AND RECOMMENDATIONS

The data presented in the figures that follow and described above show that:

- Water quality in the Soet catchment remains highly polluted with no improvement visible in water quality data from the downstream site between the 2024 and 2025 reporting periods.
- The source of water quality pollution, based on the key variables presented here, is likely to derive mainly from raw sewage that enters the channels as deposited night soils or via leaking or overflowing sewers and manholes, both continually and as episodic discharges. Periodic overflows, particularly from the problematic Naomi Street pump station, further contribute to sources of organic pollution in the lower catchment, along with other sources of organic waste such as dumped carcasses, waste vegetables and other material.
- The slow decomposition of the above has a high oxygen demand relative to available DO, contributing to DO and NH_3 at (respectively) such low and high concentrations that they would not support aquatic ecosystems of any quality.
- It is, however, extremely unlikely on the basis of these and previous water quality data in this lower catchment that any aquatic fauna other than the most pollution-tolerant would, however, occur in this system today, highlighting the large-scale elimination of river function in this catchment downstream of the T2 as far at least as the Greenways nano-bubbler interventions.
- The scale of pollution in this small catchment is clearly well beyond the natural capacity of the system to treat and ameliorate pollutants through natural pathways.
- The following recommendations are made:
    - Large-scale high intensity interventions followed by ongoing focused and probably high intensity maintenance measures are needed in the (relatively small) area between the T2 and Boundary Road to address the extensive build-up of solid waste in this part of the catchment, thus making inflows of raw sewage/other pollutants easier to identify and isolate. Such interventions need to be driven at least in part by the City's Urban Waste Department.
    - Inclusion of an additional monitoring point downstream of the Greenways interventions would provide a useful gauge of the efficacy of these measures as a water quality abatement strategy in the City.
    - In the absence of capacity for diversions to sewer and then the relevant WWTW of sewage and greywater entering the Soet channels, consideration must be given to the installation of local sewage treatment installations to address the volumes of sewage flows from established albeit illegal settlements in the catchment. In summer at least, virtually the whole run of river flows in the lower river is assumed to comprise these discharges, spills and leaks.



Figure 17.1

Summary water quality data for the Soet River catchment, presented as compliance-type data, showing percentage of all samples that fall into preallocated categories, as per tables 2.1 and 2.3. Data include (A) (geometric) mean annual *Escherichia coli* data; (B) median annual orthophosphate phosphorus (PO_4-P) data; (C) annual ammonia (NH_3) data; (D) median annual dissolved oxygen (DO) data.

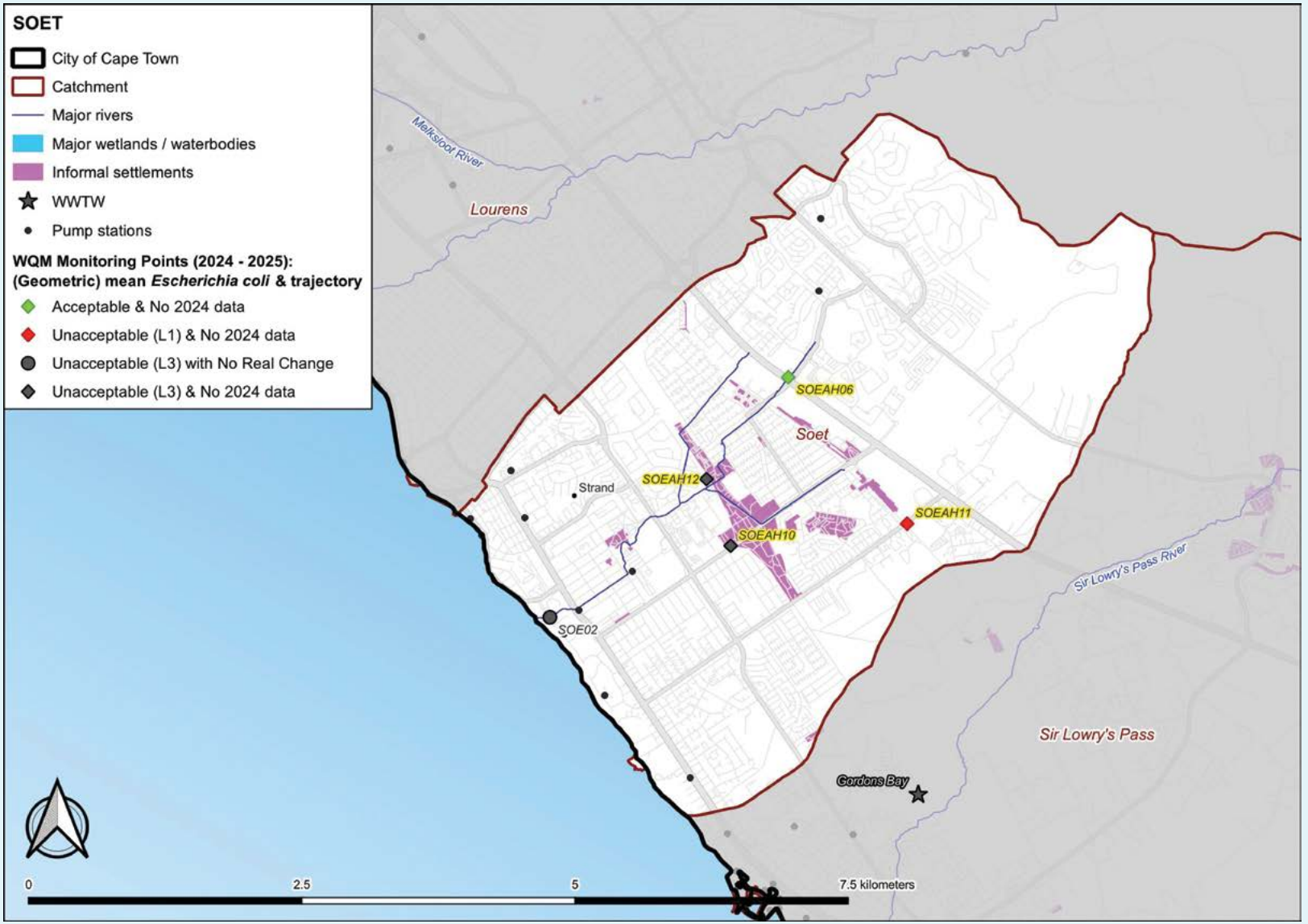


Figure 17.2

Escherichia coli data, focusing on the Soet River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory and condition calculations explained in appendix E.

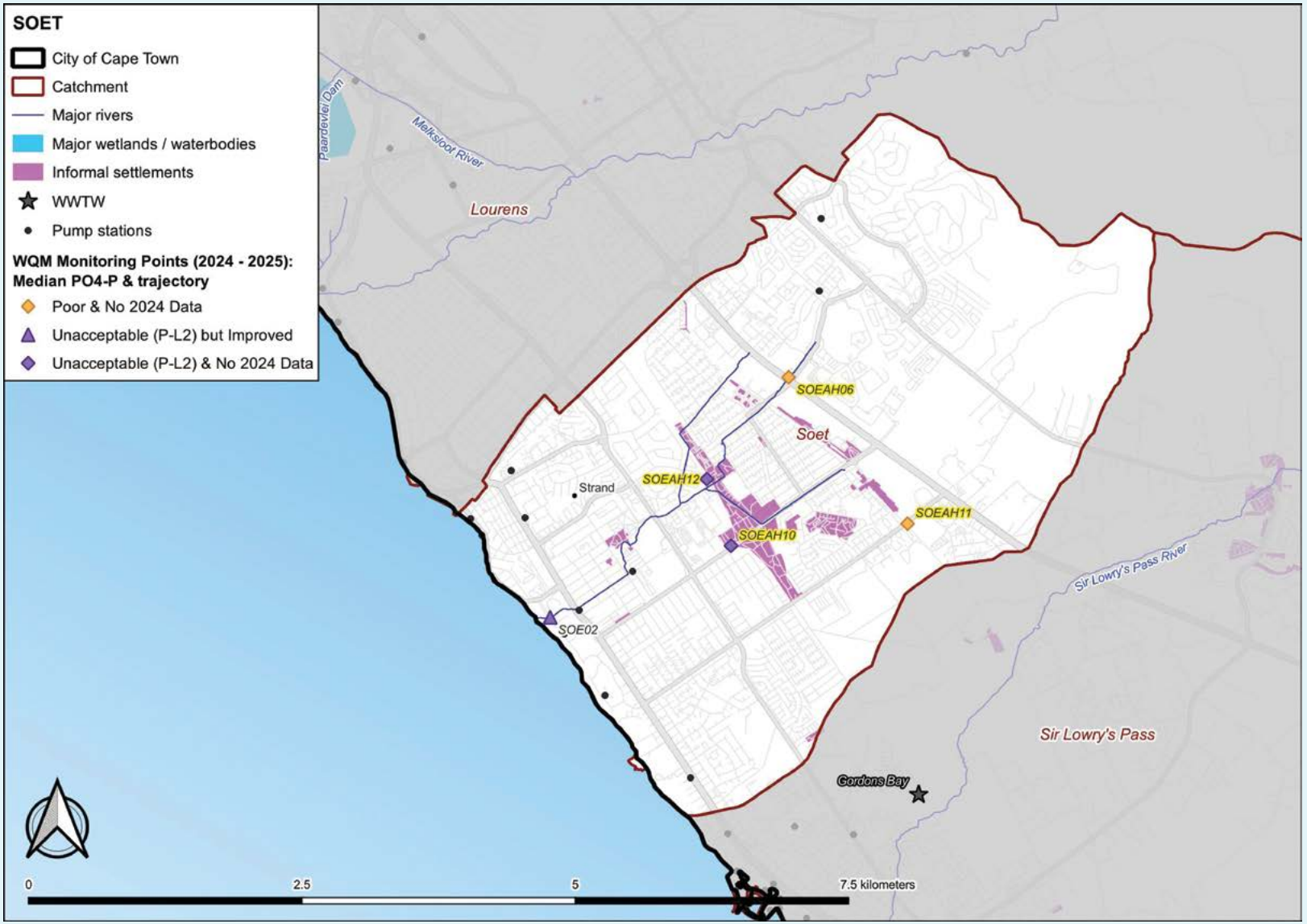


Figure 17.3

Median annual orthophosphate (PO_4-P) data, focusing on the Soet River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

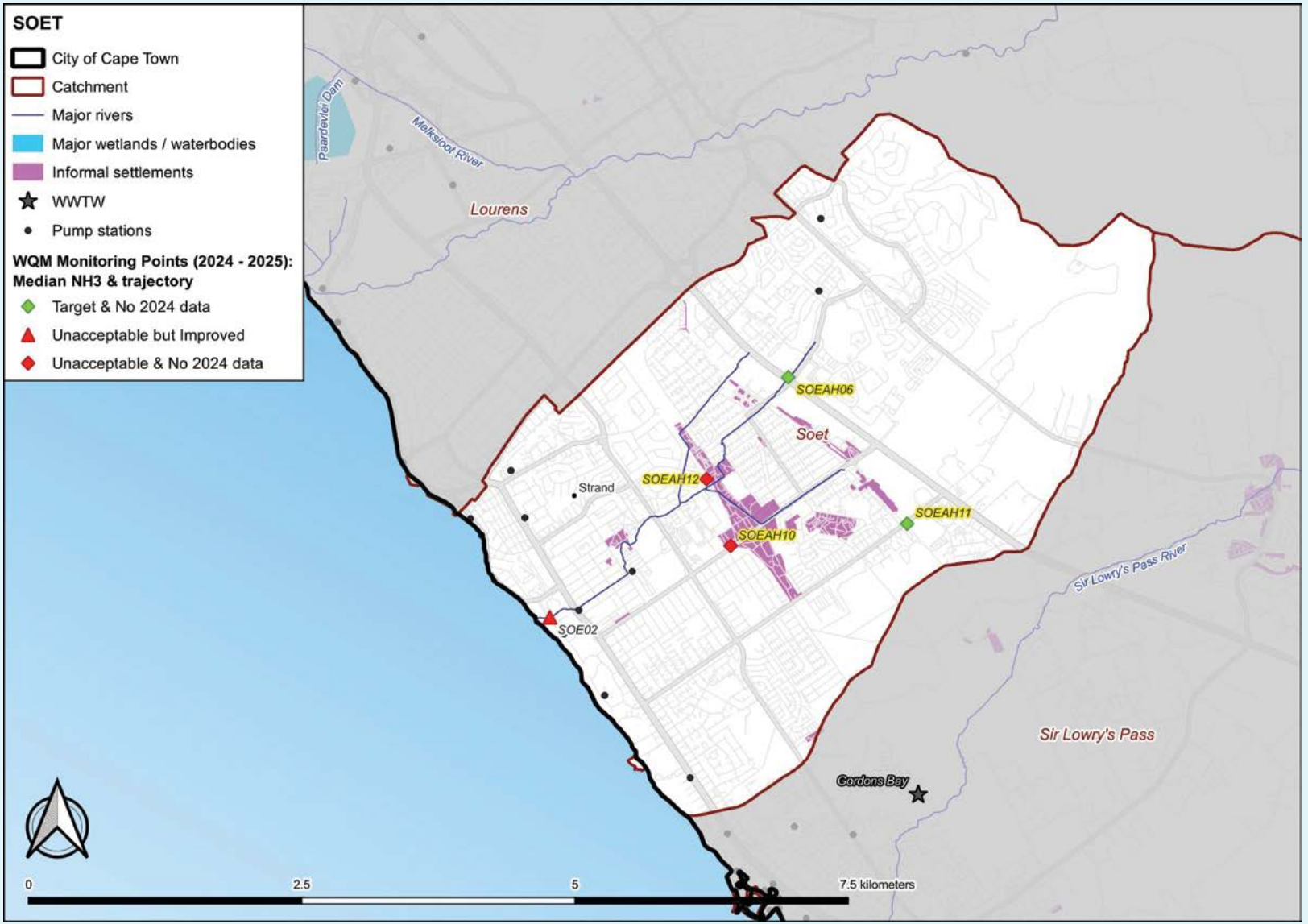


Figure 17.4

Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

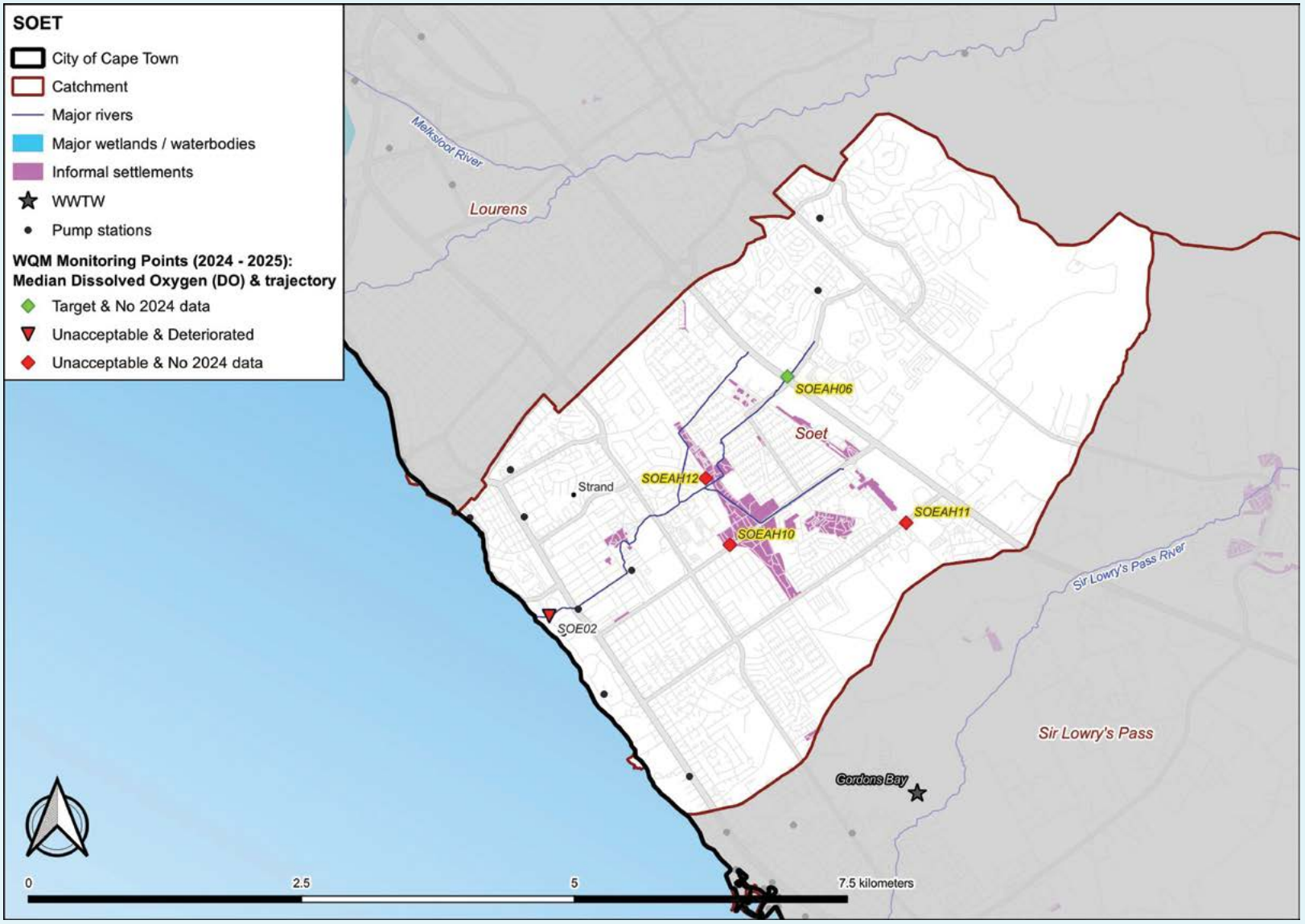


Figure 17.5

Median annual dissolved oxygen (DO) data, focusing on the Soet River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

18. WATER QUALITY IN THE SOUT RIVER CATCHMENT

18.1 CATCHMENT OVERVIEW

The Sout River catchment lies in the City's Northern stormwater drainage region and comprises a relatively small catchment through mainly agricultural areas within the City's boundaries. It drains into the Atlantic Ocean via a micro-estuary at Melkbosstrand. Catchment geology is dominated by shales of the Malmesbury formation. Water flowing through such formations is characteristically high in concentrations of dissolved salts, and as its name suggests, the water flowing in the Sout River is thus naturally brackish and characterised by high EC levels.

The river rises in the low-lying hills to the east of Melkbosstrand, on the west coast. It is a relatively short river, measuring just 18 km in length and draining a catchment of approximately 15 400 ha (Engelbrecht et al., 1997). Natural summer flows in the river are low, and under natural conditions the water was probably ephemeral throughout its reaches during summer (Day, 2000). At the end of the rainy season, flows throughout the system soon subside, and the river is reduced to a series of gradually stagnating pools occurring at intervals along the river course. As flows subside, the river water becomes progressively more saline.

In its upper and middle reaches, the Sout River flows within a channelled valley bottom wetland through predominantly agricultural land. Although a number of small streams and other drainage lines enter the river along its whole length, the only tributary of significance is the Donkergat River, which joins it in its lower reaches. The latter river receives near-permanent inflows of treated sewage effluent from the Atlantis WWTW in its upper reaches. Downstream of the confluence with the Donkergat River, the Sout River passes along the southern border of the Melkbosstrand WWTW, from which it receives treated effluent. This effluent has resulted in large-scale changes to the river ecosystem, with the seasonal, slightly brackish conditions of the upstream reaches giving way to perennially saturated, nutrient-enriched and much fresher conditions – believed to be the direct result of the release of effluent.

Downstream of the Melkbosstrand WWTW, the river flows past a caravan park on the periphery of Melkbosstrand urban area, before entering its small estuary, which opens into the Atlantic Ocean on Melkbosstrand beach. The river is channelised and in these reaches, with encroachment of the caravan park right up to the infilled, steepened and deepened river channel. The estuary itself is permanently open to the sea and the lower reaches of the river are subject to tidal influences, probably as far upstream as the lower bridge in the caravan park (Day, 2007).

The 2018 National Biodiversity Assessment (NBA) for aquatic ecosystems places watercourses in this catchment area within the South West Fynbos bioregion (Van Deventer et al., 2018). In this bioregion, wetland seeps have been rated as vulnerable; channelled valley bottom wetlands are rated as critically endangered; depression wetlands are rated as endangered; and floodplain wetlands are rated as critically endangered. Where changes in flow regime (increases) have not changed river function, seasonal wetlands are naturally characterised by extensive swathes of *Juncus kraussii* sedge wetland, with patches of *Phragmites australis* reedbed in perennially moist to wetted areas (Day et al., 2013).

18.2 THREATS TO WATER QUALITY

Water quality in the Sout catchment is threatened by a number of issues, some of which are still in their early threat stages, and could still be managed with effort. Key threats raised here comprise:

- Ongoing inflows into the lower Sout River from the Melkbosstrand WWTW, impacting water quality and the natural (seasonal) flow regime, with water quality impacts including freshening (i.e. reduction in naturally high ECs), changing watercourse plant communities;
- Seemingly ongoing (although apparently not legally sanctioned outside of 'emergency' situations) inflows of treated effluent from the Wesfleur WWTW into the seasonal Donkergat River, resulting in changes in water quality and quantity at least affecting this river within a few hundred metres of the inflow (Day, 2024);
- Increasing flows from expanding informal settlements in the Witzands residential area, just east of Atlantis towards the north of the catchment – greywater and untreated raw sewage passes out of this area in the upper catchment, and are passed via channels and seasonal wetlands into the Donkergat River downstream, threatening endangered and critically endangered wetlands in these flow corridors, including through biodiversity offset conservation areas (Day, 2024). Management of these flows through a stormwater master plan is currently under consideration by the City (Lukhozi et al., 2023);
- Possible future discharges of treated effluent from a proposed solid waste management facility into the Donkergat River, thus likely to extend the zone of influence of the Wesfleur WWTW inflows, further downstream; and
- Inflows of nutrients from fertilisers used in the agricultural areas in the catchment, as well as potential (but largely unmonitored) contamination by pesticides.



Photo 18.1 *Tributary of the upper Donkergat River, upstream of the R304, showing the seasonal, brackish river, impacted by nutrients from livestock and agriculture in this area.*



Photo 18.2 *Dense reedbed in the Sout River, downstream of the Melkbosstrand WWTW treated effluent inflows – these inflows have altered both water quality and water quantity in the river, resulting in decreased salinities, increased nutrients and increased hydroperiod (i.e. creation of a perennially inundated rather than a seasonal system).*

18.3 MONITORING POINTS AND WATER QUALITY MAPPING

18.3.1 WATER QUALITY SAMPLING POINTS

Figure 18.1 (**A to D**) presents summary water quality data for *E. coli*, orthophosphate (as PO_4-P), dissolved oxygen and free ammonia (NH_3) for the 2024 and 2025 reporting periods. The data are shown as percentages of all of the samples collected in the 2025 reporting period that fell into different water quality categories (as per **tables 2.1 and 2.3**). **Figures 18.2 to 18.5** present the same data on a site-by-site basis, showing spatial changes through the catchment and including trajectory analyses, comparing data from the 2025 reporting period with those of the previous year.

Of the above, comparison of data between the 2024 and 2025 reporting periods is not helpful, because the latter includes an additional site, DG03, making comparisons of percentage compliance meaningless. For the 2025 reporting period, 93% of samples had *E. coli* in the acceptable range; 77% were acceptable for DO; and no samples fell within any range where un-ionised ammonia concentrations would have been ecologically problematic (i.e. of chronic or acute toxicity to a known range of aquatic organisms). Orthophosphate phosphorus concentrations were, however, high with 92% of samples in the unacceptable level 2 category and just 5% in poor (the best achievable category given present laboratory threshold limitations).

The following sections provide more useful but brief commentary on the data.

18.3.2 RAW SEWAGE POLLUTION INDICATORS (*ESCHERICHIA COLI*)

Sources of raw sewage in this catchment were likely to emanate from leaks/overflows and blockages in the formal sewerage reticulation system, including pump stations (14 pump stations shown in the catchment in figure 18.2), as well as from informal settlements, with only two such areas mapped in the City's informal settlement layer, and comprising a small area of patchy settlements immediately south-east (and upstream of) the Melkbosstrand WWTW and a more extensive and growing informal settlement within and expanding from the margins of Witzands. Poorly treated effluent from the two WWTW in the catchment could also be a source of raw sewage, although WWTW effluent data presented in figures C2 to C6 in appendix C suggest that neither of the two WWTW discharging into this catchment (Wesfleur (domestic) and Melkbosstrand WWTW) were poorly performing over the 2025 reporting period.

Of the above potential sources of raw sewage:

- Most of the catchment (downstream of Witzands and upstream of the Melkbosstrand WWTW) is not on mains sewers and is unaffected by the current volumes of treated effluent discharged from the Wesfleur WWTW. Sewage sources in these reaches are likely to stem almost entirely from livestock.
- C3 complaints indicating visible sewage overflows from pump stations, manholes or other sources were very low in the south-west of the catchment (Melkbosstrand, Riebeeckstrand, Duinefontein urban areas). By contrast, high numbers of C3 complaints were recorded from the residential areas east and north-east of Atlantis, in the north of the catchment, including Witzands with its expanding informal settlements, as well as the formal residential areas of Sherwood, Avondale, Saxonsea, Protea Park and Beacon Hill, making this area one of Cape Town's minor sewage spill hotspot areas, in the upper reaches of a catchment, in which the middle reaches are currently not impacted by high volumes of treated and untreated sewage effluent.
- By contrast with C3 data, pump station data (**figure D4 in appendix D**) show moderately high levels of reported pump station overflows in the south western parts of the catchment (Melkbosstrand, Riebeeckstrand, Duinefontein), as well as in the Witzands area, and the area around and immediately west of the Wesfleur WWTW. Data in table D2 indicate three particularly problematic pump stations in the catchment, namely Piet My Vrou (eight overflows in the 2025 reporting period); and the Atlantic and Witzands pump stations (seven overflows each over the same reporting period).

- The frequency of pump station spills in this catchment was relatively high, given the small size of the catchment and the large portion that does not fall under mains sewer reticulation, with the Sout catchment having the sixth-highest number of spills out of all of the City's catchments in the 2025 reporting period. Most of these spills were, however, rated as insignificant (**figure D3**), with only one rated as minor. Nevertheless, multiple small overflows into a small, naturally seasonal system could have major implications for river condition.

Escherichia coli data provided in summary form in figures 18.1 and 18.2 provide further information, as follows:

- Despite the known sources of raw sewage overflows/spillages/discharges from informal settlements, the *E. coli* data themselves suggest that the catchment was generally unimpacted by *E. coli* contamination above levels of concern, with mean annual *E. coli* data at all sites within the range for acceptable risk (**figure 18.2**) albeit showing a deteriorating trajectory at SOU01, immediately downstream of both the Melkbosstrand WWTW and a small informal settlement upstream. Of these, the former showed 72% compliance with general limits for *E. coli*, and the deterioration is likely to reflect mainly the slightly lower compliance levels compared with 2024 (Day et al., 2025) cited compliance upwards of 80% for this WWTW in the 2024 reporting period).
- Acceptable conditions generally at SOU02 suggest that the high numbers of pump station spills in suburban areas near this monitoring point were probably of low magnitude (as per their City ratings) although they may also have taken place outside of any monitoring session.
- Data for DG03 suggest low concentrations of *E. coli* at this site – this site is, however, located well downstream of the known sources of *E. coli* from Witzands and surrounds, and *E. coli* would be expected to dissipate with exposure to sunlight and dilution from downstream groundwater-fed and perched wetlands (Day, 2024).

18.3.3 PHOSPHORUS NUTRIENTS

Orthophosphate phosphorus are key nutrients that generally dictate the City's watercourse condition. In the Sout catchment, potential sources probably revolve at present mainly around agricultural sources (fertilisers, livestock feedlots) and raw and treated sewage. More specifically:

- Sites with the highest (median annual) concentrations comprised sites SOU01 and SOU02, both of which fell within the unacceptable level 2 category for this nutrient. The main source of this nutrient in these reaches is assumed to have been ongoing inflows of treated effluent with high orthophosphate loading, and where in summer at least, treated effluent usually comprises the whole of run-of-river flow.

- DG03 also showed elevated orthophosphate, albeit 'only' in the unacceptable level 1 range. These nutrients are assumed to reflect inflows of raw sewage from upstream informal settlements and periodically overflowing sewers or pump stations, with distance downstream allowing the breakdown of organic solids into dissolved orthophosphates and other nutrient forms (e.g. ammonia, discussed below).

18.3.4 OTHER VARIABLES OF CONCERN (UN-IONISED (OR FREE) AMMONIA AND DISSOLVED OXYGEN)

These data followed similar patterns to the orthophosphate phosphorus data, with median un-ionised ammonia concentrations lying in the acceptable range at all three sites, albeit also deteriorating at SOU01. Final effluent data for the Melkbosstrand WWTW in the 2025 reporting period showed poor compliance with regard to ammoniacal nitrogen as a whole (including both un-ionised (NH_3) and ionised (NH_4+) forms) – 88% of samples did not comply with general limits for this important variable.

Elevated ammoniacal nitrogen is assumed to have accounted at least in part, along with slow flows through a densely vegetated reedbed, for the low median annual DO concentrations also found at SOU01 (figure 18.5), with the former exerting a biological demand for oxygen for its nitrification process by bacteria.

18.4 CONCLUSIONS AND RECOMMENDATIONS

The data presented in the figures that follow and described above suggest that water quality in the Sout catchment certainly indicates that it has been impacted by a variety of land uses, with inflows of treated effluent from the Melkbosstrand WWTW probably the largest source of sustained nutrient loading, and sufficient to alter hydroperiod and nutrient regime in the lower river reaches, which today function as permanent, nutrient-enriched reedbeds, rather than the patchy sedge-dominated areas that would probably have occurred here naturally.

The upstream catchment does, however, offer several important opportunities and challenges. The data show that the upstream monitoring point DG03 lies downstream of areas subject to potentially severe future water quality risks, mainly associated with expanding informal settlements in the Witzands area. It is strongly recommended that the City take urgent steps to pre-empt the kinds of permanent impacts afflicting its catchments elsewhere, where extensive existing informal settlement produces large volumes of solid waste and polluted runoff into a catchment where there is no infrastructure to address these discharges, thus permanently degrading aquatic ecosystems, downstream water quality and human health and dignity in affected areas. The Sout catchment still retains important seasonal wetland and riverine habitat in its catchment, which would be lost if nutrient enrichment and dry-season flows increased. Thus it is recommended that:

- The recommendations of the Lukhozi (2024) stormwater masterplan for the Witzands area and the ecological specifications in the associated study of Day (2024) should be implemented with urgency.
- Expansion of formal or informal development should not be allowed in the catchment until adequate WWTW capacity and sufficient sewer collection, conveyance and pumping infrastructure is in place for such expansion to take place without impacting negatively on existing natural ecosystems or on water quality.
- Poorly performing pump stations in the catchment should be investigated and problem areas isolated and addressed.
- From a water quality monitoring perspective, an additional point located upstream of the WWTW would help to allow tracking of whether water quality generated within the catchment between DG03 and the Melkbosstrand WWTW is impacted by current (or potential future) activities that require regulation or management.

It is stressed that the Sout is an important catchment, being one of the few remaining naturally seasonal catchments that has retained its seasonality and, to some extent, its natural brackish characteristics.

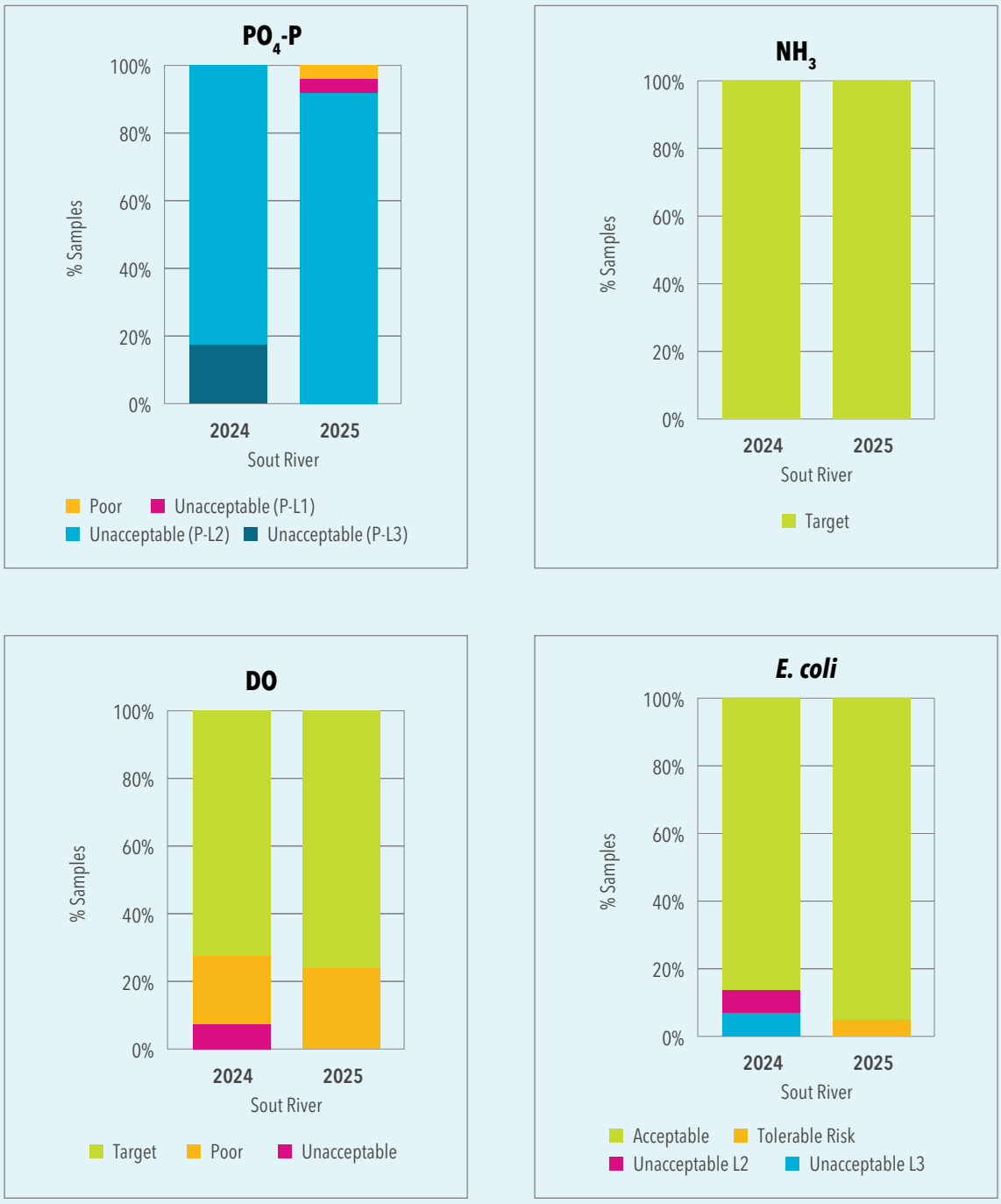


Figure 18.1

Summary water quality data for the Sout River catchment, presented as compliance-type data, showing percentage of all samples that fall into preallocated categories, as per tables 2.1 and 2.3. Data include (A) (geometric) mean annual *Escherichia coli* data; (B) median annual orthophosphate phosphorus (PO_4-P) data; (C) annual ammonia (NH_3) data; (D) median annual dissolved oxygen (DO) data.

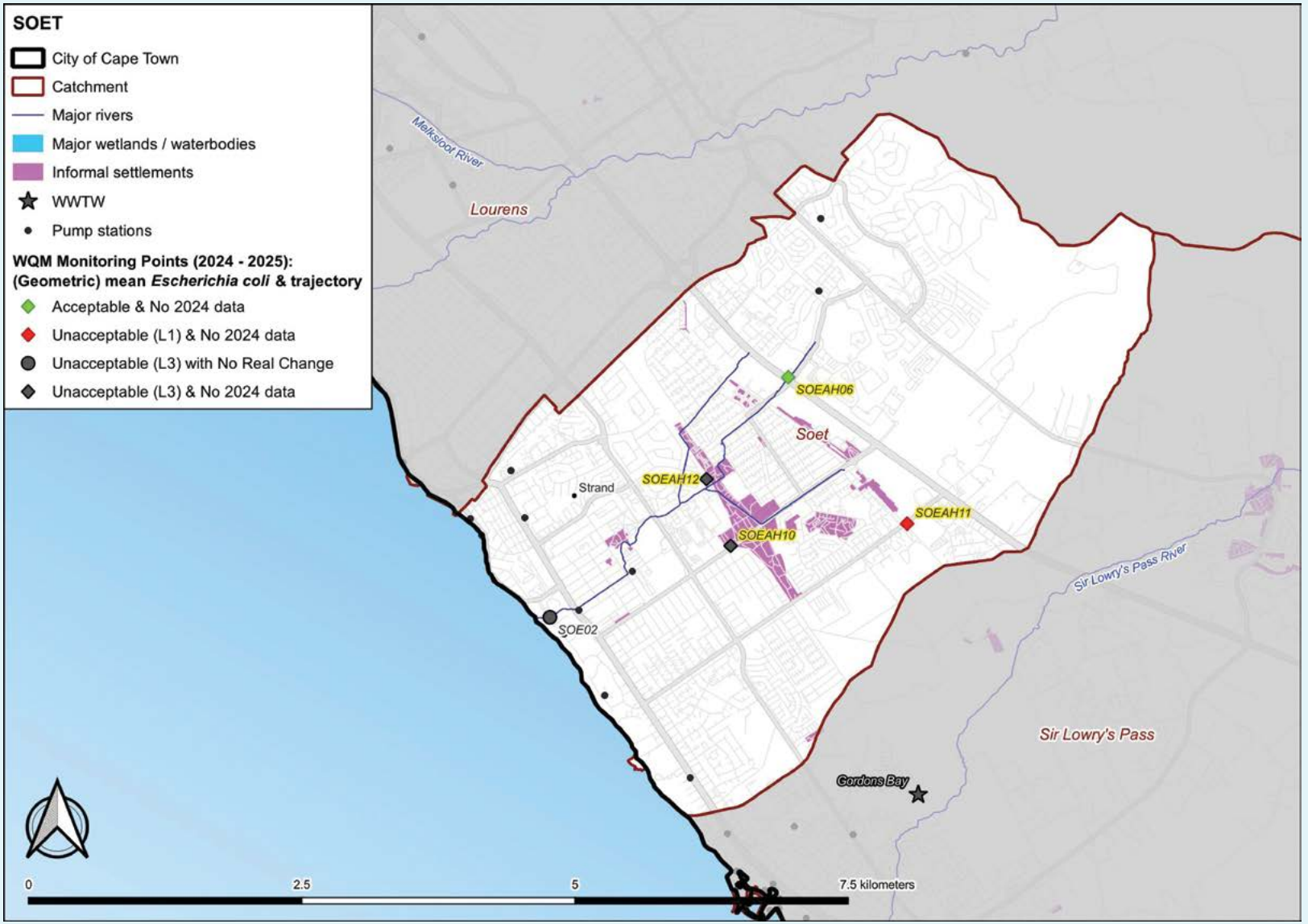


Figure 18.2

Escherichia coli data, focusing on the Sout River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory and condition calculations explained in appendix E.

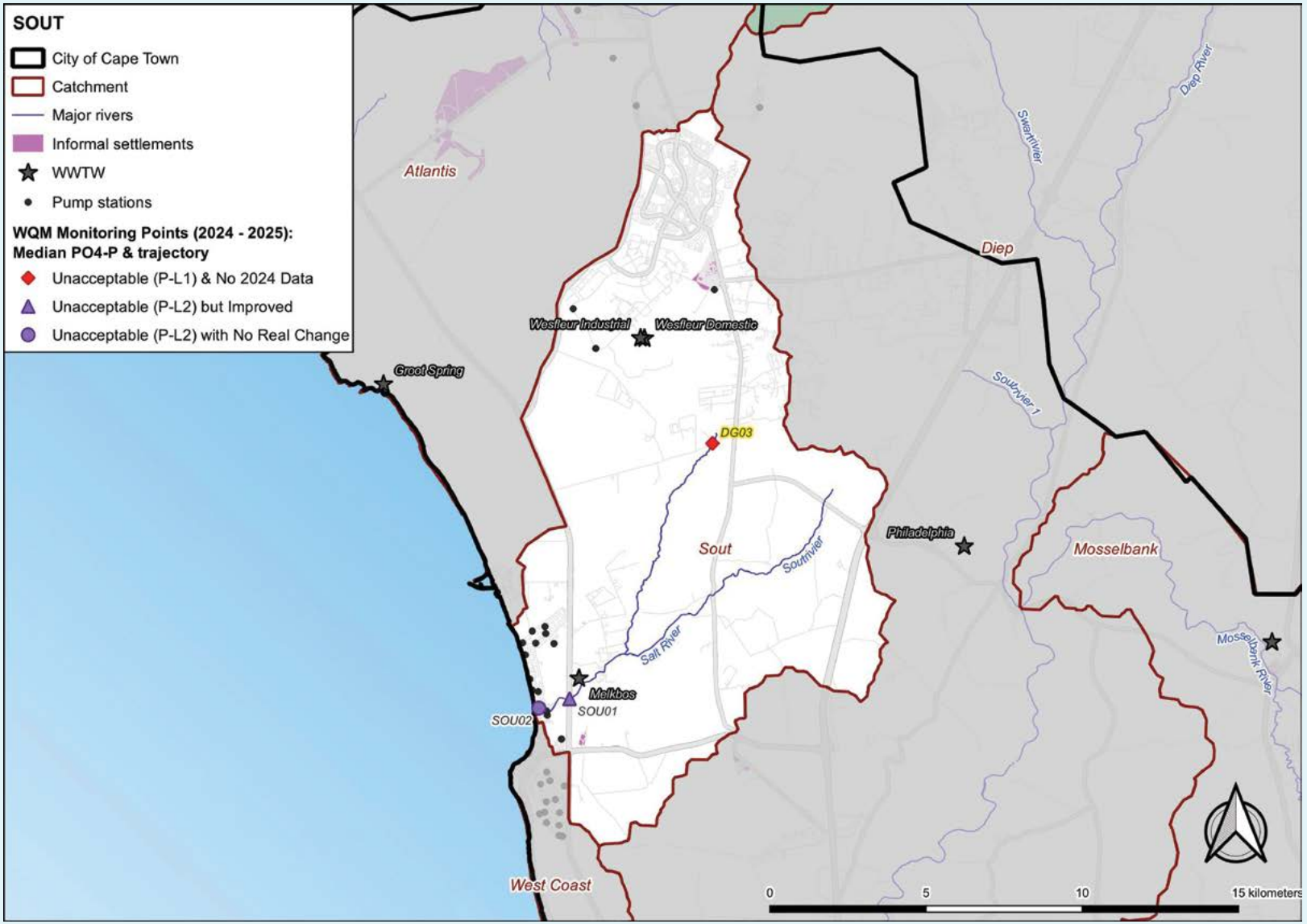


Figure 18.3

Median annual orthophosphate (PO_4-P) data, focusing on the Sout River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

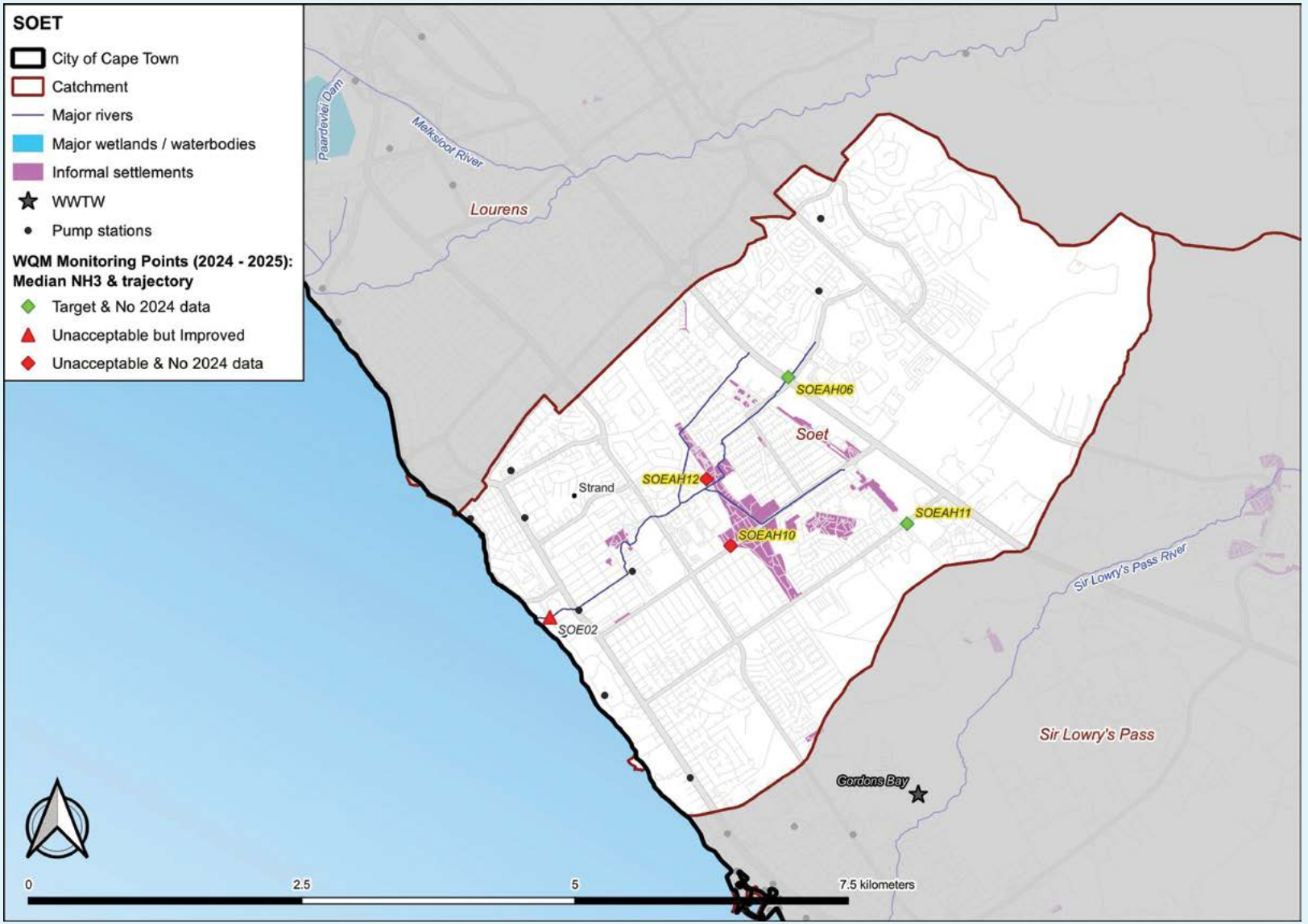


Figure 18.4

Median annual un-ionised (or free) ammonia (NH_3) data, focusing on the Sout River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

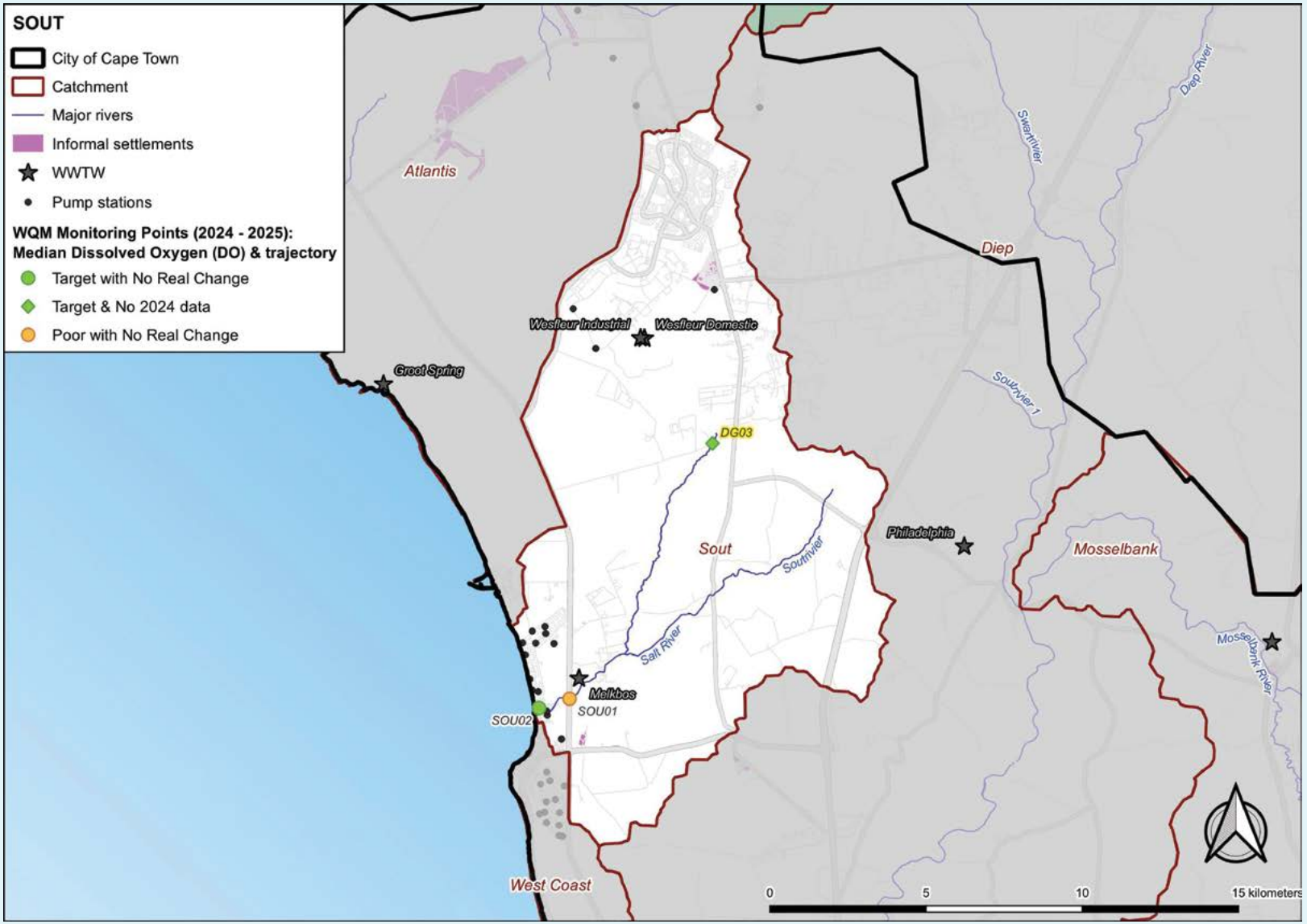


Figure 18.5

Median annual dissolved oxygen (DO) data, focusing on the Sout River catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

19. WATER QUALITY IN THE SOUTH PENINSULA CATCHMENTS

BOKRAMSPRUIT, ELSE AND SCHUSTERS CATCHMENTS

19.1 CATCHMENT OVERVIEW

The South Peninsula catchments include a number of small catchments within the City's jurisdiction, which have been grouped together historically in reporting on the City's inland water quality data. The main catchments comprise the Bokramspruit, Else and Schusters River catchments, with the Else River catchment including Glencairn Vlei. A number of other small, unmonitored watercourses also occur in the area, particularly along the steep mountain slopes dropping down to the Atlantic Ocean in the west and False Bay to the east. The larger, monitored catchments are described in brief below.

The **Bokramspruit River** rises above the Manelkloof, on the flat plateau of the Swartkopberge, south-east of Kommetjie. In its upper reaches on the mountain top, the river comprises extensive wetland flats and seeps, which pass down the mountainside as foothill streams. These converge upstream of the Ocean View high-density development, upstream of Kommetjie Main Road, and flow through Ocean View within a concrete canal. Downstream of the town, the concrete canal gives way to a steep-sided, earth-lined canal. The river enters the sea via a small estuary on Kommetjie beach, which is open for most of the year. During winter, the estuary and lower river are subject to the effects of both high waves rolling in from the sea, as well as large volumes of water channelled down the river.

The **Else River** is approximately 8 km long and drains an 1 800 ha catchment. Under virgin conditions, the river would have been a perennial system, with reduced flow during the summer months (Gale, 2000). Today, however, tributaries of the upper reaches of the river are impounded by the Lewis Gay and Kleinplaas dams. Extensive abstraction and alteration of the natural river flow regime are among the many impacts affecting the ecological condition of the river as a whole (Day and Snaddon, 2009).

In its upper reaches, the river is associated with numerous small seeps and other wetland areas, and receives water from various small tributaries, although impoundment reduces the downstream contribution of these rivers substantially. The river flows roughly northwards, and descends into the Else River Valley, flowing along the outskirts of the Da Gama Park residential area. Within these reaches, garden runoff, runoff from residential areas, invasion by alien vegetation and erosion impact on the river. At the downstream end of Da Gama Park, the river swings sharply, and flows towards its small estuary at Glencairn beach in False Bay. The estuary lies just downstream of Glencairn Vlei – a naturally seasonal wetland, important for birdlife and semi-aquatic mammals such as otters. The wetland received treated effluent from the Simon's Town WWTW for a brief period (Day et al., 1999), which, along with the hydrological effects of a small weir in these reaches, resulted in permanent water in the upstream reaches, which in turn led to the expansion of dense *Typha capensis* reedbeds across much of the affected wetland. This practice has now ceased, and the wetland has since been the subject of a number of rehabilitation projects aimed at improving local habitat diversity. It remains dominated by *Typha capensis*, however, and the weir is still in place.

The **Schusters River** rises on the south-western slopes of the Klaas Jagersberg, just outside mountains north-east of the Table Mountain National Park (TMNP) (Cape of Good Hope section) fence. The river crosses into the TMNP in the vicinity of Modderdam, swinging north and then running along the southern boundary of the reserve as far as the outskirts of Scarborough where it enters its estuary in the Atlantic Ocean. Within the reserve, the river is relatively unimpacted, and flows as a broad, channelled valley bottom wetland. In its lower reaches, in the vicinity of Scarborough, the river has been channelised and its wetland significantly impacted by the construction of a berm along the reserve boundary fence. This has resulted in the separation of large areas of wetland on the northern side of the reserve boundary, and the infilling and loss of wetlands beneath the berm itself.

The only major tributary of the Schusters River is the Perde River, which enters the Schusters River within the TMNP. The Perde River flows through an informal settlement near Redhill, and has been associated with poor water quality inputs in the past. Both the Schusters and the Perde rivers are naturally seasonal systems (Day and Clark, 2012).

19.2 THREATS TO WATER QUALITY

The South Peninsula area does not include any inland WWTW, and is not therefore exposed to the high nutrient loads and often changes in seasonal hydrology that afflict many other catchments in Cape Town.

Nevertheless, the small catchments in this area are subject to a number of water quality threats, including:

- Inflows of grey- and blackwater (raw sewage) from albeit currently relatively small informal settlements within the various catchments (e.g. along the Perde River);
- Overflowing sewers and pump stations, particularly in suburbs with high levels of solid waste accumulation and backyard settlement (e.g. parts of Ocean View);
- Seepage and overflows from septic tanks in older parts of the catchment (e.g. parts of Scarborough); and
- Seepage and runoff from suburban gardens.



Photo 19.1 *Assumed to be relatively unpolluted river flows through the foothill reaches of a tributary of the Schusters River, South Peninsula catchment area. Alien vegetation is a major issue in this area.*



Photo 19.2 *Perde River immediately upstream of its confluence with the Schusters River.*



Photo 19.3 *Expanding (poorly serviced) informal settlements in the upper Perde River catchment (Redhill) threaten water quality in the Schusters River catchment.*



Photo 19.4 *Bokramspruit River downstream of Ocean View. Photo: Dean Ollis.*

19.3 WATER QUALITY THROUGH THE CATCHMENTS – CONDITION AND TRAJECTORY

19.3.1 MONITORING POINTS AND WATER QUALITY MAPPING

The City monitors eight sites in the South Peninsula area, four of which are new sites, added in the 2025 reporting period. Of these, two lie in the small settlement of Scarborough (one in the lower reaches of the Schusters River and one in the Pound Canal, draining through the urban area); three lie in the Bokramspruit River, upstream of, within and downstream of Ocean View; two lie along the Else River (GC08 and GC012) (Glencairn Vlei); and one is located in the lower reaches of an unnamed stream through Simon's Town (SMT01).

Figure 19.1 (**A to D**) presents summary water quality data for *E. coli*, orthophosphate (as PO_4-P), dissolved oxygen and free ammonia (NH_3) for the 2024 and 2025 reporting periods. The data are shown as percentages of all of the samples collected in the 2025 reporting period that fell into different water quality categories (as per **tables 2.1 and 2.3**). **Figures 19.2 to 19.5** present the same data on a site-by-site basis, showing spatial changes through the catchment and including trajectory analyses, comparing median and geometric mean (*E. coli*) annual data from the 2025 reporting period with those of the previous year.

The following sections provide brief commentary on these findings.

19.3.2 RAW SEWAGE POLLUTION INDICATORS (*ESCHERICHIA COLI*)

The heat map for C3 sewage spill complaints shown in **figure D5** (**appendix D**) show that most of the South Peninsula area was relatively free of reported sewage spills, with the exception of the Bokramspruit catchment, which includes the Ocean View settlement and parts of Kommetjie. This area was prone to relatively low numbers of reported sewage overflows, all of which were, however, rated as insignificant to minor (**figure D3**). Sewage pump station overflows in the catchment were restricted to coastal pump stations (**figure D4**), with most of the formal sewer reticulation being gravity fed through the various catchments on mains sewer.

The above translate into the data shown in **figures 19.1 and 19.2**, as follows:

- The 2025 reporting period saw a marked reduction in the proportion of river samples with *E. coli* concentrations that were rated unacceptable. This is, however, at least in part an artefact of the inclusion of an additional four monitoring points, all located in relatively 'clean', often upper river reaches;
- Nevertheless, 82% of samples from this area fell within the acceptable range for *E. coli*, suggesting relatively low levels of overall sewage contamination;

- There was a marked improvement in exposure of the Glencairn Vlei to raw sewage, as shown by *E. coli* data, with 100% of samples from this wetland being rated as acceptable in the 2025 reporting period, compared with 92% in the previous year;
- The Bokramspruit system was most vulnerable to sewage overflows, primarily in the Ocean View area (mean annual *E. coli* counts rated as unacceptable level 2 – figure 19.2); and
- The lower Schusters River showed a concerning increase in *E. coli* in samples over the 2025 reporting period, potentially reflecting increasing inflows of untreated grey and black water from informal settlements in the upper catchment.

19.3.3 PHOSPHORUS NUTRIENTS

Orthophosphate concentrations were generally higher in monitored river rather than wetland systems, with all samples from the Glencairn Vlei being rated as poor (a rating reflecting in part limitations in laboratory analytical detection limits). Chlorophyll-a data for the wetland (**table G1 – appendix G**) showed low levels of this indicator of algal productivity, supporting an overall assessment that, despite its history of nutrient enrichment, the wetland was not in a hypertrophic condition during the 2025 reporting period.

18% of samples in the South Peninsula area fell within the unacceptable range for orthophosphate phosphorus, and again, although **figure 19.1** suggests an improvement in these data compared with 2024, the inclusion of additional, cleaner sites in the catchments have skewed these data, making inter-annual comparisons difficult, but also highlighting the fact that many of the City's watercourses in this area are not in fact impacted by phosphorus enrichment.

Figure 19.2 shows that, in fact, the worst-performing site in the area in terms of orthophosphate enrichment was in the Pound Canal in Scarborough – sources of this nutrient in this area should be identified, and could potentially be controlled with relative ease.

19.3.4 UN-IONISED (OR FREE) AMMONIA AS A TOXIN AND DISSOLVED OXYGEN

- Summary data for both free ammonia and dissolved oxygen (DO) shown in **figure 19.1** suggest that neither of these variables were of major significance in watercourses in the South Peninsula area as a whole. However, the data do indicate problem areas – with 5% of samples rated as unacceptable (high) for DO, suggesting algal bloom conditions, and 5% of free ammonia samples were also rated as unacceptable, suggesting periodic acute toxicity conditions.
- **Figure 19.3** suggests, however, that no single parts of this area were particularly prone to low DO.
- **Figure 19.4** shows a deterioration in free ammonia concentrations in the lower Schusters River – a result consistent with the elevated *E. coli* counts already flagged in this area in **figure 19.2**.

19.4 CONCLUSIONS AND RECOMMENDATIONS

The South Peninsula area is a relatively undeveloped part of the City's extent, and it includes numerous small river and wetland systems that remain relatively unimpacted by pollution. This is apparent from the inclusion of limited additional samples in the 2025 reporting period from the upper reaches of the Bokramspruit and Else catchments, but there are also numerous other small watercourses that do not pass through any major settlements and which are assumed to be relatively unimpacted with regard to water quality. These include the Smitswinkelbaai Stream, which is accessed for drinking water by the Smitswinkelbaai settlement.

The parts of this study area that are most vulnerable to water quality degradation are the Bokramspruit and Schusters River systems. Urgent attention to treatment and/or diversion to sewer of grey- and blackwater from informal settlements in the upper Schusters River catchment is strongly recommended, while the scale of this problem is relatively small. Attention to upgrading, rehabilitation and improved management of stormwater and sewers in the Bokramspruit catchment is also strongly recommended, to address clear but still seemingly manageable pollution nodes, before they spiral out of control, as seen in other catchment areas.



Figure 19.1

Summary water quality data for the South Peninsula catchments, presented as compliance-type data, showing percentage of all samples that fall into preallocated categories, as per tables 2.1 and 2.3. Data include (A) (geometric) mean annual *Escherichia coli* data; (B) median annual orthophosphate phosphorus (PO_4-P) data; (C) annual ammonia (NH_3) data; (D) median annual dissolved oxygen (DO) data.

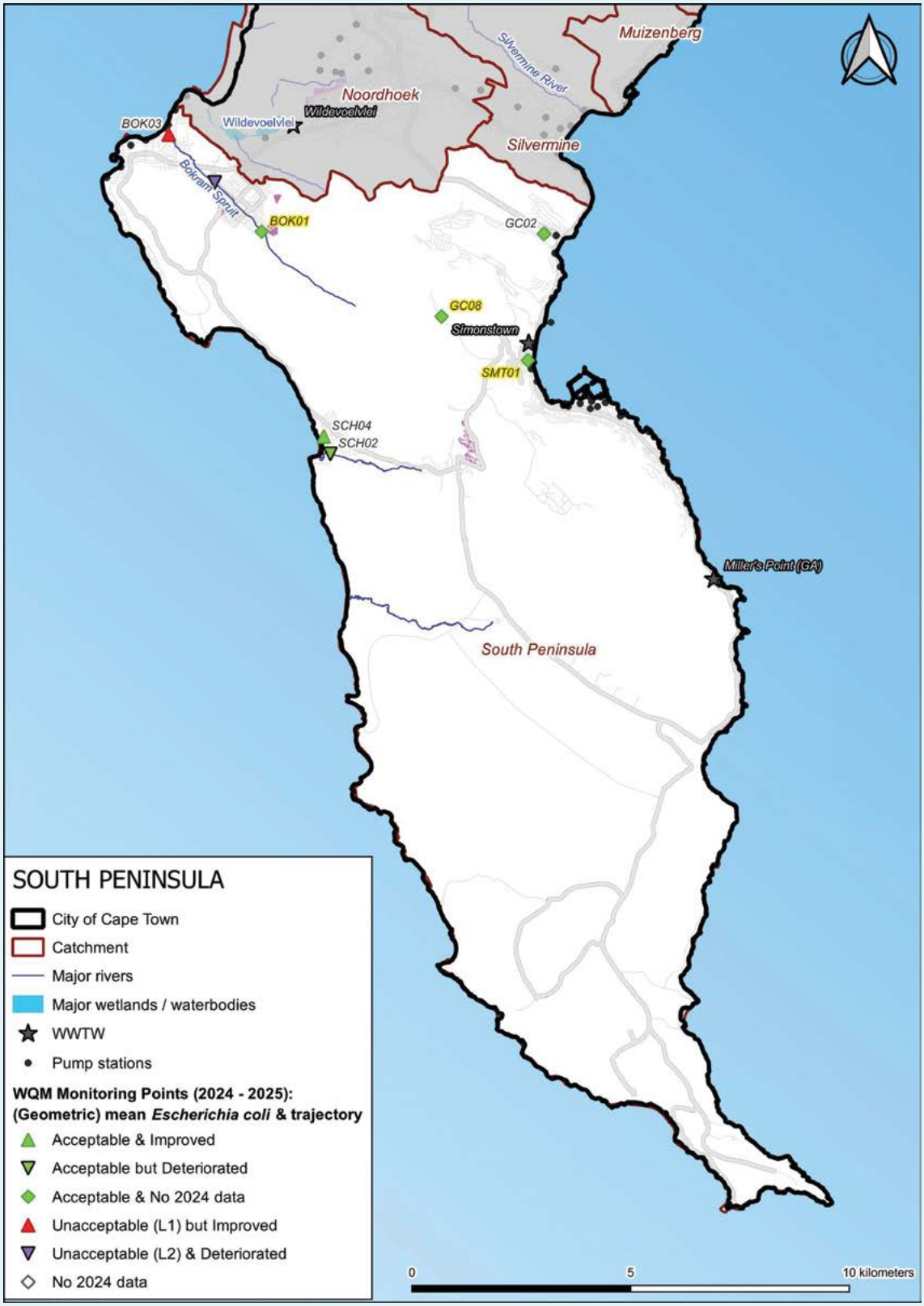


Figure 19.2

Escherichia coli data, focusing on the South Peninsula catchments. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory and condition calculations explained in appendix E.

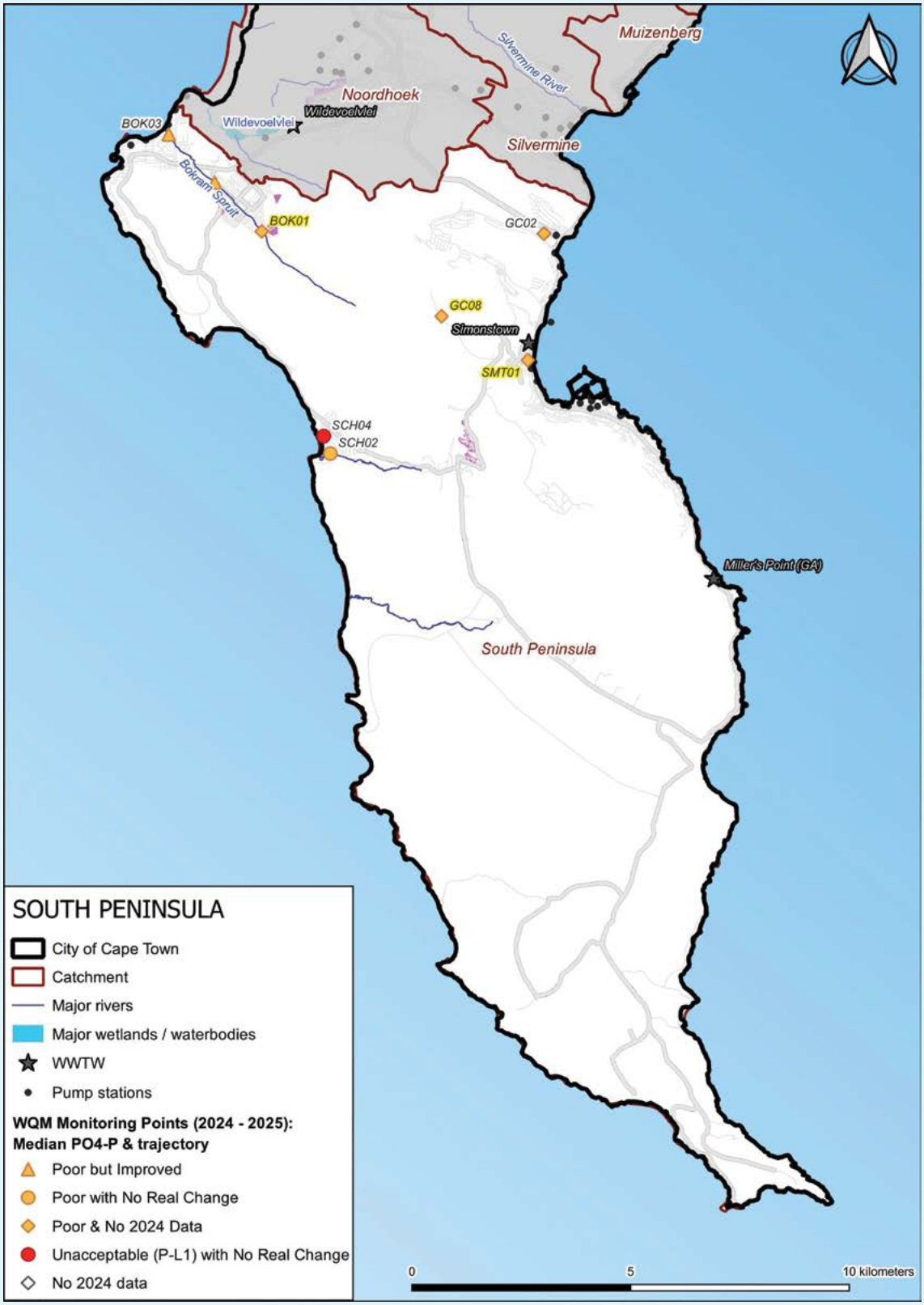


Figure 19.3

Median annual orthophosphate (PO_4-P) data, focusing on the South Peninsula catchments. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

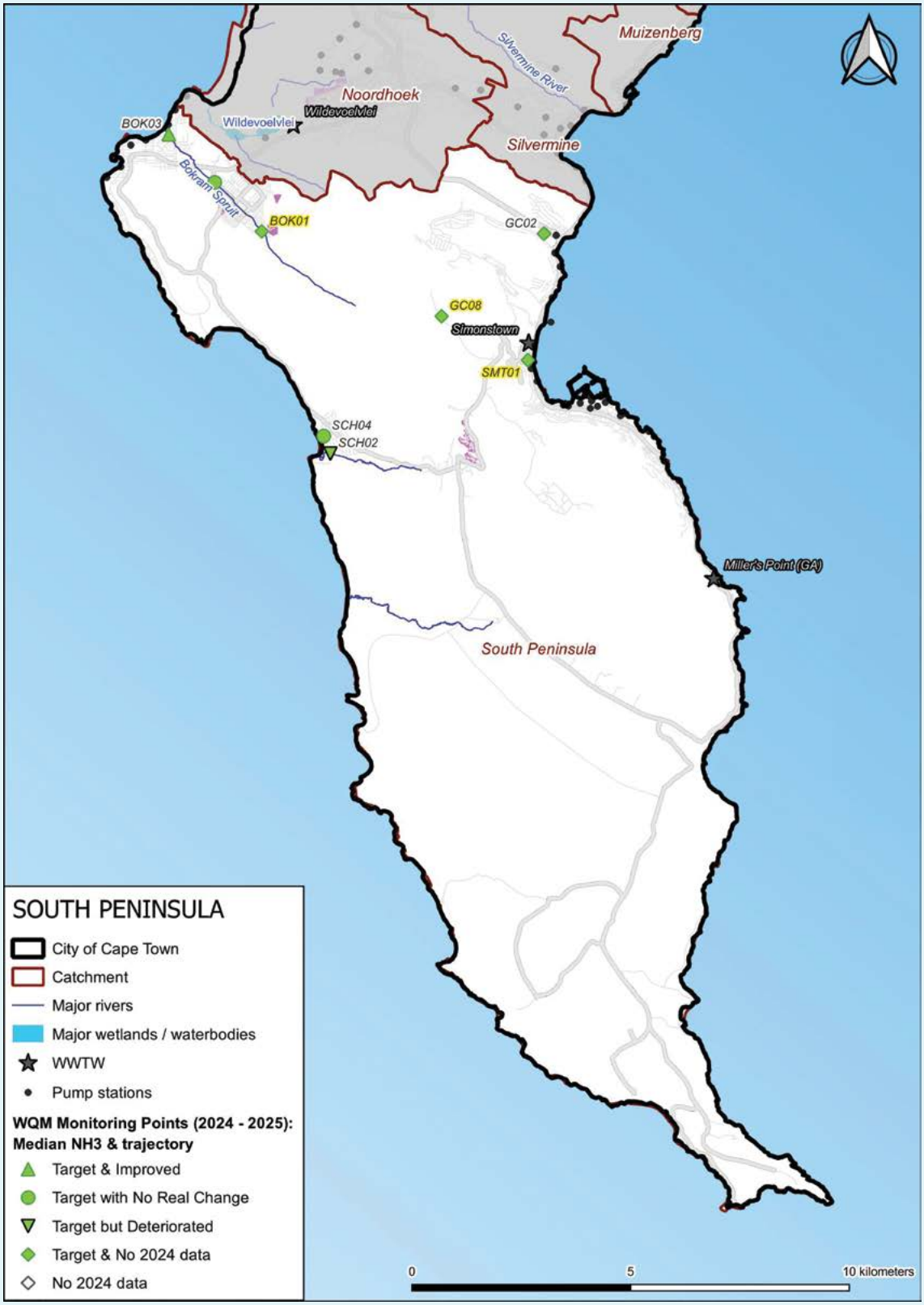


Figure 19.4

Median annual un-ionised (or free) ammonia (NH_3) data, focusing on the South Peninsula catchments. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

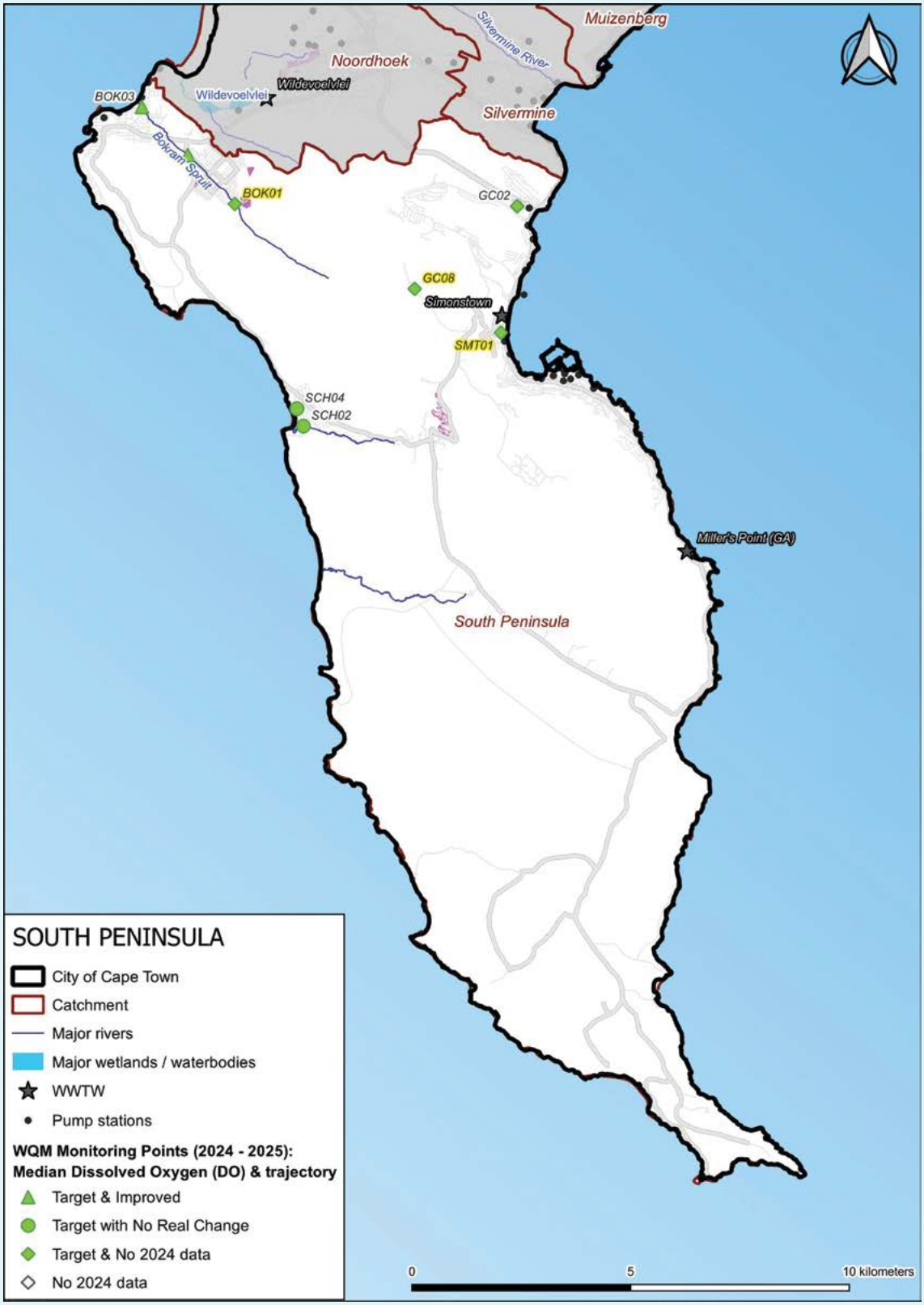


Figure 19.5

Median annual dissolved oxygen (DO) data, focusing on the South Peninsula catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

20. WATER QUALITY IN THE ZEEKOE CATCHMENT

INCLUDING ZEEKOEVLEI AND PRINCESS VLEI

20.1 CATCHMENT OVERVIEW

The Zeekoe catchment covers an area of some 7 813 ha and includes numerous vleis, wetlands and the City's only Ramsar Wetland Site – False Bay Nature Reserve, located in the south-west of the catchment and including Zeekoevlei and Rondevlei wetlands. Of these, Zeekoevlei covers approximately 260 ha when full, and is both the largest wetland in the catchment and one of the City's largest recreational waterbodies. Rondevlei, which under natural circumstances connected to Zeekoevlei as a single large wetland, covers an area of some 53 ha. Both vleis are fed by groundwater from the Cape Flats Aquifer, and surface flows from their respective catchments. Zeekoevlei is fed by the Little and Big Lotus rivers, which drain from Ottery and from just north of the N2 near the airport respectively (see **figure 20.2.2**). Rondevlei is fed by overflows from Princess Vlei to the north-west, as well as stormwater runoff from the suburb of Grassy Park, which enters the vlei via the Perth Road and Italian Road culverts. Princess Vlei is fed by the Southfield Canal. The catchment includes the Edith Stephens Nature Reserve, which conserves important seasonal wetlands, currently being rehabilitated, and a permanent (but polluted) waterbody that provides flood attenuation functions.

Of the river systems feeding Zeekoevlei, the Big Lotus River has a far larger catchment area, starting as a small stormwater channel just north of the N2, through the airport industrial area. Immediately downstream of the N2, it flows through parts of Nyanga, Gugulethu and New Crossroads, mainly as a lined canal. These areas are all densely populated, with high levels of backyard and other informal settlement. Downstream, the river flows along the southern edges of Manenberg and Hanover Park. Many of these areas have significant socio-economic problems and high levels of crime and gang violence, which challenge effective catchment management activities, including the City's capacity to effect basic service delivery in the form of solid waste removal in some areas.

The Big Lotus River swings south just east of Wetton. It is crossed by Govan Mbeki Road and passes through parts of the Philippi Horticultural Area, where agriculture as well as associated manure and composting forms the main land use. In these river reaches, a low-flow diversion (the Springfield diversion) diverts a portion of flow from the river to the nearby Cape Flats WWTW, in an effort to reduce downstream water quality impacts on Zeekoevlei. From the Springfield diversion, the river flows, still as an open channel, through residential and commercial land uses in Ottery and is joined by the Woodlands Canal, just east of the remnant and ecologically highly important Bamboesvlei seasonal wetland (see Day, 2024; Emms, 2022). The canal flows from here through parts of the residential areas of Lotus River and Grassy Park, before entering Zeekoevlei. The Big Lotus River has been subjected to numerous inflows of raw sewage from blocked manholes, failed pump stations and, increasingly over the past few years, large inflows from expanding informal settlements in the upper catchment in particular, in the Sweet Homes and Brown's Farm areas. These have contributed to the documented progressive decline in water quality and wetland ecosystem quality in Zeekoevlei (see Day et al., 2022) and the need for its dredging (Day, 2023).

The Little Lotus River, by contrast, drains a smaller and less impacted catchment. It rises just south of Ottery Road (east of the Royal Golf Course) and flows through the mainly residential areas of Parklands and Grassy Park, mainly as a lined canal, before entering Zeekoevlei south of the Big Lotus River confluence. The river is generally less vulnerable to raw sewage inflows and solid waste accumulation than the Big Lotus River, but nevertheless also experiences periodic pollution episodes (Day et al., 2022). High levels of criminality in parts of the Little Lotus River sub-catchment also impact on services such as solid waste removal.

As a result of ongoing receipt of unacceptably high loads of solid waste into Zeekoevlei and the high costs and effort required for its removal once in the vlei, local community/City partnerships have facilitated and funded litter fences at the outlet of both the Big and the Little Lotus rivers into Zeekoevlei and in the upper catchment on the Big Lotus River, on its tributary the Woodlands Canal and the Little Lotus River. From a user perspective, the three main waterbodies in the catchment are used quite differently. Princess Vlei is used for full-immersion baptisms. Zeekoevlei is used for recreation and supports several active sailing, rowing and fishing clubs, while Rondevlei is managed primarily for conservation and allows bird watching and controlled walking.

20.2 THREATS TO WATER QUALITY

The most significant sources of pollution in the catchment stem mainly from large areas of informality and backyard settlements in the upper reaches of the Big Lotus River, from just downstream of the N2 crossing, as far as the Govan Mbeki river crossing into the Philippi Horticultural Area (PHA). These areas discharge greywater from domestic use and night soils into the Big Lotus River, either directly or by way of stormwater drains, resulting in strong, permanent but unmonitored inflows, particularly from the Sweet Homes catchment area.

Episodic sewage blockages, sewer pump station failures, sewer manhole overflows and occasional failures at the Cape Flats WWTW inlet (see Day et al., 2022) are also major contributors to river and vlei pollution, occurring at a rate throughout the catchment that cumulatively is probably permanent rather than episodic.

Other threats to water quality comprise:

- High criminality in parts of the catchment generating (assumed) major loads of solid waste and loading of raw sewage and greywater – this affects the speed at which the City can respond to reported pump station overflows and sewer spills, and the likelihood of these being observed by City Pollution Control inspectors;
- Runoff from agricultural areas (mainly in the Philippi Horticultural Area), including from fertilisers, manure, insecticides and herbicides);
- Illegal discharges of oil and other waste into watercourses
- Runoff from roads and parking areas, in places with high levels of solid waste.



Photo 20.1 *Solid waste and raw sewage/greywater in channel into the Big Lotus River past Riemvasmaak informal settlement.*



Photo 20.2 *May 2025 clearing of solid waste from channel into Big Lotus River past Riemvasmaak informal settlement.*



Photo 20.3 *Inflows of polluted grey- and blackwater from backyard dwellings and other land uses in the upstream reaches of the Big Lotus River (downstream of N2)*

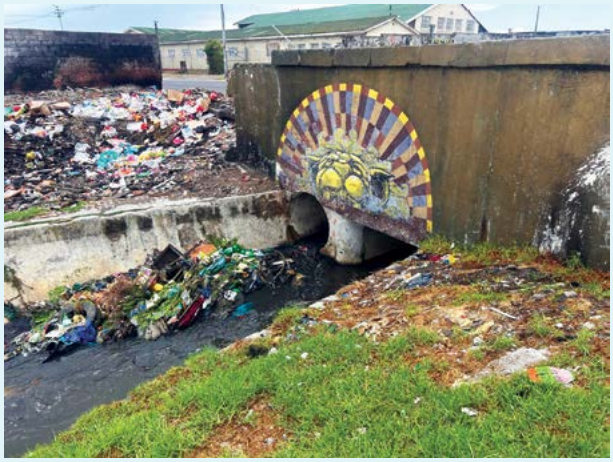


Photo 20.4 *Big Lotus River downstream of Barcelona informal settlement (some 780 m downstream of the N2). Large volumes of dumped solid waste accumulate in this area.*



Photo 20.5 *Significant inflows of polluted water (greywater and raw sewage) into the Big Lotus River from the Sweet Home informal settlement, via the stormwater system.*



Photo 20.6 *Visibly polluted flows in the Big Lotus River past Hanover Park, including inflows from Sweet Home informal settlement and other upstream pollution sources.*



Photo 20.7 *Visibly polluted inflows of raw sewage into the Lotus stormwater wetland ponds, south of Old Lansdowne Road, Zeekoe catchment – these wetlands overflow into wetlands in the Edith Stephens Nature Reserve, north of Jakes Gerwel Drive.*



Photo 20.8 *Early results of daily cleanups of solid waste in the Big Lotus River – cleanup team provided by The Litter Boom Project, with daily removal of solid waste by the City (to prevent vandalism of bags, if left overnight).*



Photo 20.9 *Solid waste interceptor on the Big Lotus River, upstream of Duinefontein Road. Adjustments to fence design are urgently required.*



Photo 20.10 *Little Lotus River Canal through Grassy Park – a solid waste interceptor has been installed by the City in this canal.*

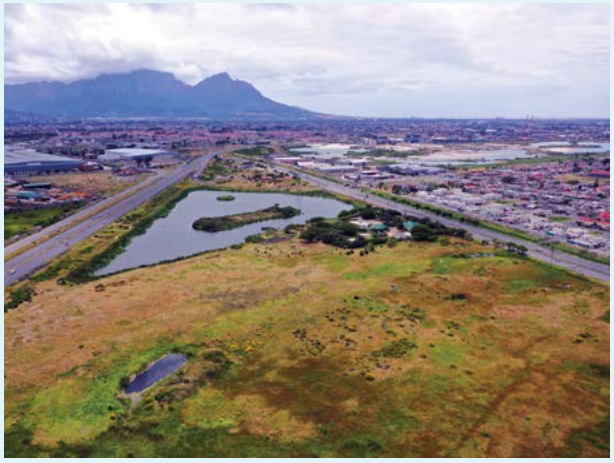


Photo 20.11 *Aerial view of Edith Stephens Nature Reserve, courtesy B. Sutherland, City of Cape Town*



Photo 20.12 *Lower reaches of Princess Vlei wetland*

20.3 WATER QUALITY THROUGH THE CATCHMENTS – CONDITION AND TRAJECTORY

20.3.1 MONITORING POINTS AND WATER QUALITY MAPPING

The City currently collects routine water quality samples from 23 sites in the Zeekoe catchment (up from 17 in the previous reporting period). Of these, two are on detention ponds, eight are on the various vleis in the catchment and the rest are located on the main channels/canals and stormwater outlets in the catchment. The six new sites are located in the Edith Stephens detention pond (ESDP01 and ESDP02); at the Govan Mbeki Road crossing (Big Lotus River) (LR04); downstream of the combined Princess Vlei and Italian culvert inflows into Rondevlei (RVS); on the upper reaches of the Little Lotus River (LR09); and in Zeekoevlei towards the weir (ZEV4S). Some of these sites are sites previously monitored, for which there are historical data records.

Figure 20.1 (A to D) presents summary water quality data for *E. coli*, orthophosphate (as PO_4-P), dissolved oxygen and free ammonia (NH_3) for the 2024 and 2025 reporting periods. The data are shown as percentages of all of the samples collected in the 2025 reporting period that fell into different water quality categories (as per tables 2.1 and 2.3). **Figures 20.2 to 20.5** present the same data on a site-by-site basis, showing spatial changes through the catchment and including trajectory analyses, comparing data from the 2025 reporting period with those of the previous year. Note that these data separate river and vlei/detention pond data, using names for the latter and the coding 'river' for the former. This is explained in **appendix F**.

The following sections provide brief commentary on the above outputs.

20.3.2 RAW SEWAGE POLLUTION INDICATORS (*ESCHERICHIA COLI)*

Figure D5 (**appendix D**) shows that the upper reaches of the catchment were major hotspots for sewage overflows in the city during the 2025 reporting period, particularly in the Manenberg, Gugulethu, Crossroads and Nyanga areas, as well as (to a lesser degree) the downstream suburbs of Lotus River and Grassy Park. The Big Lotus River sub-catchment was highlighted in these data to a much greater extent than the Little Lotus and Southfield Canal/Princess Vlei sub-catchments.

Pump station data (**figure D4**) show high levels of pump station overflows throughout the catchment, excluding the Philippi Horticultural Area (PHA), most of which is not in fact on the sewer reticulation system. Data in **table D2** indicate the three most problematic pump stations in the catchment, namely Philippi Phase 4 (15 overflows in the 2025 reporting period); Millers Camp (seven overflows) and Philippi East (also seven overflows). These pump stations are all located in the densely populated upper catchment in areas dominated by high levels of informal settlement, backyard dwellings and accumulation of solid waste in streets along the river canals and in other open spaces. The frequency of sewage spills in this catchment was the third highest across the city, exceeded only by the lower Salt and the Diep River catchments (**figure D3**). Thus, although the spills themselves were all rated

insignificant, minor and moderate, their cumulative long-term impact on water quality in aquatic ecosystems could be significant. In this catchment it is, however, probably completely outweighed by the visible (but unquantified) flows of contaminated greywater from stormwater outlets into the river in the upper catchment.

Escherichia coli data provided in summary form in **figures 20.1 and 20.2** suggest:

- As suggested by heat maps and sewage spill reporting data, rivers throughout the catchment were impacted over the 2025 reporting period by inflows of raw sewage, with annual mean *E. coli* levels at all sites above unacceptable thresholds and 78% of all river samples throughout the sample in an unacceptable category (69% in unacceptable level 2 and level 3 categories). The summary data shown in **figure 20.1** moreover suggest deteriorating water quality in these rivers since the previous reporting period, and the new river sites added in the current reporting period would not have skewed these data into worse categories. The mapped data, differentiating data by individual sites, provide a clearer picture, suggesting minor improvement at several river sites. Sites on the Big Lotus River generally still fell within the unacceptable level 2 or level 3 category, while the lower Little Lotus and Southfield Canal sites fell within a (still unacceptable) but lower risk category (level 1). Of concern are the high *E. coli* levels (unacceptable level 3) in the lower Zeekoe canal, downstream of Zeekoevlei and the WWTW outlet. These data point to poor effluent from the latter, with data in figure C6 showing zero compliance with *E. coli* general limits.
- With regard to monitored wetlands:
    - *Escherichia coli* concentrations in Rondevlei reduced substantially, with wetland water quality showing that 100% of samples fell within acceptable levels. This is an important and positive outcome.
    - In Zeekoevlei, the number of samples where *E. coli* concentrations were at acceptable levels increased slightly in the 2025 reporting period, reflecting fewer (or smaller) inflows of raw sewage in the vicinity of the vlei, although upstream inflows would still impact on wetland ecosystem function in terms of nutrient and general organic loading. Nevertheless, over this reporting period, 80% of samples in the vlei were in an acceptable condition. Site-level data mapped in figure 20.2 show that, in fact, the most impacted part of the vlei was, not surprisingly, the upstream site (ZEV2S, at the mouth of the Big Lotus River) and that *E. coli* levels generally reduced substantially thereafter, making the main body of the vlei generally safe for intermediate recreational use over this period.
    - Princess Vlei *E. coli* concentrations were at acceptable levels in over 90% of samples collected, suggesting that this waterbody was not generally of high risk, at least for intermediate recreational activities – the risks of full immersion for baptism have not been assessed.
    - Data for the Edith Stephens detention pond showed that this system was impacted by extreme levels of raw sewage, assumed to stem from overflowing sewers along Old Lansdowne Road to the south, with 88% of samples being in the unacceptable range, and 81% being in the level 2 and level 3 range, showing a prolonged, high magnitude of impact.

20.3.3 PHOSPHORUS NUTRIENTS

Summary orthophosphate-phosphorus data (presented as PO_4-P) in **figures 20.1 and 20.3** suggest that:

- The highest concentrations of this nutrient derived from the Big Lotus River, along which concentrations were assessed as unacceptable level 2 and deteriorating, in long-term sites, and level 2 in new sites;
- Samples from the Little Lotus River and the Southfield Canal were all much lower in orthophosphate concentrations, and were rated as poor (noting that poor ratings are the lowest category available for water samples when this variable is considered, due to analytical limitations affecting detection limits – see appendix F);
- Samples from monitored wetlands showed that:
    - Orthophosphate concentrations were high and in the hypertrophic level in samples from Zeekoevlei and Rondevlei, with data for these wetlands showing increases in the number of samples rated as unacceptable from 45–68% and 82–93% for Rondevlei and Zeekoevlei data respectively between the 2024 and 2025 reporting periods. The percentage of unacceptable level 2 samples also increased in Zeekoevlei over this period.
    - These data reflect significantly increased inflows of raw sewage into the upper catchment, which were not reflected in *E. coli* data in this vlei, because of die-off of these bacteria with distance downstream from source.
    - Orthophosphate concentrations in Princess Vlei were generally low (median annual data for sites all rated poor) and reflect a sub-catchment less affected by inflows from informal settlements than the Zeekoevlei sub-catchment.
    - Orthophosphate concentrations in the Edith Stephens detention pond showed excessive eutrophication, linked to a build-up of inflows of raw sewage over time. 100% of samples were rated as unacceptable level 2 with regard to this nutrient.

20.3.4 UN-IONISED (OR FREE) AMMONIA AS A TOXIN

The data presented in **figures 20.1 and 20.4** for this variable indicate that:

- In the main stem rivers in this catchment:
    - 50% of river water samples were rated as unacceptable (i.e. above acute toxicity levels) for this variable.
    - These data reflect catchments with high levels of raw sewage inflows. The site-level data provided in **figure 20.4** show that these samples probably mostly came from the Big Lotus River and Zeekoevlei Canal (downstream of the Zeekoevlei weir), which showed median concentrations in the unacceptable range over the 2025 reporting year.

- Ammonia toxicity was potentially a significant issue in the Edith Stephens detention pond, with 81% of samples collected lying in the unacceptable range.
- Free ammonia concentrations did not appear to have been problematic in Princess Vlei over the 2025 reporting period, with > 75% of data lying in the acceptable range.

20.3.5 DISSOLVED OXYGEN

Summary DO data presented in **figures 20.1 and 20.5** for this variable indicate that:

- In the catchment's rivers:
  - While DO concentrations lay in the target range for 90% of the time in the catchment's rivers, the map in **figure 20.5** shows that DO concentrations at sites in the Big Lotus River were problematic in the 2025 reporting period, and shown as unacceptable and deteriorating. Median DO values for these sites ranged in this reporting period between 1,7 and 3,55 mg/ℓ, suggesting very poor oxygenation at times, attributed to high levels of decaying organic material (mainly raw sewage) in the channels.
  - All sites did, however, show periodic spikes in DO concentrations (in a few cases > 12 mg/ℓ, highlighting likely effects of localised algal growths in hypertrophic waters).
- In monitored wetlands:
  - The Edith Stephen's detention pond sites showed low median DO concentrations in the unacceptable range and reflected the assumed high levels of raw sewage entering these systems (as shown by *E. coli* data) and resulting in elevated COD and BOD.
  - DO concentrations in Rondevlei were always within the target range for this variable.
  - DO was usually within target in Zeekoevlei and Princess Vlei – however, both systems had periods when concentrations were very high, indicating high levels of photosynthesis by algae, in response to nutrient availability, light and warm conditions.

20.3.6 OTHER WATER QUALITY VARIABLES AFFECTING VLEIS IN THE CATCHMENT

Other variables not reported on in the mapped or compliance-type data but of relevance for any catchment that includes standing waterbodies that are utilised for recreational purposes comprise chlorophyll-a and microcystin toxicity data. Of these, the former indicate the density of algal cells in assessed waterbodies, using chlorophyll-a as an indicator of algal presence, while the latter are toxins produced by *Microcystis aeruginosa*, which is dominant in most of Cape Town's recreational waterbodies. The toxins are released when algal cells rupture, often under bloom conditions when their densities are high.

Summary data for both of the above variables are presented in **appendix G** for all waterbodies for which the data are available. Mean annual chlorophyll-a data were very high in Zeekoevlei, and increased by 75% in the 2025 reporting period, from an already high 336,96 µg/ℓ in 2024 to 588,90 µg/ℓ in 2025. Concentrations in Princess Vlei were lower, but still well within the range suggesting hypertrophic conditions.

Of the samples analysed in the 2025 reporting period for microcystin toxins, 90% (84 samples) from Zeekoevlei fell within the target or safe range for this toxin, while 1% (two samples) were assessed as medium risk and 9% (eight samples) fell in the high to extreme risk categories. The latter contributed to the temporary closure of Zeekoevlei in December 2024/early January 2025. No samples analysed from Princess Vlei showed concentrations above acceptable limits.

Algal blooms and the associated periodic release of microcystin toxins into the water as a result of cell rupture are the direct consequences of significant and sustained nutrient enrichment in Zeekoevlei, brought about by both ongoing pollution loading from upstream and internal nutrient cycling from stored organic sediments.

20.4 CONCLUSIONS AND RECOMMENDATIONS

Data presented in this section show that while parts of the Zeekoe catchment experienced relatively good to moderately impacted water quality (Princess Vlei and Little Lotus River sub-catchments), the Big Lotus River was seriously impacted by pollution streams that affected all of the water quality parameters assessed in this report, showing annual mean or median *E. coli*, orthophosphate phosphorus, DO and free ammonia concentrations all in the unacceptable range, and often several orders of magnitude above this threshold. Poor water quality in the lower Zeekoe canal reflected poor water quality from the Cape Flats WWTW.

River water quality was generally far worse than vlei water quality, where extended detention, exposure to sunlight and a dilution effect can mitigate the impacts of inflows of pulses of polluted water. Phosphorus nutrient enrichment was an issue in all four waterbodies assessed, resulting in problem growths of algae and/or water hyacinth and reeds. Nevertheless, water quality in Rondevlei and Princess Vlei was generally acceptable for the four variables assessed, and although Princess Vlei experienced periodic algal blooms, its algal densities were generally much lower than those in Zeekoevlei. Zeekoevlei was the only one of the monitored vleis where microcystins were present in high (toxic) concentrations, leading to temporary vlei closure, with significant economic and reputational damage being incurred by local sporting clubs and their associated businesses (see Day et al., 2025). Water quality in the Edith Stephens detention pond was extremely poor, seemingly reflecting persistent inflows of polluted water over the reporting period.

The data highlight the urgent need, previously noted in Day et al. (2025), to address the major sources of pollution entering the Big Lotus River upstream. At the time of writing this report, the City was investigating interventions such as the use of a package plant for near-source treatment; nano-bubbler technology; and low-flow diversions to sewer. Dredging of organic sediments from Zeekoevlei also commenced during the 2025 reporting period and should play an important role in removal of the build-up of years of algal growth from the vlei bed. However, unless attention is paid to initiating urgent and effective upstream interventions, the positive effects of this expensive and necessary measure will be short-lived.



Figure 20.1

Summary water quality data for the Zeekoe catchment, presented as compliance-type data, showing percentage of all samples that fall into preallocated categories, as per tables 2.1 and 2.3. Data include (A) (geometric) mean annual *Escherichia coli* data; (B) median annual orthophosphate phosphorus (PO_4-P) data; (C) annual ammonia (NH_3) data; (D) median annual dissolved oxygen (DO) data.

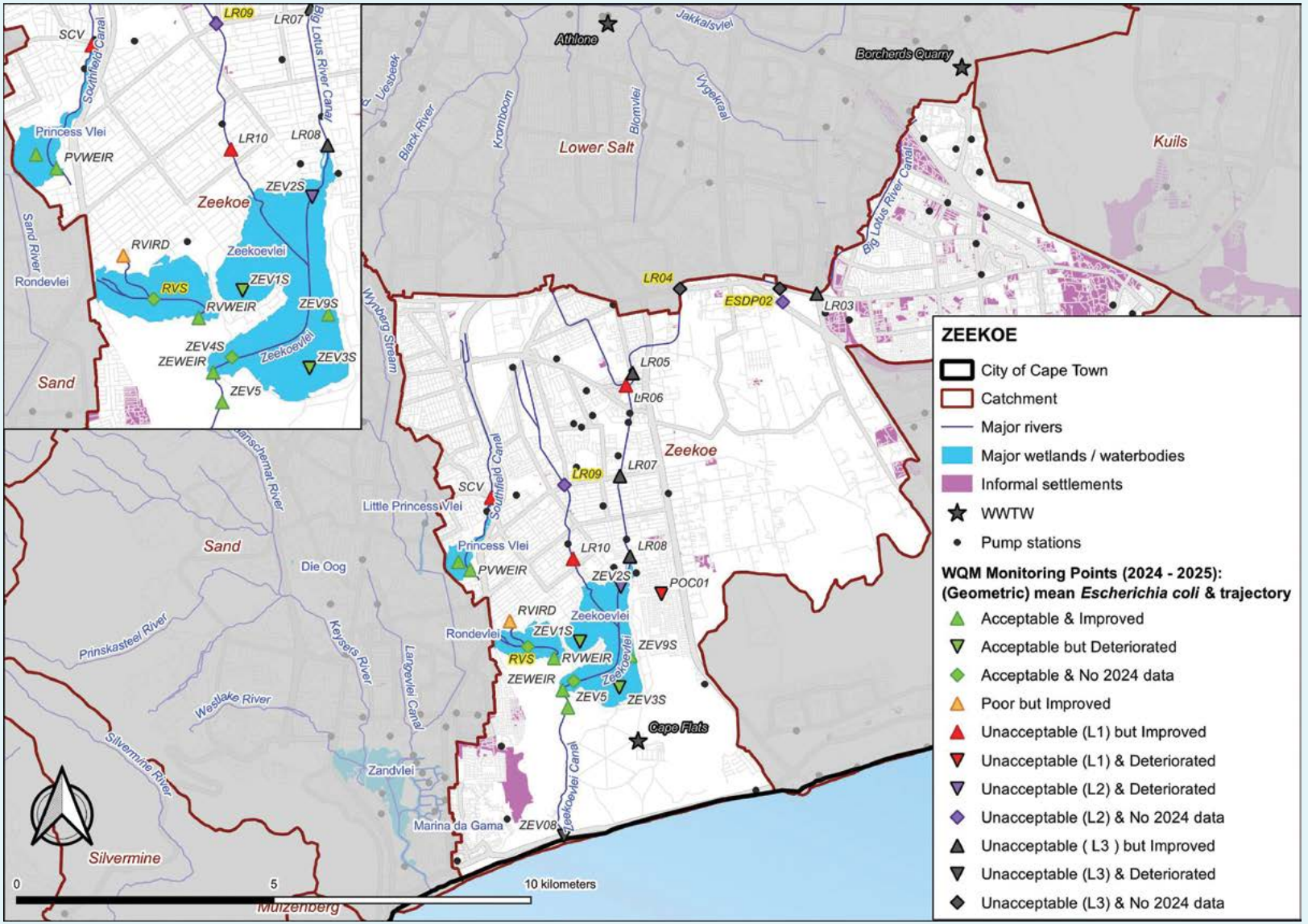


Figure 20.2

Escherichia coli data, focusing on the Zeekoe catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory and condition calculations explained in appendix E.

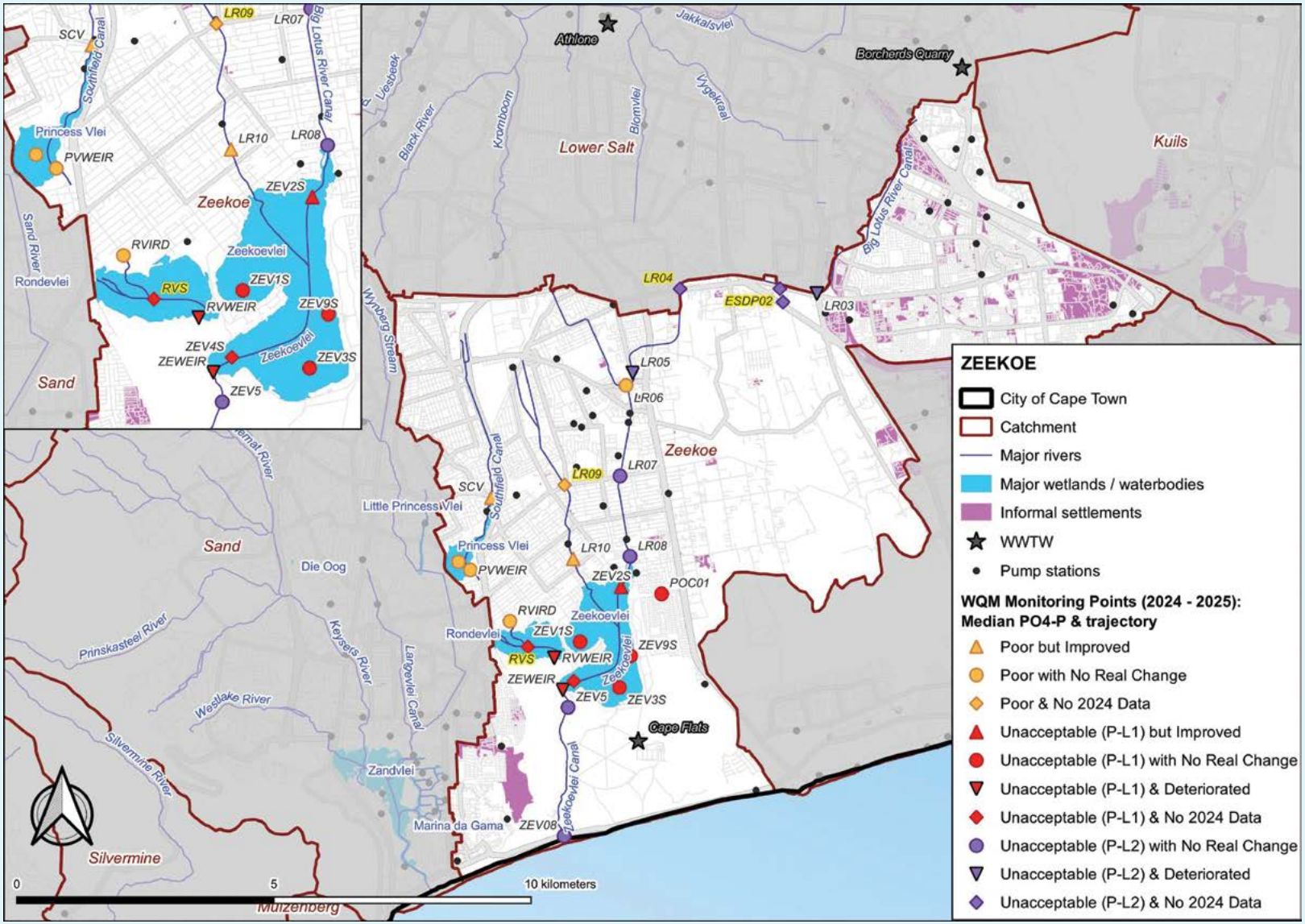


Figure 20.3

Median annual orthophosphate (PO_4-P) data, focusing on the Zeekoe catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

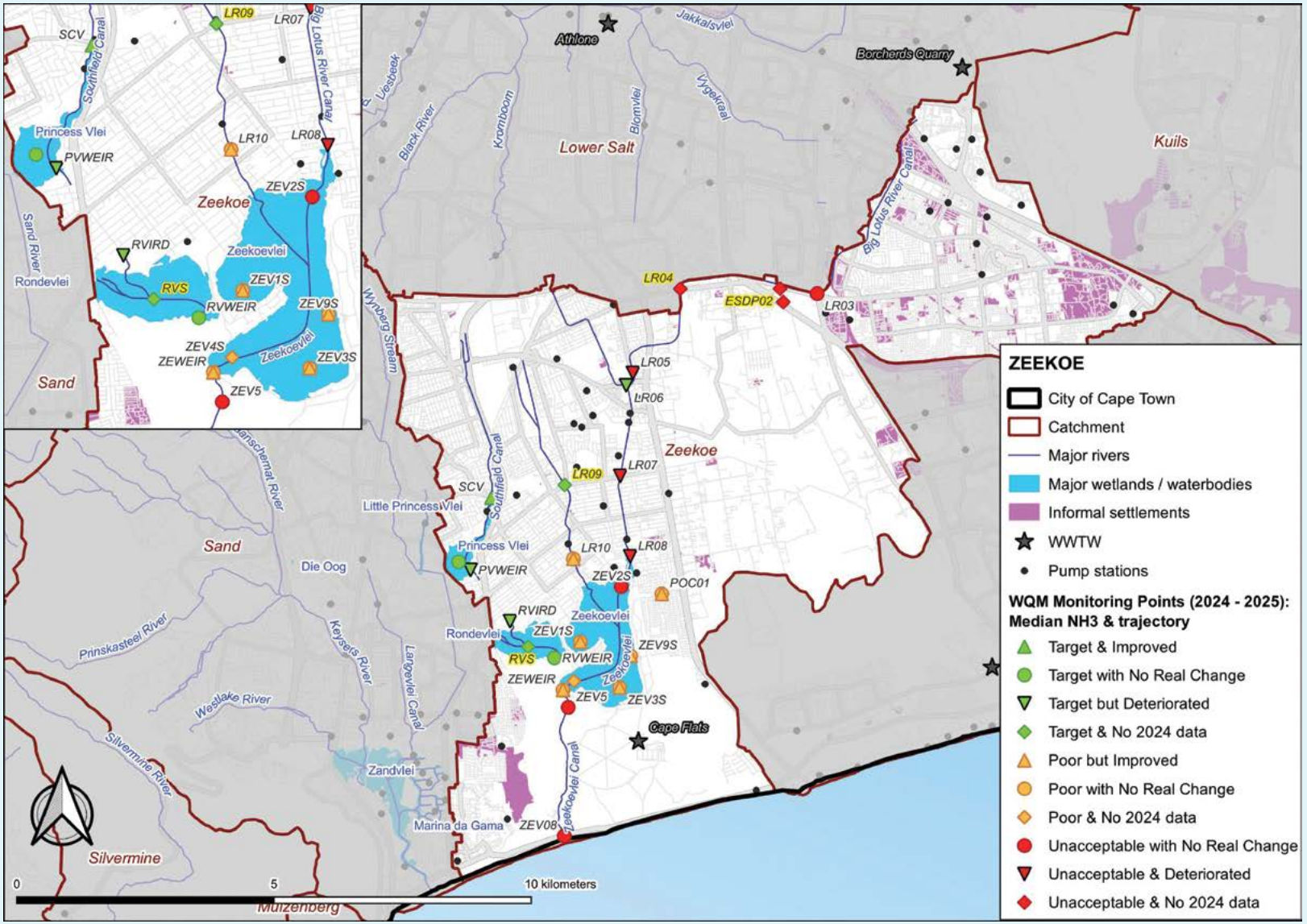


Figure 20.4

Median annual un-ionised (or free) ammonia (NH_3) data, focusing on the Zeekoe catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

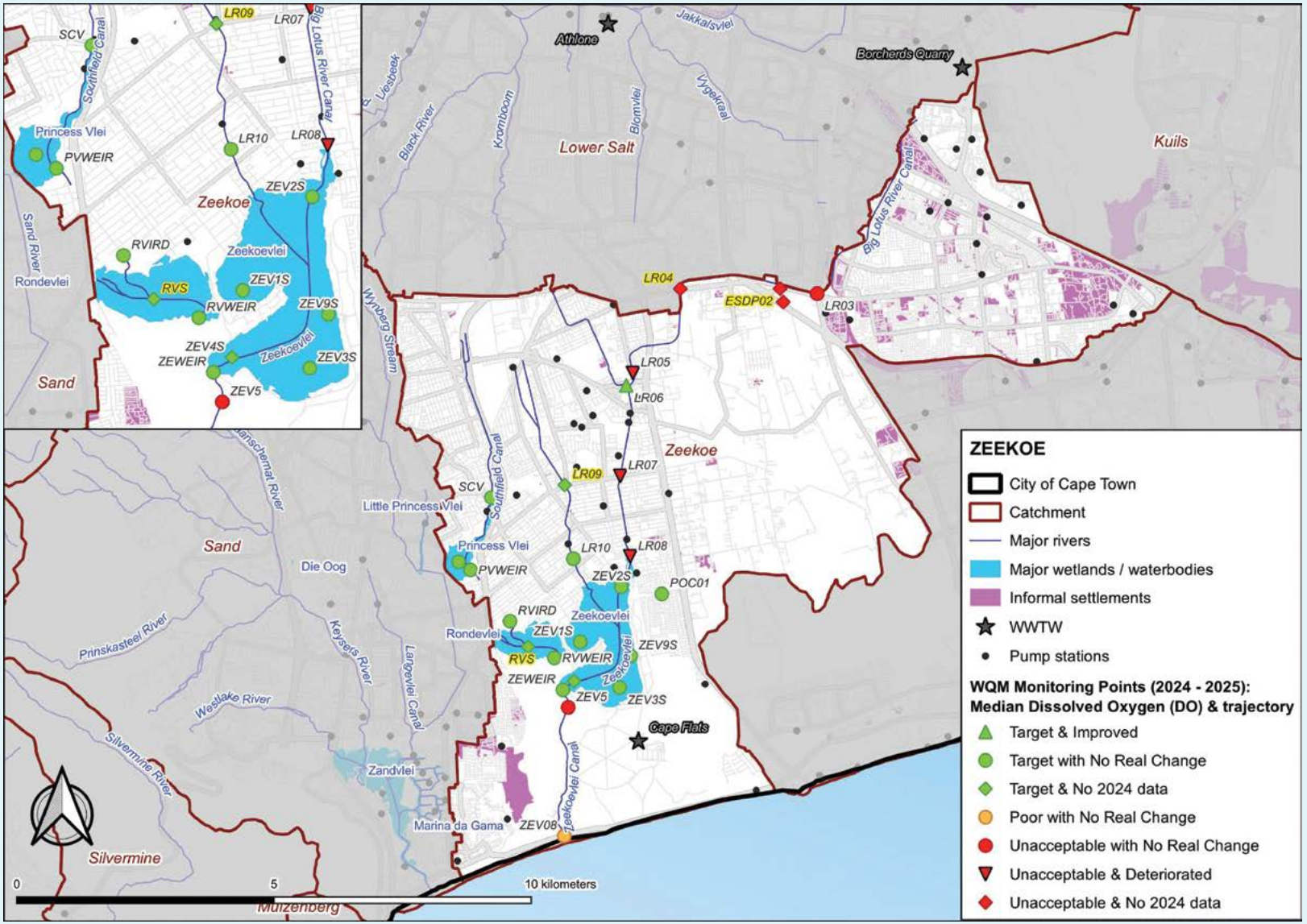


Figure 20.5

Median annual dissolved oxygen (DO) data, focusing on the Zeekoe catchment. Data coded as to level of change in the 2025 reporting period, compared with the 2024 reporting period. Trajectory calculations explained in appendix E.

CONCLUSIONS AND RECOMMENDATIONS

21.1 GENERAL

This report focused on the City's water quality data for the 2025 reporting period against a baseline of data from the previous year (2024 reporting period). It has followed a different format to that of previous reports, in that it presents water quality data on a catchment-by-catchment basis, with general assessment at a city level being presented in section 3. All of the assessments are, however, broad, and the scope of this report does not allow for deep drilling into the reasons for and details of water quality at and between individual sites across all 17 catchments monitored by the City. The coded summary site data provided in **appendix F** may, however, be of value for specific queries around individual sites and river reaches.

This final section of this report has been kept brief, and the recommendations have tried to focus on aspects that lie within the mandate of the CSRM, rather than other City branches and directorates, whose engagement is crucial to successful implementation of the recommendations.

21.2 KEY POLLUTION SOURCES

Key pollution sources that affected Cape Town's watercourses during the 2025 reporting period, and indeed were identified in much earlier annual Inland Water Quality Reports (e.g. Day et al., 2020) as the most significant impacts on water quality, comprised:

- Inflows of treated effluent from the City's WWTW, which discharged large loads of contaminants of known concern in the City's catchments, specifically phosphorus and nitrogen nutrients, often in organic forms in effluent with high TSS, contributing to high CODs, low DO and associated knock-on chemical and biological effects in receiving waterbodies. Additional findings were that:
    - **Appendix C** identifies a number of works that performed poorly against general effluent limits in the 2025 reporting period;
    - Although all WWTW met general effluent limits for orthophosphate in > 90% of samples, and most performed much better (achieving 100% compliance), these limits are excessively high for discharge into catchments that are naturally seasonal, and where at least summer flows often comprise almost wholly treated effluent, supplemented by untreated sewage and greywater runoff.
- Episodic overflows of untreated sewage from faulty sewer pump stations and surcharging manholes – **appendix D** highlights the catchments most affected by these impacts, with the Diep catchment being the worst-performing in this regard, and including one catastrophic overflow, followed by the lower Salt, Kuils and Zeekoe catchments, in descending order.

- Runoff of grey- and blackwater (raw sewage) from informal settlements and areas with high levels of backyard settlements: Seemingly increasing volumes of such flows were flagged as having a significant impact on water quality in catchments such as the Diep and Zeekoe catchment, both of which include important wetland ecosystems in their downstream reaches.
- Accumulations of large volumes of solid waste in and along watercourses and roads and open spaces from where they wash off or are disposed of into stormwater systems and sewers. This waste clogs rivers, distracts from key water quality issues, and results in more frequent sewer pump station and overflows from sewer manholes.
- Other lesser urban impacts play a role in impacting water quality in rivers and other watercourses in catchments or sub-catchments that are not impacted by informal settlements or WWTW inflows. Excluding sewage and pump station overflows, already covered, these include nutrient-enriched seepage or runoff from fertilised residential gardens; runoff of sediment from poorly managed construction sites; and contaminants washed off parking areas and roads.

21.3 KEY RECOMMENDATIONS FROM THIS REPORT

21.3.1 THE NEED TO ADDRESS WWTW, SEWER RETICULATION, PUMP STATION AND SOLID WASTE IMPACTS

Previous annual Inland Water Quality reports have included lengthy recommendations about interventions needed to address impacts stemming directly from failing or poorly performing WWTW, sewer reticulation and pump station issues, and inadequate solid waste management. These interventions are critical, but lie beyond the mandate of CSRM, who are responsible for the Inland Water Quality Monitoring Programme and the measurement and management of stormwater flows through the city. The present report thus simply notes that until the pervasive issues of pollution from WWTW, inflows of raw sewage and greywater from informal settlements and backyard dwellings, as well as solid waste impacts can be addressed, it is unlikely that there will be a significant turnaround in water quality in many areas of the city. Serious reflection and problem solving at executive director (ED) level, between the departments of Water and Sanitation and Urban Waste Management, including their key directors and the City's four stormwater district managers, must take place in order to facilitate effective policing, reporting, management and other interventions that result in actual change on the ground.

It is critical that these interventions include short-term measures that will direct existing flows of raw sewage from watercourses (rivers and wetlands) into areas that include adequate technologies designed for sewage treatment.

21.3.2 PROTECTION AND IMPROVED MANAGEMENT OF LEAST-IMPACTED CATCHMENTS

An important recommendation from this report is that Cape Town's least-impacted rivers in terms of water quality should be carefully managed and actively conserved, with any deterioration rigorously investigated. These systems would all, moreover, usually be better candidates for ecological rehabilitation projects than other watercourses that are extremely adversely affected, where water quality amelioration should be prioritised. This report has identified these as including the Lourens and Silvermine catchments, and the upper Hout Bay catchment, as well as catchments included in inland water quality reporting for the first time (namely the small river catchments within the southern section of the City Bowl along the Atlantic Seaboard, the Modder River in the Atlantis catchment, and tributaries in the south-eastern part of the Eerste catchment).

21.3.3 CONSIDER INTERIM USE OF ALTERNATIVE TECHNOLOGIES TO IMPROVE WATER QUALITY IN IDENTIFIED POLLUTION HOTSPOTS

Section 17 mentions the apparently effective use of nano-bubbler technology in the lower Soet catchment, as deployed by private residents. Such interventions should be considered, along with interventions such as modular sewage treatment package plants and other appropriate measures, to provide interim relief in watercourses where important downstream aquatic ecosystems are threatened (e.g. Zeekoevlei in the FBNR Ramsar wetland site), and where the odour and other impacts of pollution critically impact on local communities (e.g. Big Lotus River; Soet River catchment; areas of the Diep sub-catchment).

21.3.4 NEED FOR IMPROVED LEVELS OF DETECTION IN ORTHOPHOSPHATE ANALYSES AND INCLUSION OF TOTAL PHOSPHORUS ANALYSES

Changes in equipment at SSB have, since December 2022, resulted in an increase in the level of detection in orthophosphate analyses from < 0,01 mg P/ℓ to < 0,1 mg P/ℓ. This is an order of magnitude increase in the detectable concentrations of phosphorus, and means that it is standard reporting conventions of reporting such data at 50% of the detection limit, all data reported as undetected are analysed in datasets as 0,05 mg P/ℓ. This means that the best category achievable by any orthophosphate data analysed by SSB can only be 'poor' for rivers/flowing systems. Since total phosphorus analyses ceased post-December 2022 (used for wetland and vlei/standing water data interpretation), the level of phosphorus enrichment of vleis and other 'standing' waterbodies can also only be assessed using orthophosphate concentrations, and the default minimum 'poor' label is thus attached to these samples as well.

This has implications for tracking the trajectory of concentrations of this critical nutrient in the City's waterbodies, as high detection limits/limits of quantification may mask improvements in some systems, and will not indicate significant deterioration in others.

It is recommended that urgent attention should be paid to resourcing SSB to address the lack of capacity to analyse orthophosphate phosphorus at useful limits of detection and to analyse total phosphorus at all. Alternatively, these analyses should be outsourced to external accredited laboratories.

21.3.5 NEED TO DIFFERENTIATE BETWEEN ROUTINE AND POLLUTION-TRACKING DATA

An issue that has caused considerable delays and the need for complex data manipulation in this project has been the fact that the City's routine water quality database includes both data for routine (monthly or weekly) samples from its monitoring sites, as well as additional samples collected when pollution events are noticed or suspected. Such samples may be repeated several times over a few weeks. If left in the dataset, they would skew annual reporting data, by including multiple samples collected specifically over periods of water quality impairment. However, the SSB dataset does not identify which samples are routine and which are additional. This makes cleaning of the large dataset difficult and time-consuming.

It is strongly recommended that SSB include codes in their datasets that identify routine from emergency/pollution tracking or control data.

21.3.6 MONITORING OF RIVER AND MAJOR POINT-SOURCE POLLUTION FLOWS

Water quality data on their own do not allow calculations of pollution loading on downstream ecosystems. This means that the impact of high concentrations from small discharge sources may be overestimated, while significant impacts resulting from large discharges of less polluted effluent may be missed.

It is (as per previous reporting) recommended that measurement of flows and the conversion of these data to estimated discharge should take place from at least Cape Town's major mainstem rivers, with an emphasis on those in highly polluted areas, where discharge data can be used to calculate pollution loading and motivate for appropriate pollution-control interventions, sized as to the scale of the problem.

21.3.7 DEVELOPMENT OF A WATER QUALITY INDEX

At the time of this submission, the City had issued an RFQ for the development of a new Water Quality Index for its inland waters. Such an index, if developed with scientific rigour and a degree of pragmatism, would go a long way towards simplifying annual (and other) reporting on the City's Inland Water Quality Programme, and is supported by this report.

21.3.8 FUNDING OF SOLID WASTE CLEARING FROM WATERCOURSES IN SOLID WASTE HOTSPOTS

In the absence of more effective clearing of solid waste from terrestrial catchment areas by the Urban Waste Directorate, additional investment in the ongoing removal of solid waste from watercourses, as close to source as possible, must be allowed for by CSRM. This should allow for the strategic placement and regular (in some areas, daily) clearing of waste interceptor fences. It is recommended that access to dumping areas along most-impacted watercourses should be further restricted by bollards, or fences with turnstiles or similar, allowing for dumping to be focused in areas outside of the watercourse corridors.

21.3.9 ATTENTION TO AWARENESS AND EDUCATION CAMPAIGNS

It is recommended that attention be paid to increasing public awareness around the following:

- The availability (and use) of the C3 reporting platform for reporting on observed pollution streams, such as overflowing manholes and pump stations, as well as stormwater pipes discharging outside of rainy conditions;
- The ecological and other implications of using phosphorus-based detergents, which form direct pathways to WWTW and downstream watercourses. At the same time, innovative measures to improve uptake of non-phosphorus-based products should be considered.

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APPENDIX A

WATER QUALITY SAMPLING SITES AND MONITORING RECORD

		ASSESSMENT YEAR	
SUB-CATCHMENT	SYSTEM	2024	2025
Atlantis	River		2
City	Canal		1
	River		5
	Sea SW outlet	12	12
Diep	Canal	5	5
	Estuary	4	4
	River	7	10
	Vlei	10	11
	Vlei and wetland		2
Eerste	Canal	1	
	Detention pond		1
	Estuary	1	1
	River	5	13
Else	Vlei	1	
Elsieskraal	Canal	1	
	Dam	4	7
	River	2	6
Hout Bay	Estuary	1	1
	River	4	5
	Sea SW outlet	1	1
Kuils	Canal	3	
	Detention pond	1	4
	River	3	6
Lourens	Detention pond		1
	River	7	10
	Stormwater outlet	1	1
Lower Salt	Canal	8	
	River	10	20
Mosselbank	Canal	2	
	Detention pond		4
	River	6	10

		ASSESSMENT YEAR	
SUB-CATCHMENT	SYSTEM	2024	2025
Mitchells Plain	Detention pond	2	2
	Stormwater outlet	2	2
Muizenberg	Sea SW outlet	2	2
Noordhoek	River		1
	Vlei	3	3
Sand	Canal	4	2
	Estuary	12	13
	River	11	18
	Sea SW outlet	1	1
	Vlei	7	7
Silvermine	River	3	3
	Sea SW outlet	4	4
Sir Lowry's Pass	River	7	7
Soet	Canal		3
	River	1	2
Sout	River	2	3
South Peninsula	Canal	1	1
	River	3	6
	Vlei		1
Zeekoe	Canal	6	3
	Detention pond		2
	Effluent	1	1
	River	3	8
	Stormwater outlet	1	1
	Vlei	6	7
	Vlei and wetland		1
Grand Total		**181**	**247**

APPENDIX B

TRENDS AND PATTERNS IN RAINFALL IN THE 2025 REPORTING PERIOD

B1 DATASETS USED FOR THE ANALYSES

Daily rainfall data were provided by the CSRM for 38 rain-gauging stations across Cape Town, spanning the period October 2020 to September 2025 (i.e. reporting years 2021 through to 2025), to gain an understanding of the amount and patterns of rainfall in reporting year 2025 compared to that of the previous few years. Unfortunately, the dataset provided had numerous 'no data' entries for most of the stations during the relevant reporting periods. In the end, the rainfall analyses completed for the current report involved the use of data from only seven official CCT rain-gauging stations with no missing data. The seven stations that were selected are spread across six of the CCT's sub-catchments (see list in table B1).

Additional monthly rainfall data for the five-year period of analysis (reporting years 2020 through to 2024) were obtained for rain-gauging stations at the Rondevlei section of False Bay Nature Reserve (in the Zeekoe catchment) and at Intaka Island (in the Diep catchment). The Intaka Island dataset included a reliable long-term record of historical monthly rainfall figures, from which 20 years of rainfall data were extracted for the period October 2005 to September 2025, to gain a better understanding of the rainfall patterns in the study area during the time period of analysis in relation to longer-term trends.

Table B1

List of rain-gauging stations used in the rainfall analyses, indicating which catchment and sub-catchment each station is located within [official CSRM rain stations in bold].

Rain station	Description	Catchment	Sub-catchment
ATLA17AR	`	Sout	[n/a]
INTAKA	Intaka Island, Century City	Diep	Diep
ELSI03BR	Dagbreek Reservoir	Salt	Elsieskraal
ELSI03CR	Tygerberg Reservoir		
VYGE03GR	Athlone WWTW		Lower Salt
DIEP05CR	Wynberg Reservoir	Sand	[n/a]
RONDEVLEI	Rondevlei Section of FB Nature Reserve	Zeekoe	[n/a]
KHAY01RS	Khayelitsha Roads Depot	M-Plain	[n/a]
SPEN13AR	Brooklyn WTP, Red Hill, Simon's Town	South Peninsula	[n/a]

[Note that rain stations KEYS05FR and LOUR06DR were included in the previous report but could not be used for the current reporting period due to unreliable data.]

B2 OUTPUTS AND MAIN FINDINGS OF THE RAINFALL ANALYSES

The outputs of the analyses (figures B1 to B6) indicate that, at most of the stations that were analysed, there has been a trend of decreasing year-on-year annual rainfall from reporting year 2023 (a particularly wet year) to reporting year 2025, with total annual rainfall in the 2025 reporting period being close to the lowest recorded in the last five years. The only real exception to this pattern was VYGE03GR at the Athlone WWTW in the lower Salt sub-catchment, where the total annual rainfall in reporting year 2025 was greater than that of reporting year 2024, and among the highest rainfalls recorded at that station in the five-year period from reporting year 2021. At most of the stations, the annual rainfall in reporting year 2025 was significantly below the 20-year long-term MAR recorded at Intaka Island (554 mm), with the exception of stations VYGE03GR, DIEP05CR and RONDEVLEI.

Analysis of total monthly rainfall against maximum daily rainfall during each month for the stations for which daily rainfall data were available (**figure B3**) shows that June 2025 was the wettest month during reporting year 2025 and that, at most of the stations, a single rainfall event was responsible for between one-third and one-half of the total monthly rainfall in this month. These graphs also reveal that, at all of the stations, the maximum monthly rainfall for reporting year 2025 (in June 2025) was still significantly lower than the maximum monthly rainfall for reporting year 2024 (which occurred in July 2024).

In terms of seasonality, the total winter rainfall at most stations in reporting year 2025 was less than that recorded during reporting years 2023 and 2024 (**figure B5**), with the exception of stations KHAY01RS and RONDEVLEI (where it was less than that of reporting year 2024 but greater than or similar to that of reporting year 2023) and station VYGE03GR (where it was, anomalously, greater than that of reporting year 2024 and similar to that of reporting year 2023). At most stations across the city, the total winter rainfall recorded during reporting year 2025 was lower than the 20-year long-term winter average derived from the Intaka Island dataset (399 mm), with the exception of stations DIEP05CR, RONDEVLEI and VYGE03GR. At all of the stations for which analyses were completed, the total summer rainfall was very low during reporting year 2025, as was the case for reporting year 2024, being significantly lower than the 20-year long-term summer average derived from the Intaka Island dataset (155 mm) (see **figure B6**).

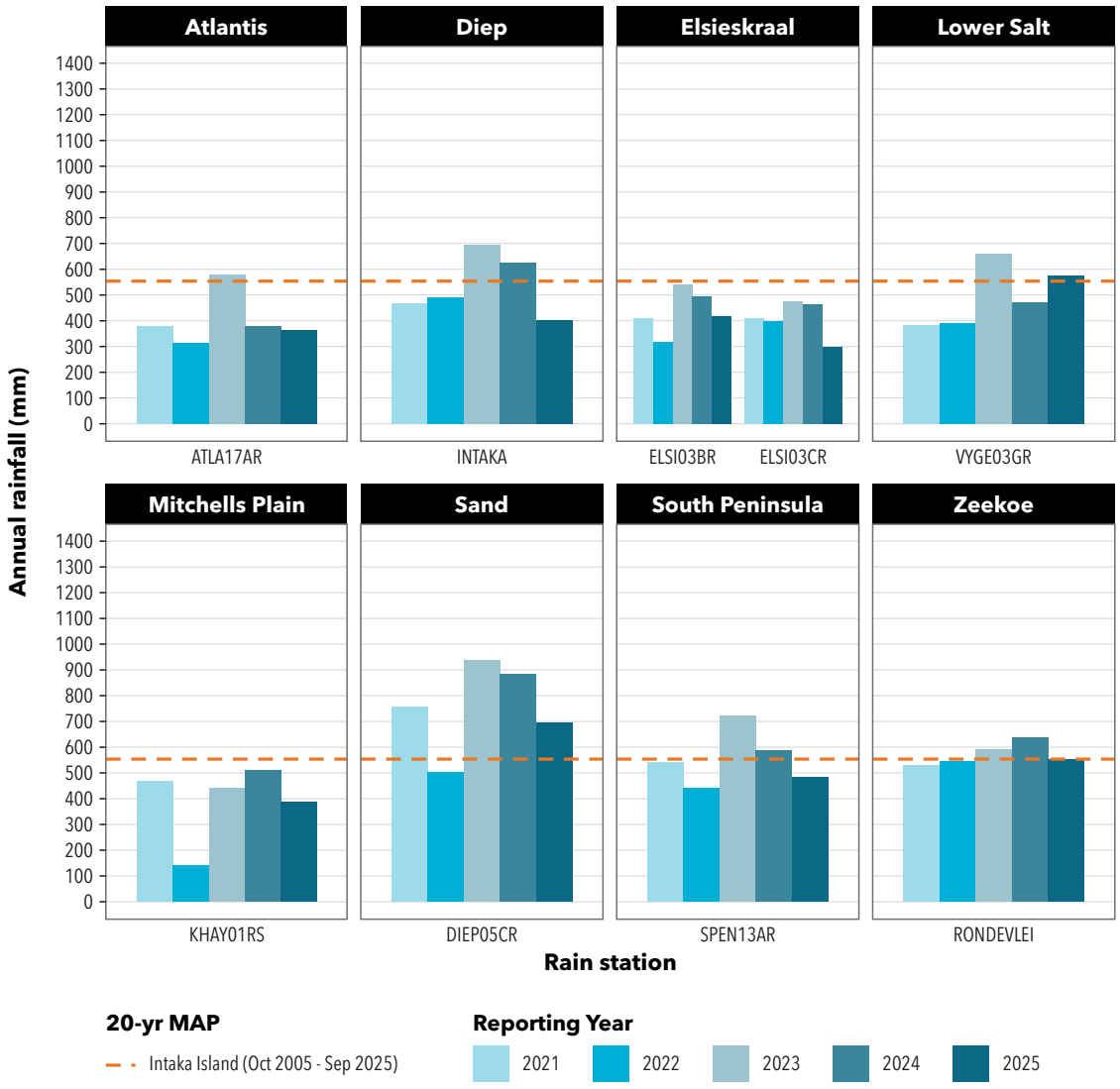


Figure B1

Total annual rainfall (reporting years 2021–2025) at each of the rain-gauging stations that were selected for the rainfall analyses, grouped by sub-catchment, showing the long-term (20-year) map at Intaka Island.

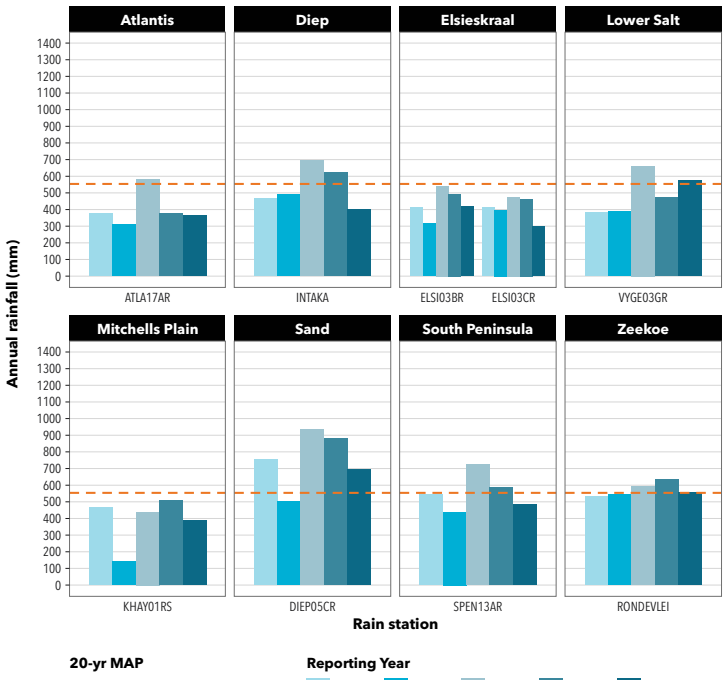


Figure B2

Mean annual rainfall (and standard deviation) per year across all of the rain-gauging stations that were selected for the rainfall analyses (reporting years 2021–2025).

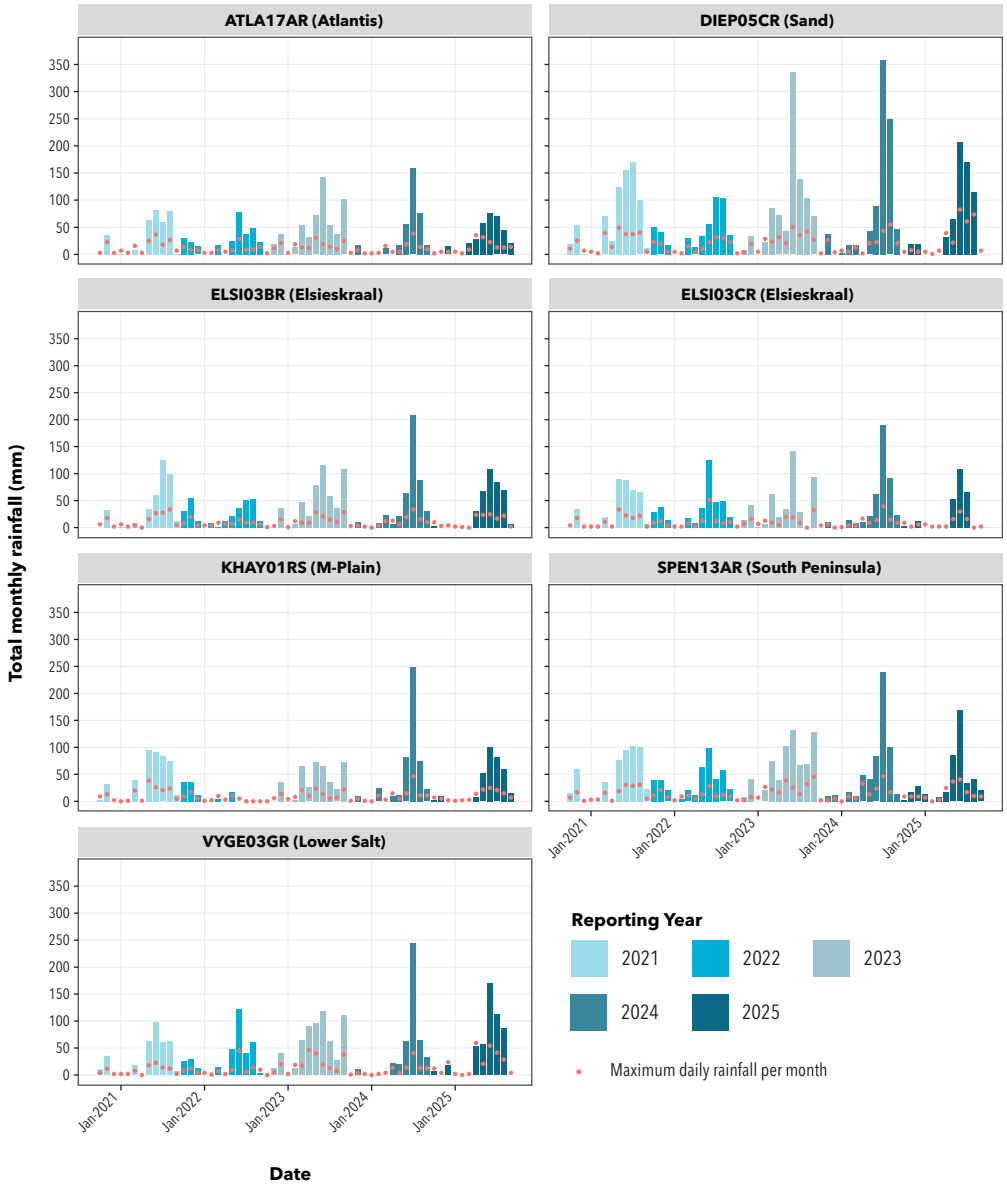


Figure B3

Total monthly rainfall (bars) and maximum daily rainfall per month (red dots) at each of the CCT-operated rain-gauging stations that were selected for the rainfall analyses (reporting years 2021–2025), indicating the sub-catchment (in brackets behind the station name).

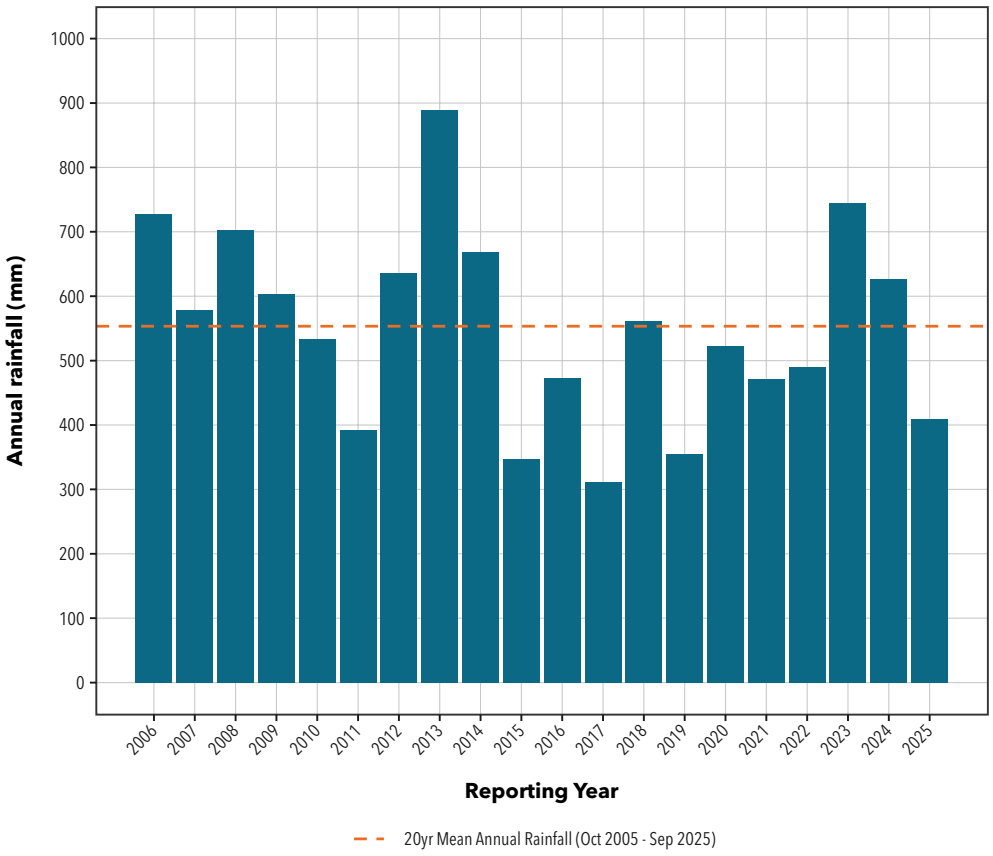


Figure B4

Total annual rainfall at Intaka Island for the 20-year period Oct 2005–Sep 2025, showing the mean annual rainfall over this period.

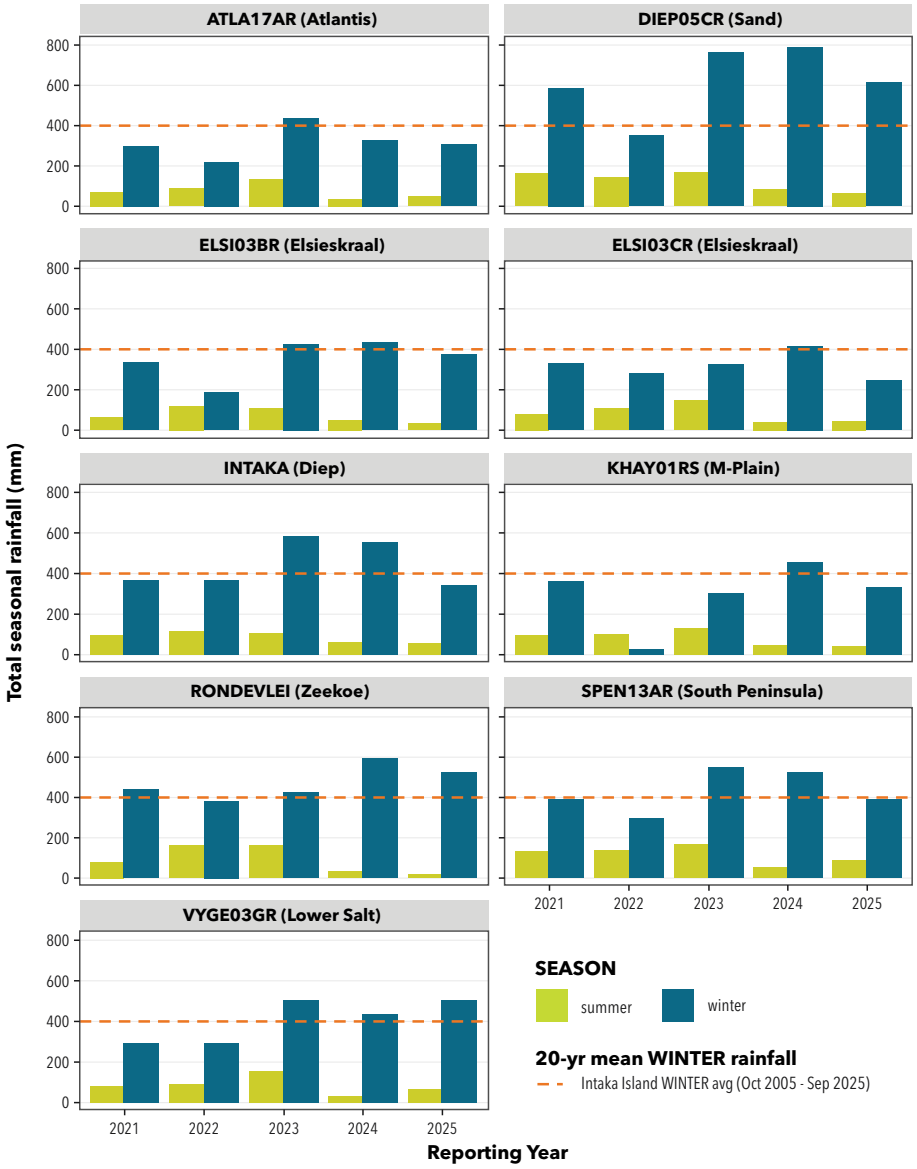


Figure B5

Total rainfall per season at the rain-gauging stations for each reporting year from 2021 to 2025, compared with the 20-year mean winter rainfall figure derived from the Intaka Island dataset.

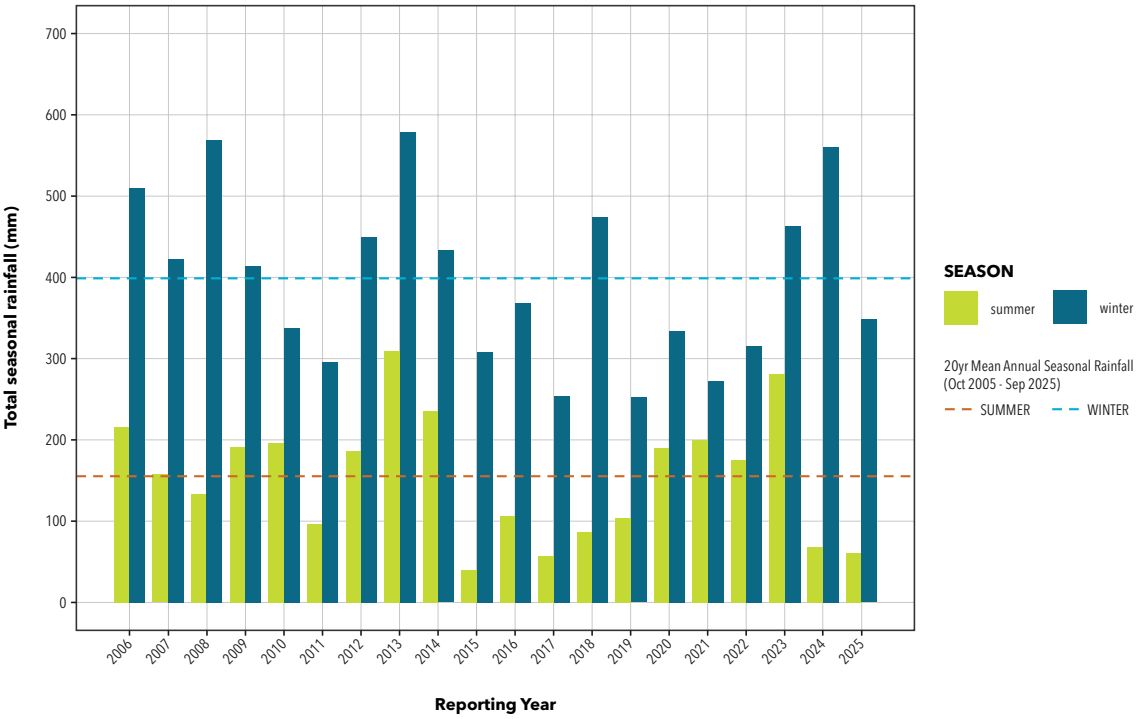


Figure B6

Total summer and winter rainfall at Intaka Island for each reporting year between 2006 and 2025, in relation to mean annual summer and winter rainfall for the full 20-year period.

B3 IMPLICATIONS OF RAINFALL DATA FOR WATER QUALITY

The general implications of relatively lower rainfall in Cape Town in the 2025 reporting period are that wet season dilution of polluted waters is likely to have been reduced. In areas where rainfall recharges primary aquifers (e.g. on the Cape Flats), lower annual rainfall is assumed to have had an impact on groundwater levels as well, potentially reducing the rate of groundwater discharge into rivers and vleis within these areas and thus potentially increasing the contribution of polluted surface flows, often comprising treated and untreated sewage effluent and greywater, to watercourses.

At the same time, in some catchments where small to moderate storm events in fact result in a worsening of water quality as a result of catchment wash-off effects (Cerfonteyn and Day, 2009), it is possible that wet season water quality may in fact have improved as a result of less frequent rain events. These issues are considered in the relevant sections of this report, by catchment.

APPENDIX C

WASTEWATER TREATMENT WORKS PERFORMANCE

C1 OVERVIEW AND BACKGROUND

The City has 25 WWTW, 16 of which pass effluent into inland aquatic ecosystems and are therefore considered in this report. These 16 WWTW treated approximately 576 Mℓ/day during the 2025 reporting period, and this is discharged into a number of different aquatic ecosystems. Nine of the City's WWTW plants discharge directly to the marine or coastal environment. Cape Town's marine outfalls contribute approximately 5% of the total amount of wastewater produced in Cape Town, with 95% of Cape Town's wastewater discharging first into inland aquatic ecosystems, which lead to the sea via rivers and/or estuaries. Of these, the Cape Flats and Macassar WWTW discharge into estuaries in close proximity to the mouths of these systems. The largest of these works by effluent volume discharged is the Cape Flats WWTW, followed (in descending order) by Zandvliet, Athlone, Potsdam, Bellville, Macassar and Borcherds Quarry WWTW. Effluent flows from these seven works make up roughly 90% of total final treated effluent flows produced in the City's works.

The quality and the quantity of effluent that is discharged from the City's WWTW is regulated, at least theoretically, by a water use licence issued by the national Department of Water and Sanitation or the Breede-Olifants Catchment Management Agency in terms of the National Water Act. Auditing of WWTW compliance is currently undertaken through the Green Drop Certification programmes, as well as through direct monitoring and reporting programmes stipulated in the conditions included in the various individual WWTW licences.

In general, effluent quality from the City's WWTW is required to comply as a minimum with the DWS's general effluent limits, as listed in **table C1** (taken from Government Notice No. 169 of 2013). Since the main focus of this report is on inland water quality and not on WWTW compliance, only those water quality variables that are most relevant to the receiving environments (rivers, vleis, dams, estuaries and wetlands) are considered here, and this appendix is not intended to comprise an audit on WWTW compliance.

The data presented here also need to be considered in the context of impacts on receiving watercourses. Even WWTW effluent discharges that are fully compliant with general limits for effluents may exert major impacts on aquatic ecosystems, where the volume of effluent discharged exceeds or dominates the volume of natural flows in the river or wetland at any time.

C2 LOCATIONS OF INLAND WWTWS

The inland WWTW are located in the following major catchments/sub-catchments (see figure C1):

- Eerste sub-catchment
  - Macassar WWTW
- Kuils sub-catchment:
  - Scottsdene WWTW
  - Bellville WWTW
  - Zandvliet WWTW
- Mosselbank sub-catchment:
  - Klipheuwel WWTW
  - Kraaifontein WWTW
  - Fisantekraal WWTW
- Lower Diep sub-catchment:
  - Potsdam WWTW
- Sout sub-catchment:
  - Melkbosstrand WWTW
  - Wesfleur Industrial WWTW
  - Wesfleur Domestic WWTW
- Lower Salt sub-catchment
  - Athlone WWTW (note that sludge from this WWTW is at times piped to the Cape Flats WWTW, in the Zeekoe sub-catchment)[10]
  - Borcherds Quarry WWTW
- South Peninsula catchments
  - Wildevoëlvlei WWTW
- Zeekoe catchment:
  - Cape Flats WWTW
- Sir Lowry's Pass catchment:
  - Gordon's Bay WWTW

C3 DATA ACCESSED FOR ANALYSIS

Data presented here were provided in raw form by the City of Cape Town for the 2025 reporting period. They are presented in figures C2 to C6 as compliance-type data, rating each data point per variable against the general limits outlined in GN383 of 2019, and repeated in table C1. The graphs indicate the proportion of data that fall above or within the general limits (rated 'unacceptable' or 'compliant' respectively).

Table C2 by contrast provides summary annual data for key variables for each of the inland WWTW, including daily loading data, calculated from final effluent discharge volumes also in the table.

[10] Comment from Mr L Abdullah (CSRM) to Liz Day

Table C1

General and special effluent limits as applicable to discharges from WWTW into water resources in South Africa (Government Notice (GN) 383 of 2019: Continuation of the General Authorisation of GN169 of 2013: Revision of General Authorisations in terms of Section 39 of the National Water Act, Act 36 of 1998).

SUBSTANCE/PARAMETER	GENERAL LIMIT	SPECIAL LIMIT
Faecal Coliforms (per 100 ml)	1 000	0
Chemical Oxygen Demand (mg/l)	75 (i)	30 (i)
pH	5,5 – 9,5	5,5 – 7,5
Ammonia (ionised/un-ionised) as Nitrogen (mg/l)	6	2
Nitrate/Nitrite as Nitrogen (mg/l)	15	1,5
Chlorine as Free Chlorine (mg/l)	0,25	0
Suspended Solids (mg/l)	25	10
Electrical Conductivity (mS/m)	70 mS/m above intake to a maximum of 150 mS/m	50 mS/m above background receiving water, to a maximum of 100 mS/m
Ortho-Phosphate as phosphorous	10	1 (median) and 2,5 (maximum)
Fluoride (mg/l)	1	1
Soap, oil or grease (mg/l)	2,5	0

SUBSTANCE/PARAMETER	GENERAL LIMIT	SPECIAL LIMIT
Dissolved Arsenic (mg/l)	0,02	0,01
Dissolved Cadmium (mg/l)	0,005	0,001
Dissolved Chromium (VI) (mg/l)	0,05	0,02
Dissolved Copper (mg/l)	0,01	0,002
Dissolved Cyanide (mg/l)	0,02	0,01
Dissolved Iron (mg/l)	0,3	0,3
Dissolved Lead (mg/l)	0,01	0,006
Dissolved Manganese (mg/l)	0,1	0,1
Mercury and its compounds (mg/l)	0,005	0,001
Dissolved Selenium (mg/l)	0,02	0,02
Dissolved Zinc (mg/l)	0,1	0,04
Boron (mg/l)	1	0,5

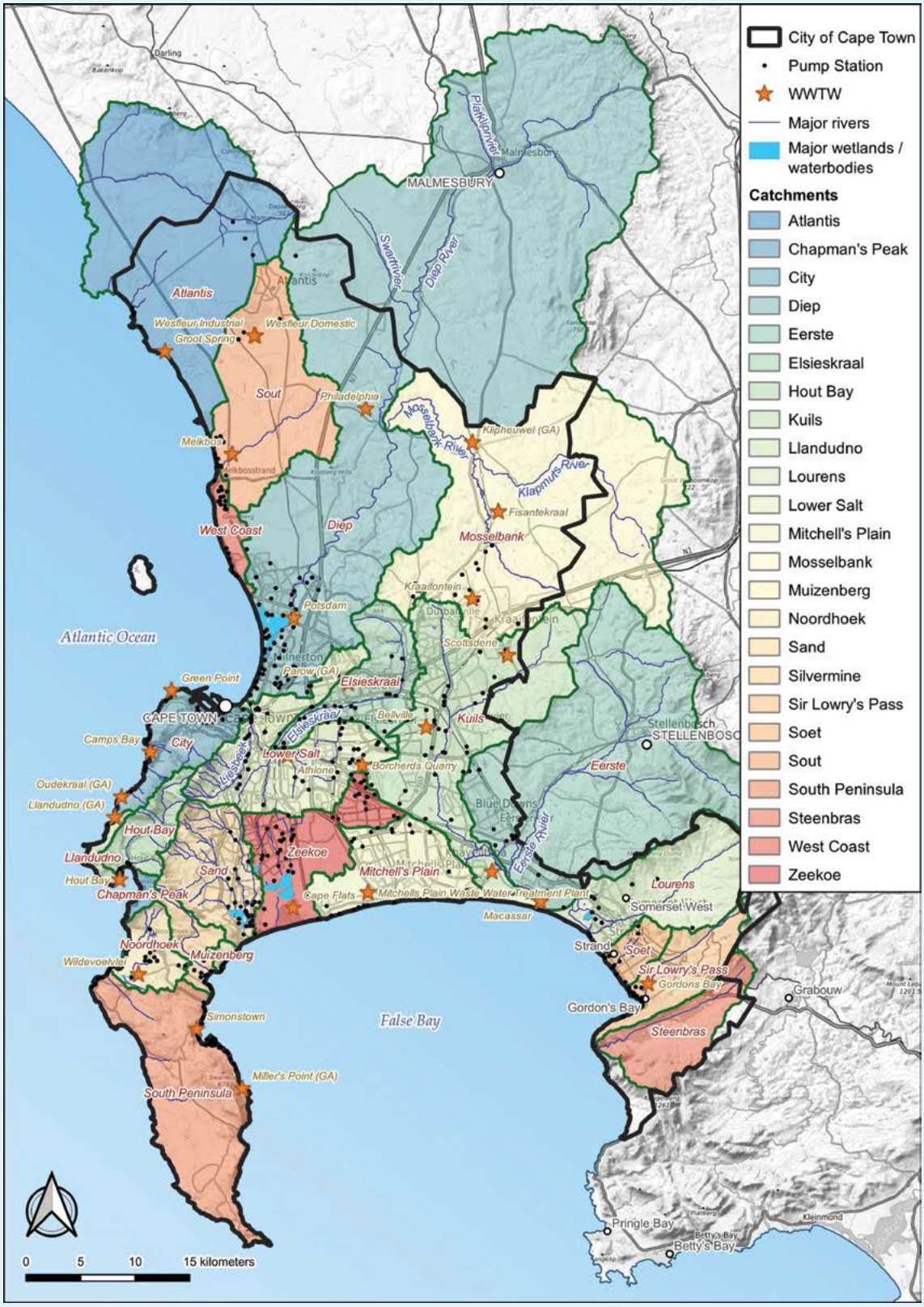


Figure C1

Locations of the City's WWTW, including its nine marine/coastal outfalls and 16 inland WWTW.

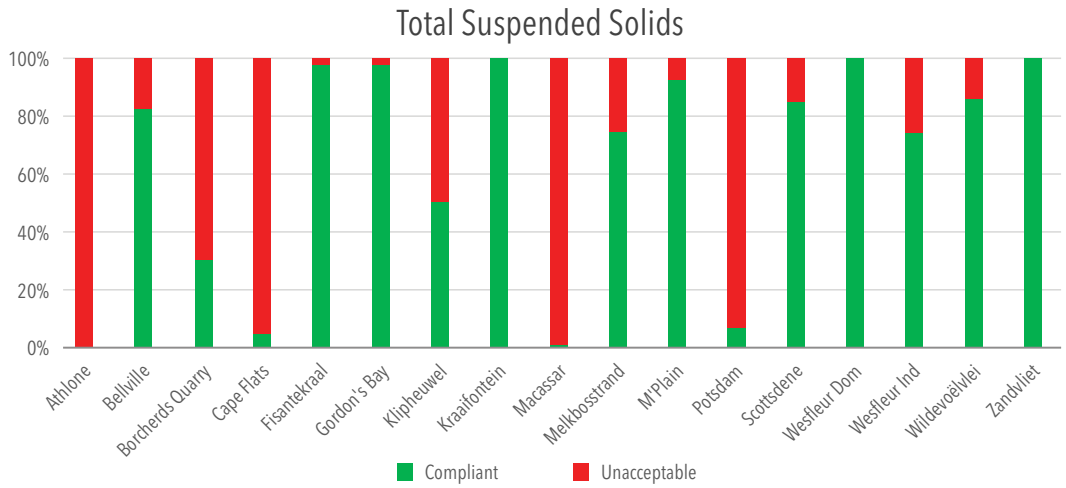


Figure C2

Total suspended solid (TSS) compliance of final effluent from the City's inland WWTW for the 2025 reporting period, measured against general limits of GN383 of 2019. Note that of the works shown, M'Plain (Mitchells Plain) does not discharge into inland waters but instead discharges into the sea in False Bay.

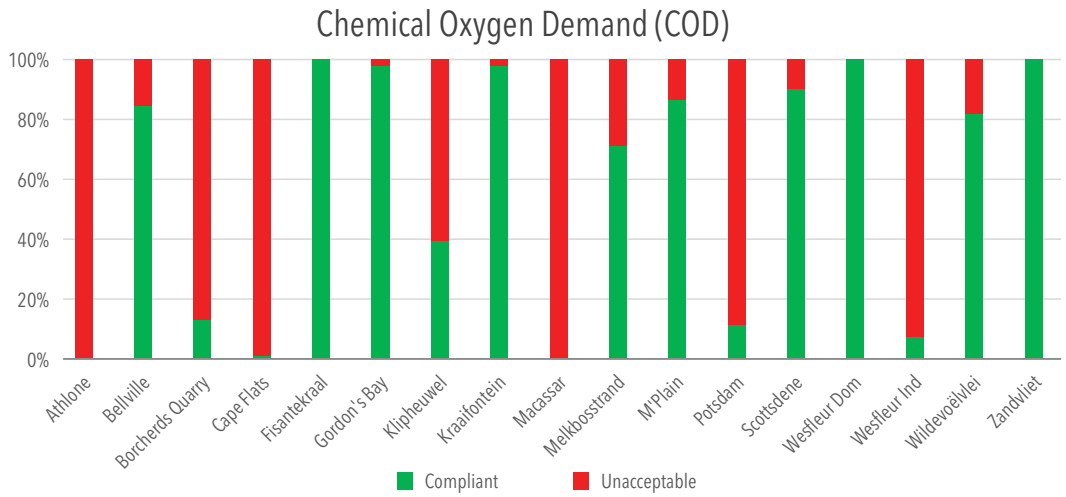


Figure C3

Chemical oxygen demand (COD) compliance of final effluent from the City's inland WWTW for the 2025 reporting period, measured against general limits of GN383 of 2019. Note that of the works shown, M'Plain (Mitchells Plain) does not discharge into inland waters but instead discharges into the sea in False Bay.

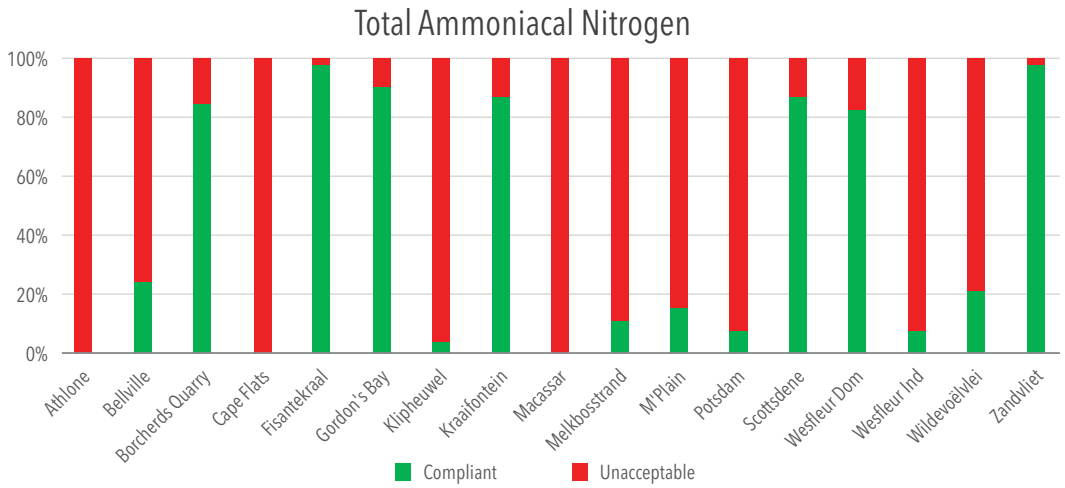


Figure C4

Total ammoniacal nitrogen compliance of final effluent from the City's inland WWTW for the 2025 reporting period, measured against general limits of GN383 of 2019. Note that of the works shown, M'Plain (Mitchells Plain) does not discharge into inland waters but instead discharges into the sea in False Bay.

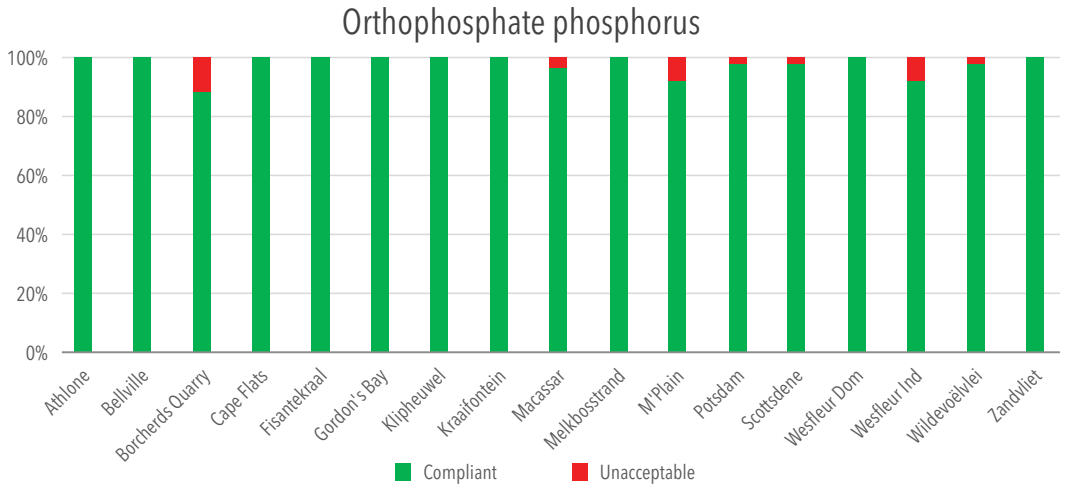


FIGURE C5

Orthophosphate phosphorus compliance of final effluent from the City's inland WWTW for the 2025 reporting period, measured against general limits of GN383 of 2019. Note that of the works shown, M'Plain (Mitchells Plain) does not discharge into inland waters but instead discharges into the sea in False Bay.

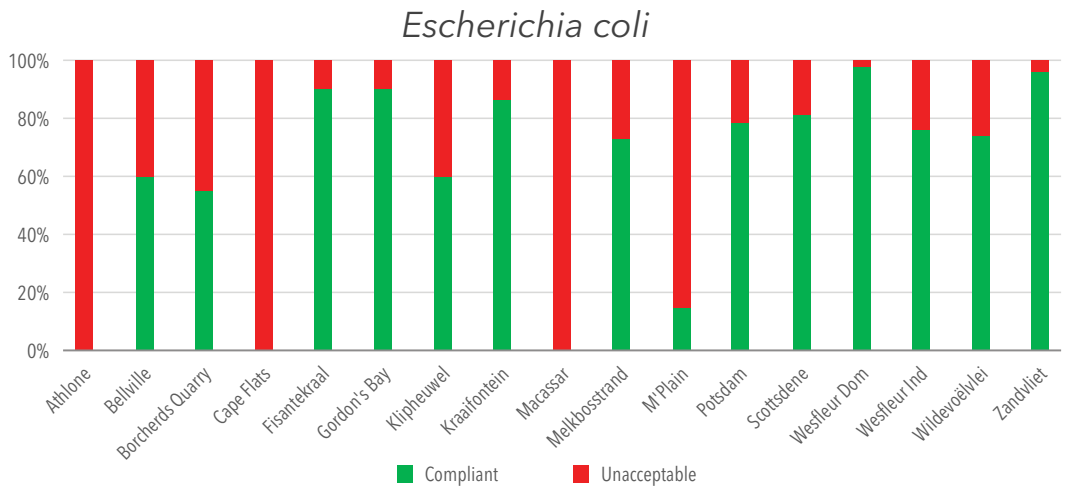


Figure C6

Escherichia coli compliance of final effluent from the City's inland WWTW for the 2025 reporting period, measured against general limits of GN383 of 2019. Note that of the works shown, M'Plain (Mitchells Plain) does not discharge into inland waters but instead discharges into the sea in False Bay.

C4 FINDINGS FROM THE 2025 REPORTING PERIOD DATASET

The assessed data suggest the following:

- The worst performing WWTW in terms of the data presented here were Athlone and Macassar, which were both 100% non-compliant with general effluent limits for TSS, COD, total ammoniacal nitrogen and *E. coli*, with only orthophosphate concentrations being generally within the general limits.
    - Athlone WWTW is the City's third largest effluent treatment plant, and during summer comprises almost 100% of the run of river flow in the Black River (lower Salt sub-catchment). This means that the poor effluent quality from the WWTW is effectively the summer run of river flow in the Black River, severely compromising ecological function.
    - Macassar WWTW is the City's sixth-largest effluent treatment plant, and discharges into the Eerste River estuary.
    - High *E. coli* concentrations in final effluent suggest that disinfection by chlorination was not in practice (or effective) at either works over this reporting period, which is positive from an ecological perspective, since chlorination of waters with high concentrations of ammoniacal nitrogen results inter alia in the formation of persistent, highly toxic chloramines, but indicates generally poor sewage treatment that poses risks to downstream water users.

- The Cape Flats WWTW also performed extremely poorly, with only marginally better compliance results for COD and TSS compared with Macassar. The maturation ponds of these works form part of the False Bay Nature Reserve (FBNR) Ramsar wetland site, and issues of high COD, high ammoniacal nitrogen and high TSS all suggest knock-on impacts to the Ramsar site.
- Zandvliet WWTW, the second largest works in the City, performed best out of all of the works, achieving between 95% and 100% compliance with the general limits for all of the variables assessed in figures C2 to C6. This WWTW was recently upgraded, and the success of the upgrades appear to reflect in the quality of treated effluent.
- Potsdam WWTW, the City's fourth largest treatment works and currently undergoing upgrades, also performed poorly in the 2025 reporting period, with high COD, TSS and (associated) ammoniacal nitrogen concentrations well above general effluent limits and contributing to the ongoing deterioration of Milnerton Lagoon downstream (see section 6). High levels of compliance with general limits for *E. coli* at this site are, unfortunately, indicative of effective chlorine disinfection at the plant, where UV disinfection has been inactive for over three years, and it is again anticipated that additional unintended water quality impacts occurred in downstream receiving waterbodies (i.e. Milnerton Lagoon) due to the assumed but unmeasured production, in ammonia-rich water, of chloramines.
- Slightly better levels of performance were shown in the City's fifth-largest WWTW's effluent (Bellville), with COD, TSS, ammoniacal nitrogen and orthophosphate data all lying above 80% compliant with general limits, although *E. coli* data fell to 55% compliance only. This system discharges into the Kuils River.
- Of the smaller WWTW, the worst-performing were Melkbosstrand and Klipheuwel WWTW.
- High levels of ammoniacal nitrogen and (associated) COD-characterised effluent from the Wesfleur Industrial outfall – one of the smaller WWTW but which nevertheless impacts on downstream water resources.
- The high levels of compliance across all City WWTW with regard to general limits for orthophosphate phosphorus belie the fact that the general limits at 10 mg/ℓ of phosphorus in orthophosphate lie two orders of magnitude above the threshold for hypertrophic ecosystems – this is an important note for naturally seasonal watercourses such as the Black and Kuils rivers where, at least in summer, the majority of flows derive from WWTW effluent releases.
- Overall, the City's WWTW contribute some 1 747 kg p/day to Cape Town's watercourses. This is a significant load – and one that most likely derives mainly from sewage as well as washing and personal hygiene detergents (laundry soaps, shampoos, soaps, etc.).

Table C2

Summary treated effluent water quality and flow data from the City's inland WWTW for the 2025 reporting period. Data as supplied by City of Cape Town. WWTW in descending order based on mean daily flows in 2025 reporting period.

WWTW	Catchment	Mean flow (Mℓ/d)	Median COD mg/ℓ	Median TSS mg/ℓ	*E. coli* (geometric mean) cfu/100 mℓ	Median PO_4-P	Median NH_4-N	Median TSS loading kg/d	P loading (kg/d)	Median NH_4-N loading (kg/d)	Median COD loading (kg/d)
Cape Flats	Zeekoe	124,86	176	94	306 821	5,2	32,5	9 778,56	619,442	3 936,634	19 555,48
Zandvliet	Kuils	99,77	22	2,5	7	0,7	0,2	254,5	77,91	20,66	2 091,6
Athlone	Lower Salt	98,06	227	90	1 699 449	3,2	36,3	8 602	303,68	3 346,95	20 301,4
Potsdam	Diep	61,80	143	76	14	2,7	26,6	4 441,145	171,1125	1 768,494	9 354,71
Bellville	Kuils	41,81	55,5	14	78	2	14,1	552,2	87,055	592,775	2 274,8
Macassar	Eerste	32,02	242	68,5	1 230 020	6,3	55,8	1 953,2	191,215	1 666,925	7 072,55
Borcherds Quarry	Lower Salt	30,88	100,5	33	771	5,25	0,6	1 102,5	163,85	19,1	3 312,5
Fisantekraal	Mosselbank	14,67	37,5	8	77	0,8	1	145,5	11,048	14,35	569,2
Wildevoëlvlei	Noordhoek	10,27	53	11	231	3	20,1	98,64	32,706	212,94	544,12
Wesfleur Dom	Sout	10,13	30,5	2,5	4	3,8	1,4	27,875	37,53	12,605	305,95
Scottsdene	Kuils	6,22	32	12	7	2,2	0,2	76,58	12,518	1,656	195,27
Kraaifontein	Mosselbank	5,57	37	8,5	43	0,9	0,9	38,825	5,238	4,656	168
Gordon's Bay	Sir Lowry's Pass	3,79	31	6	5	0,1	0,5	20,608	0,3988	1,91535	110,406
Wesfleur Ind	Sout	3,65	106	14	8	6,5	20,8	52,8	21,17	78,2	406
Melkbosstrand	Sout	2,77	64,5	17	22	3,8	22,55	48	11,69	65,45	178,5
Klipheuwel	Mosselbank	0,25	86	25	116	4	30,2	6,44	0,975	7,201	21,6

APPENDIX D

SOURCES OF RAW SEWAGE INTO CAPE TOWN'S WATERCOURSES

D1 OVERVIEW

A major but episodic rather than perennial source of raw sewage into the City's catchments is from the sewer system, with overflows occurring from blocked or malfunctional pump stations; sewer manholes (because of sewer or pump station blockages); or as a result of sewer pipeline collapse/ failure. When overflows occur, raw sewage and other material in the sewers are usually passed via roads and parking area surfaces into the stormwater system and then into Cape Town's watercourses. The City has in the order of 512 sewer pump stations located throughout its catchments, but with the highest density in the Diep, Zeekoe and Sand catchments, as suggested by **figure D1**.

This section attempts to gauge the magnitude of these issues, and to identify which sub-catchments are most vulnerable, using City records of both pump station failures and the public reporting of sewer manhole overflow incidents (C3 reporting). Sewage spill data are further categorised by the City in terms of the magnitude and/or significance of impact of each spill incident, as shown in **table D1**.

D2 SEWER PUMP STATION OVERFLOWS

During the 2025 reporting period, 694 pump station overflows were recorded from 204 pump stations. Of these, 47 pump stations overflowed five or more times during the year, suggesting repeated and possible systemic problems either in that part of the catchment (e.g. communities prone to dumping or disposing of inappropriate waste into sewers) or in the sewerage system itself (e.g. old infrastructure, lack of maintenance). **Table D2** ranks pump stations by number of overflows, with the Koeberg Road pump station clearly being the worst-offending, with 45 overflows over this period, followed by West Beach (Diep River catchment) (25 overflows), Nooiensfontein (Kuils River catchment) (16 overflows), Philippi Phase 4 (Zeekoe catchment) (15 overflows) and Summer Greens (Diep River catchment) (also 15 overflows). Prioritisation of repairs to, or redesigns of, these 13 pump stations should be an item for urgent consideration by the City.

With regard to the levels of pump station failure, one catastrophic failure was reported from the Table View East pump station in the Diep River catchment, just north of Potsdam WWTW. This failure lasted three days and took place in early April 2025. It should be noted that this pump station also gave way to a catastrophic failure in the 2024 reporting period (Day et al., 2025).

Five major spills were also recorded, variously from the Mosselbank, Zeekoe, Sand, Diep and City Bowl catchments. The other recorded overflows were rated as moderate (104), minor (levels 1 and 2 together) (366) and insignificant (221). Even small-scale overflows, however, if repeated frequently or in combination with other overflows and pollution sources in a catchment, can have significant impacts on downstream water quality over time.

With regard to the cause of pump station failure, these data were limited in the dataset, with reasons outlined in only 148 of the total 694 recorded incidents. This is unfortunate, as it means that measures to systematically reduce pump station failure frequency and magnitude are more difficult to deduce without hard evidence.

Figure D2 presents data showing the total number of pump station failures across the city and their significance, while **figure D3** presents the same data by catchment. **Figure D4** shows pump station failure data as a heatmap. It should be noted that the latter does not show the magnitude/rated significance of any of these events.

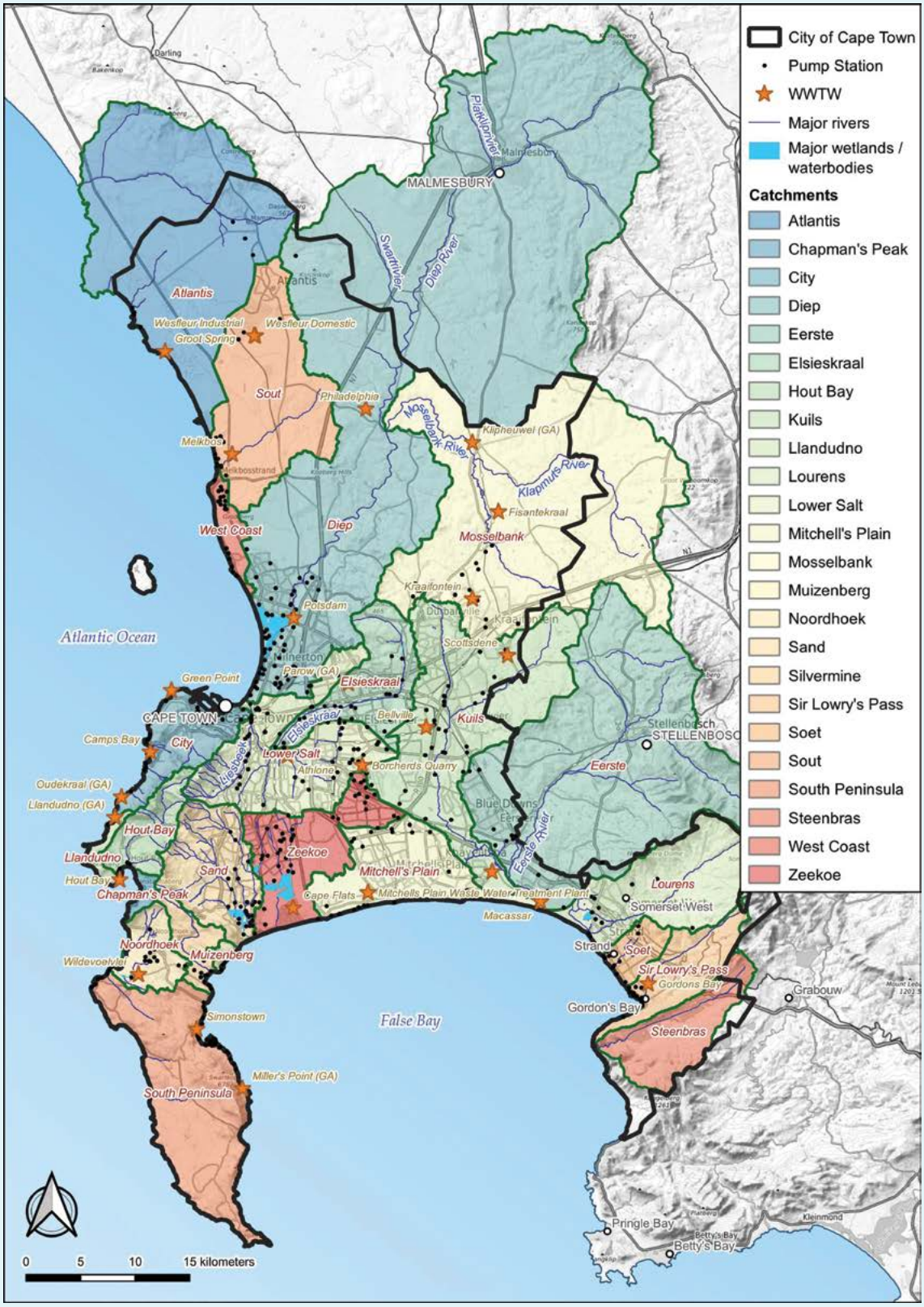


Figure D1

Sewer pump station location and spread in the city of Cape Town.

Table D1

Classification of sewage pollution incidents. Classification supplied by the City.

LEVEL	CLASSIFICATION	DESCRIPTION
1	**Minor** (No reporting)	The overflow is/will be contained and not drain to a local sensitive environment* and/or • Where the overflow reaches waters, the volume of sewage likely to enter the waterway may be insignificantly small with regard to the volume and flow of receiving waters, or • Where the overflow reaches land, it is contained in an area where public exposure is minimal given the maximum response time.**
2	**Moderate** (Responsible person to report internally, alarm report and EIR)	The overflow may not be contained and/or could drain to a local sensitive environment* and/or • Where the overflow reaches waters, the volume of sewage likely to enter the waterway is insignificant with regard to the volume and flow of receiving waters, or • Where the overflow reaches land or watercourse, it may travel to an area where public exposure is low within the maximum response time.**
3	**Major** (Responsible person to report internally and externally – alarm report and 14 days EIR)	The overflow is uncontrollable and likely to drain to a local sensitive environment* and/or • Where the overflow reaches waters, the volume of sewage likely to enter the waterway is high with regard to the volume and flow of the receiving waters, or • Where the overflow reaches land or watercourse, the public exposure risk will be high given the maximum response time.**
4	**Catastrophic** (Responsible person to report internally and externally – alarm report and 14 days EIR)	The overflow drains to a local sensitive environment* and • Where the overflow discharges to waters, the volume of sewage entering the water is very high with regard to the volume and flow of receiving waters, or • Where the overflow discharges to land or watercourse, the public exposure risk is very high given the maximum response time.**

* A sensitive environment includes:
- A drinking water catchment or domestic groundwater source, or
- Protected waterbodies, ecological communities or conservation areas as defined by local government, national conservation authorities, or
- Waterways used for recreation (non-contact), or
- A recreational area or other area with high public exposure or associated health risk

** Maximum response time should be based on the length of time taken for the relevant official to detect the overflow or for the overflow to be reported, and the time taken for the relevant official to attend to the site and secure against public contact.

*** Overflow = raw untreated overflow

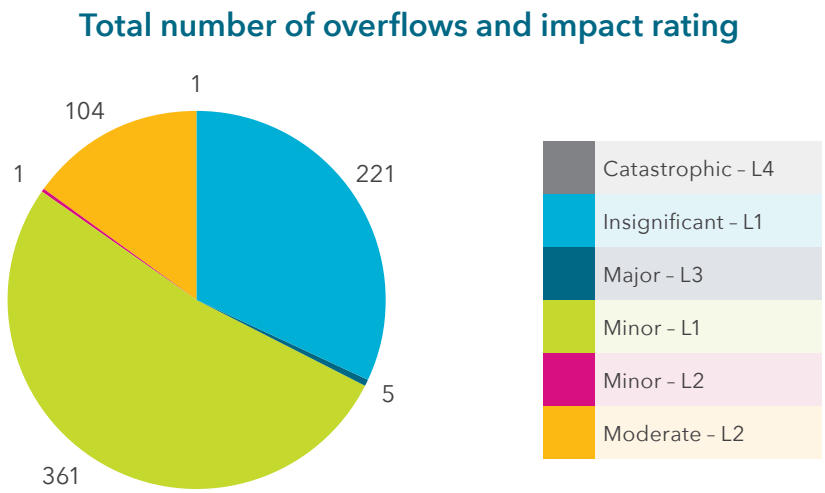


Figure D2

Number of pump station spills across the City's catchments during the 2025 reporting period, showing impact significance ratings by the City, as per table D1.

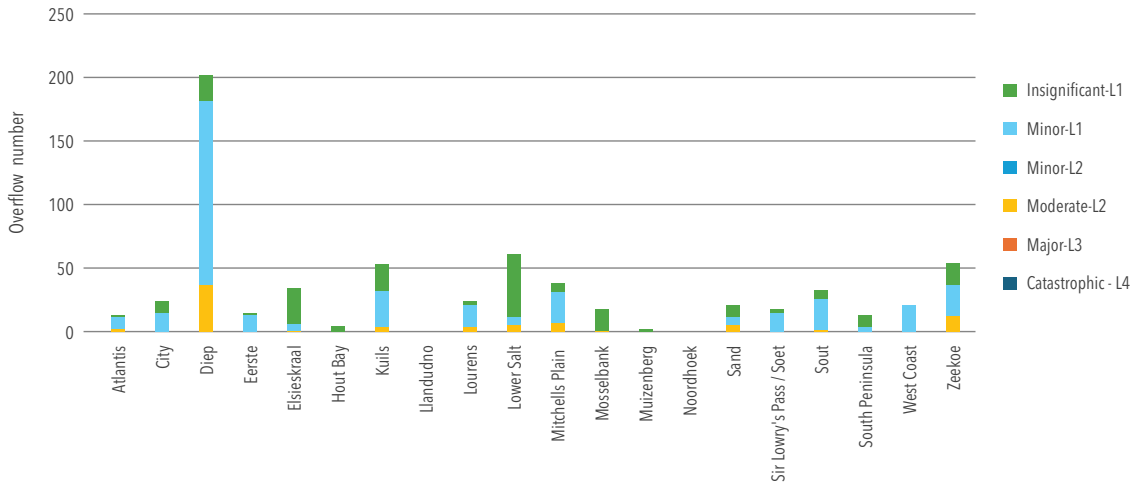


Figure D3

Occurrence rates of different spill magnitudes (as recorded by the City) from pump stations per catchment during the 2025 reporting period.

Figure D2 clearly shows that by far the highest number of pump station overflows were recorded in the Diep River catchment, and although these comprised mostly minor overflows, they did include 37 moderate, one major and one catastrophic overflow, highlighting the fact that pump station overflows are likely to be a significant contributor to at least episodic pollution in the catchment.

The lower Salt, Kuils and Zeekoe catchments were (in descending order) the next worse-performing catchments in the city, all reflecting catchments with high levels of informal settlement, solid waste accumulation on streets and river banks, all of which can contribute to pump station blockage failure. These catchments do, however, also have more pump stations than many of the others, as illustrated in **figure D1**.

Generally, and not surprisingly, the larger and more urbanised catchments tend to have the most pump stations per catchment, are prone to more frequent pump station failure than smaller or more rural catchments (e.g. Noordhoek). At the same time, it is noted that pump station overflows in more affluent areas are also evident in the data, with the Steel Doors pump station in Bantry Bay, for example, also included in the list in table D2 as a pump station prone to relatively frequent overflow. These incidents are due both to misuse of sewers (flushing inappropriate objects) and pump station maintenance issues.

Table D2

Pump stations experiencing five or more spills in the 2025 reporting period, ranked in order of spill frequency

PUMP STATION	CATCHMENT	NO OF SPILLS
Koeberg Rd - pump station	Diep	45
WEST BEACH	Diep	25
Nooiensfontein - pump station	Kuils	16
Phillippi Phase 4 - pump station	Zeekoe	15
Summer Greens - pump station	Diep	15
Area L - pump station	Mitchells Plain	14
Beach Road - pump station	Lower Salt	10
Dunoon 2	Diep	10
Phoenix Park - pump station	Diep	10
Symphony Way 1	Kuils	10
Beaconvale 1 - pump station	Elsieskraal	8
Bridgetown - pump station	Lower Salt	8
Piet My Vrou - pump station	Sout	8

PUMP STATION	CATCHMENT	NO OF SPILLS
Atlantic 1 - pump station	Sout	7
Bosbou - pump station	Elsieskraal	7
Boston 2 - pump station	Elsieskraal	7
Diep River - pump station	Diep	7
Lupin Crescent - pump station	Diep	7
Millers Camp - pump station	Zeekoe	7
Naomi Street - pump station	Sir Lowry's Pass/Soet	7
Philippi East - pump station	Zeekoe	7
Rietvlei - pump station	Kuils	7
Steel Doors - pump station	City	7
Tambo Street - pump station	Lower Salt	7
Witzands	Sout	7
Big Bay 2 - pump station	West Coast	6
Boston 1 - pump station	Elsieskraal	6
Da Gama Street - pump station	Lourens	6
Disa Rd - pump station	Hout Bay	6
Grey Rd - pump station	Diep	6
Helderberg	Eerste	6
Hillary Close - pump station	Lourens	6
Kuyasa	Mitchells Plain	6
Mostert's Bay - pump station	Lourens	6
Rugby - pump station	Diep	6
Table View East - pump station	Diep	6
Timour Hall - pump station	Sand	6
Cayman Beach - pump station	Sir Lowry's Pass/Soet	5
Fisantekraal Main - pump station	Mosselbank	5
Joe Slovo Drive - pump station	Mitchells Plain	5
Mamre North - pump station	Atlantis	5
Nooitgedacht - pump station	Lower Salt	5
Parklands - pump station	Diep	5
Prieska Rd	(blank)	5
RACING PARK	Diep	5
Thibault Square - Pump station	City	5
Victoria Palms - pump station	Diep	5

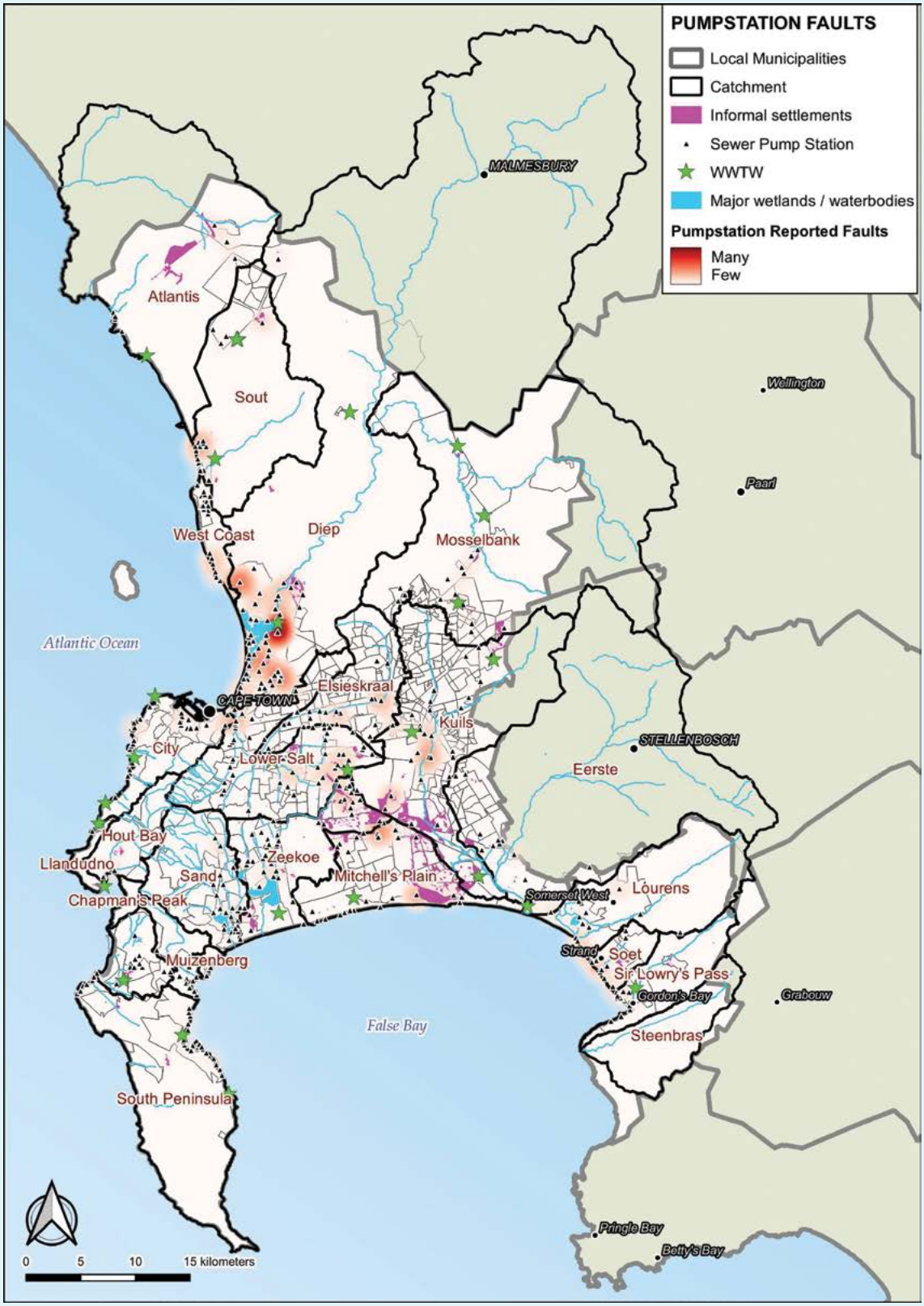


Figure D4

'Heat map' showing the number of pump station failures or overflows in Cape Town over the 2025 reporting period. Data not coded as to significance of overflow event.

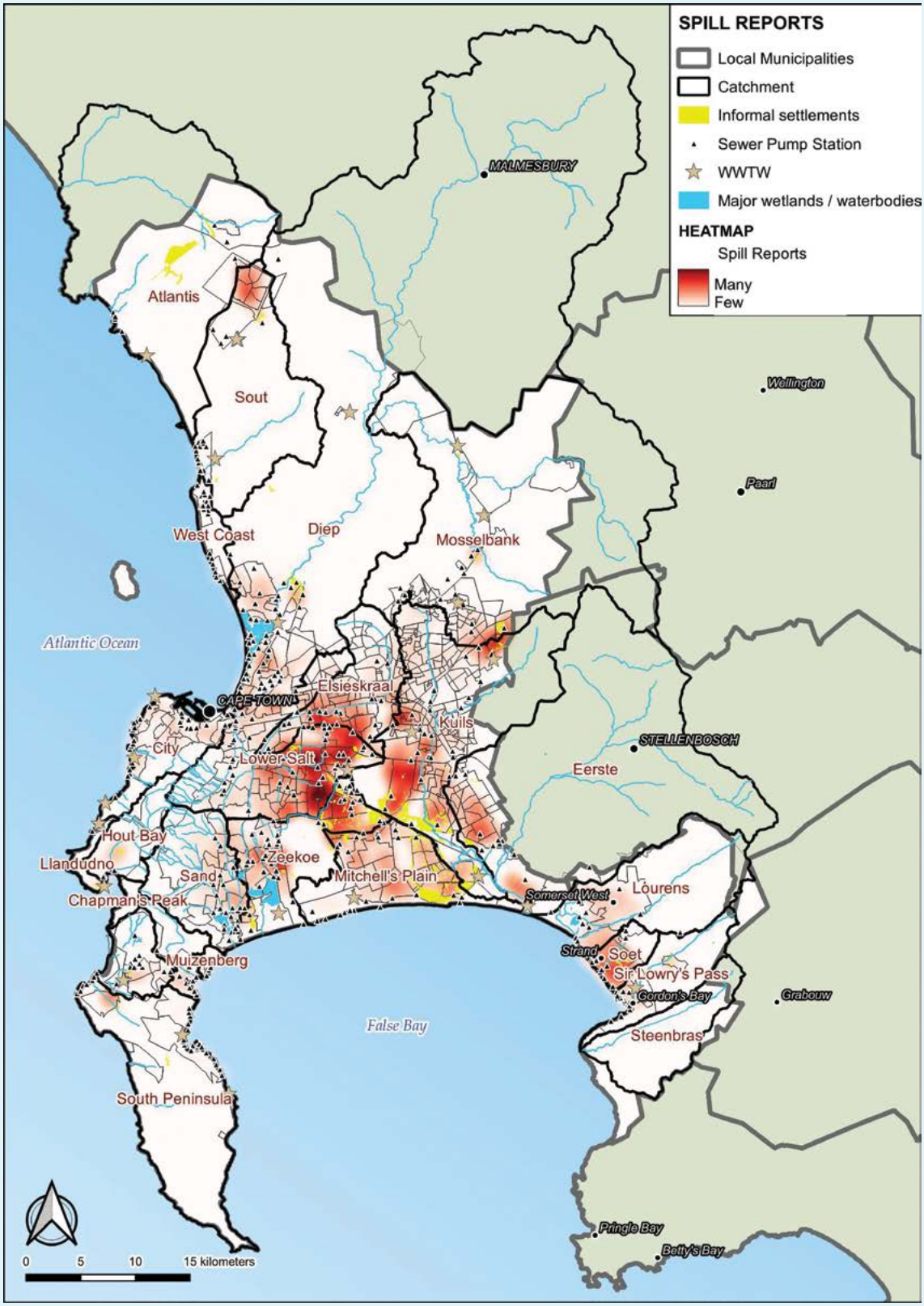


Figure D5

'Heat map' showing the number of C3 complaints filed for sewage spills in Cape Town over the 2025 reporting period.

D3 SEWAGE OVERFLOWS FROM MANHOLES

Another measure of sewage spill frequency in Cape Town is provided by records of reporting on sewage spills by members of the public. This is done online using the City's C3 reporting forms. **Figure D5** provides a coarse spatial overview of the distribution of C3 data for the 2025 reporting period. The data are presented as a 'heat map', which shows the intensity of C3 reporting for sewage spills in different areas of Cape Town. Repeated reporting of single incidents were deleted from the dataset.

These data, which unfortunately show little change since the 2023 and 2024 reporting years, assessed in Day et al. (2025), indicate that, over the 2025 reporting period:

- The hotspots for sewage overflows, based on reported incidents, lay in the lower Salt, Kuils, Zeekoe, Soet and Elsieskraal catchments, as follows:
    - Lower Salt – Bonteheuwel, Ruyterwacht, Kewtown and Manenberg areas
    - Kuils – Delft, Kalkfontein and Belhar areas
    - Zeekoe – Manenberg, Crossroads/Gugulethu, and along the Parklands and Grassy Park areas
    - Soet – Nomzamo, Strand and Lwandle
    - Elsieskraal – Goodwood and Epping areas, along both edges of the Elsieskraal River
- Other significantly affected catchments or sub-catchments included:
    - The Diep River – low levels of reporting across most of the sub-catchment
    - Mitchells Plain (particularly in the Westridge, Eastridge, Tafelsig and Beacon Valley areas)
    - The Eerste River in the Faure and Macassar areas
    - The Sout – northern corner of the catchment, including Witzands and parts of Atlantis
    - South Peninsula – northern corner including Ocean View

Of the above, areas with the most intense levels of sewage overflows are those with high levels of informal settlement and/or backyard dwellings. These same sub-catchments are characterised by an accumulation of solid waste that is likely to contribute to the frequency of sewer blockage, along with an increased likelihood of vandalism of sewers and pump stations as a result of a range of socio-economic conditions.

A caveat to the data presented in figure D5 is, however, that the original data source does not indicate volumes of sewage spilled or overflowing, or the time over which the spill occurred before being addressed. In addition, the data reflect only areas in which sewage spills were reported – in some areas, residents might be more vigilant in reporting problems than in others, and some reports might also reflect relatively short-lived incidents versus major spills.

APPENDIX E

SUMMARY DATA FOR WATER QUALITY ANALYSIS – 2024 AND 2025 REPORTING YEARS

This appendix provides quantitative summary data at a catchment and a site scale, for ease of reference.

Table C1

Summary data for key variables per catchment or sub-catchment for reporting periods 2024 and 2025. All sites included, except for stormwater outfalls to the sea. Data presented as median values for all variables except *E. coli*, for which data are presented as geometric means. Up arrows indicate improvement; down arrows indicate deterioration; a dash indicates no change since the previous reporting period. 'Change' means ≥ 25% change. All data presented as concentrations in mg/ℓ, with the exception of *E. coli*, presented as MPN/100 mℓ.

	E. coli				ORTHOPHOSPHATE				NH_3				DO			
CATCHMENT	**2024**		**2025**		**2024**		**2025**		**2024**		**2025**		**2024**		**2025**	
Atlantis			2 358				0,11				0,008				7,1	
City			1 138				0,05				0,001				8,9	
Diep	2 226	▼	2 065	–	0,40	▼	0,52	▼	0,023	▼	0,032	▼	6,4	–	6,1	–
Eerste	25 314	▼	14 056	▲	1,15	–	0,91	–	0,054	▼	0,030	▲	7,0	–	6,9	–
Else																
Elsieskraal	650	▲	3 785	▼	0,05	–	0,05	–	0,005	▼	0,020	▼	7,3	–	9,6	▲
Hout Bay	4 563	–	5 954	▼	0,05	–	0,05	–	0,001	–	0,001	–	9,2	–	9,6	–
Kuils	74 008	▼	149 637	▼	1,50	–	2,46	▼	0,078	▼	0,180	▼	4,5	–	4,0	–
Lourens	742	▼	460	▲	0,05	–	0,05	–	0,001	–	0,001	▼	9,4	–	9,0	–
Lower Salt	213 746	▼	539 547	▼	1,41	▼	2,40	▼	0,141	–	0,210	▼	5,1	–	3,6	▼
Mosselbank	3 128	▲	13 772	▼	1,60	–	1,50	–	0,013	–	0,020	▼	5,3	–	4,0	–
Mitchells Plain	1 395 007	▼	1 410 989	–	1,26	–	0,95	–	0,219	–	0,180	–	4,2	–	5,8	▲
Noordhoek	91	▲	119	▼	3,20	▲	2,25	▲	0,124	▲	0,170	▼	7,8	–	8,5	–
Salt			790				0,05				0,005				8,0	
Sand	556	–	346	▲	0,05	–	0,05	–	0,006	▼	0,006	–	8,5	–	8,4	–
Silvermine	106	▼	39	▲	0,05	▼	0,05	–	0,001	–	0,001	–	7,8	–	8,5	–
Sir Lowrys Pass	5 129	▼	5 106	–	0,10	–	0,10	–	0,019	▼	0,018	–	8,4	–	8,4	–
Soet	848 327	▼	236 813	▲	3,71	▼	1,26	▲	0,744	▼	0,120	▲	3,0	–	2,8	–
Sout	309	▲	447	▼	6,03	–	4,10	▲	0,001	–	0,001	–	6,9	▲	7,6	–
South Peninsula	1 954	–	255	▲	0,05	▲	0,05	–	0,001	▲	0,001	–	6,9	–	8,2	–
Zeekoe	3 073	▼	3 421	–	0,61	–	0,66	–	0,096	–	0,126	▼	8,0	–	7,1	–

Table C.2

Summary data for key variables for all sites for reporting periods 2024 and 2025. All sites included. Data presented as median values for all variables except *E. coli*, for which data are presented as geometric means. Up arrows indicate improvement; down arrows indicate deterioration; a dash indicates no change since the previous reporting period. 'Change' means ≥ 25% change. All data presented as concentrations in mg/ℓ, with the exception of *E. coli*, presented as MPN/100 mℓ.

			E. coli			PO_4-P		NH_3		DO	
TYPE	CATCHMENT	SITE	2024	2025		2024	2025	2024	2025	2024	2025
River dataset	Atlantis	MOD01		559			0,562		0,005		6,8
	City	MOD02		4 981			0,05		0,01		7,4
		CEN01		540			0,05		0,0005		9,55
		CEN02		716			0,05		0,0005		9,55
		CEN03		422			0,05		0,00075		9,45
		CEN04		13,577			0,05		0,001		9
		CEN05		415			0,05		0,001		8,6
		CN06B	7,462	3,552	▲						
		CN16B	20,348	42,809	▼						
		CN17A	32,830	24,533	▲						
		CN17B	16,485	67,397	▼						
		CN17C	105,496	164,543	▼						
		CN17E	21,341	136,043	▼						
		CN24	4,532	103,190	▼						
		CN25	15,603	188,532	▼						
		CN26	18,811	66,233	▼						
		CN27	4,688	15,884	▼						
		CN28	36,955	51,971	▼						
		CN33	25	37	▼						
		NR30		3,665			0,05		0,007		7,5

			E. coli				PO_4-P				NH_3				DO			
TYPE	**CATCHMENT**	**SITE**	**2024**		**2025**		**2024**		**2025**		**2024**		**2025**		**2024**		**2025**	
	Diep	DIEP12			1,785				0,582				0,005				9,05	
		MCC	9,962	▲	21,773	▼			1,01				0,07				4,2	
		MOS05	2,190	–	6,024	▼	0,397	▲	0,414	–	0,006	–	0,06	▼	7,7	▲	6,9	–
		MOS12			449				0,15				0,0005				8,8	
		RTV01	5,732	▼	6,364	–	1,7	▲	1,72	–	0,012	▼	0,01	–	5,55	–	4,4	–
		RTV03	36,997	▼	108,289	▼	0,285	▼	0,18	▲	0,01	–	0,006	▲	5,3	–	4,2	–
		RTV04	95,544	▼	169,085	▼	0,05	▲	0,11	▼	0,0655	▼	0,04	▲	8,4	–	5,2	▼
		RTV04_DS																
		RTV04_US																
		RTV05	216,791	–	398,584	▼	3,7	–	2	▲	0,249	▲	0,23	–	2,25	–	2,6	–
		RTV06	687	–	805	–	0,939	▲	0,79	–	0,014	▼	0,01	▲	5,1	▼	4,9	–
		RTV08	6,199	▼	1,538	▲	0,2465	▲	0,198	–	0,016	▲	0,03	▼	6	–	6,9	–
		RTV09	117,051	▼	91,177	–	2,395	▲	2,14	–	0,145	▲	0,18	–	3,4	▼	3,2	–
		RTV10	2,755	▲	7,817	▼	0,5995	▲	1,02	▼	0,03	▲	0,06	▼	8,3	–	7	–
		RTV11	235,987	▼	83,768	▲	2,31	▲	1,995	–	0,424	–	0,27	▲	5	–	4,5	–
		RTV12	205,558	▼	105,741	▲	0,46	–	0,665	▼	0,011	▲	0,03	▼	4,5	▼	3,6	–
		RTV14	58,688	▼	76,753	▼	0,05	▲	0,135	▼	0,0345	▼	0,04	–	4,65	–	6,6	▲
		RTV18	260,672	▼	283,747	–	2,86	–	2,83	–	0,168	▲	0,295	▼	3,4	–	2,35	▼
		RTV22	40,046	▼	33,988	–	2,45	▼	3,165	▼	0,101	▼	0,47	▼	3,35	▼	2	▼
		RTV38			13,596				1,33				0,012				4,8	
		THEO MARAIS	405,368	▼	361,234	–	2,64	–	1,785	▲	0,286	▲	0,2065	▲	3,4	–	3,55	–
Eerste		EK08	646,620	▼			2,2	–	1,9	–	0,2655	▼			1,75	▼		
		EK11	378,450	▼			1,9	–	1,5	–	0,207	▲			3,65	–		
		EK12	89,266	▼			1,51	–	1,5	–	0,235	–			2,35	▼		
		EK13	1,611	–	1,742	–	0,4335	▼	0,46	–	0,0015	▲	0,006	▼	7,35	–	8,7	–
		EK15	265,804	▼	173,134	▲	0,1835	–	0,106	▲	0,127	▼	0,08	▲	13,1	–	9,95	–

			E. coli				PO_4-P				NH_3				DO			
TYPE	**CATCHMENT**	**SITE**	**2024**		**2025**		**2024**		**2025**		**2024**		**2025**		**2024**		**2025**	
		EK17	135,240	▼			1,8	▬	2,05	▬	0,5135	▲			5,25	▬		
		EK18	2,117	▬	32,701	▼	0,15	▬	0,34	▼	0,006	▬	0,019	▼	7,1	▬	6,9	▬
		EK27			697,961				4,15				0,36				2,1	
		EK28			2,516				2,3				0,01				8,4	
		EK29			13,429				0,05				0,011				6,9	
		EK30			26,076				3,42				0,58				4	
		EK31			3,016				0,05				0,0045				6,1	
		STRM01			1,202				0,05				0,0015				7,05	
		STRM02			725				0,05				0,002				8,8	
	Elsieskraal	ELS_GW	28,885	▲	190,751	▼	0,172	▲	0,305	▼	0,0775	▬	0,29	▼	11,25	▬	11,9	▬
		ELS04			231,966				0,4				0,23				11,4	
		ELS08	9,170	▲	128,569	▼	0,1465	▲	0,2	▼	0,267	▲	0,27	▬	17,5	▬	15,25	▬
		ELS10	5,024	▬	995	▲	0,077	▬	0,05	▲	0,0095	▼	0,002	▲	6,75	▬	7,2	▬
		ELS11			1,057				0,05				0,001				9,6	
	Hout Bay	BKR01	22,678	▲	111,360	▼	0,05	▲	0,01	▼	0,003	▬	0,0045	▼	5,5	▬	5,35	▬
		DR01	35,013	▲	102,722	▼	0,05	▲	0,05	▬	0,001	▲	0,0025	▼	8,4	▲	7,45	▬
		DR02	125	▬	156	▼	0,05	▼	0,05	▬	0,0005	▬	0,0005	▬	9,45	▬	10,05	▬
		DR04	35,593	▼	40,820	▬												
		DR05	561	▼	429	▬	0,05	▼	0,05		0,001	▼	0,001	▬	9,7	▬	10,1	▬
		DR06	494		82	▲			0,05				0,0175				9,25	
		HB11	8,875	▼	3,003	▲	2	▲	2,61	▼	0,1185	▼	0,21	▼	5,55	▬	5,4	▬
	Kuils	EK03	9,654	▼			1,3	▼	1	▬	0,067	▼			5,9	▼		
		EK04	798,590	▼	1,346,593	▼	1,555	▲	2,36	▼	0,2015	▬	0,19	▬	3,4	▼	2,7	▬
		EK05	2,513,588	▼			1,89	▬	2,2	▬	0,568	▼			4,7	▼		
		EK08	2,615	▲	1,462	▲	0,1395	▬	0,05	▲	0,006	▬	0,0015	▲	5,15	▬	6,6	▲
		EK09					3,48	▼										

			E. coli				PO_4-P				NH_3				DO			
TYPE	**CATCHMENT**	**SITE**	**2024**		**2025**		**2024**		**2025**		**2024**		**2025**		**2024**		**2025**	
		EK11			77,760				0,15				0,215				14,9	
		EK19			924				0,05				0,0005				6,4	
		EK20	81	▲	164	▼	0,05	▼	0,05	–	0,0005	–	0,001	▼	9,5	–	9,6	–
	Lourens	GLT01	505	▼	215	▲	0,05	▼	0,05	–	0,0005	–	0,001	▼	9,6	–	9,6	–
		LOU01	3,145	▼	1,475	▲	0,05	▼	0,05	–	0,0005	–	0,001	▼	9,5	–	9,5	–
		LOU02	3,997	▼	1,942	▲	0,05	–	0,05	–	0,0005	–	0,001	▼	8,9	–	9	–
		LOU03	5,637	▼	1,821	▲	0,05	–	0,05	–	0,001	–	0,001	–	8,9	–	9,1	–
		LOU04	39	▲	16	▲	0,05	–	0,05	–	0,0005	–	0,0005	–	9,7	–	9,7	–
		LOU05	2,142	▼	1,323	▲	0,05	▼	0,05	–	0,001	▼	0,001	–	9,2	–	9,3	–
		LOU06	139	▲	287	▼	0,05	▲	0,05	–	0,0025	▼	0,002	–	7,2	–	7,2	–
		LOU08			742				0,05				0,002				8,2	
		LOU13			1,833				0,31				0,006				3	
		LOU14	49,999	▲			0,139	▲			0,036	▼			11,05			
		LOU15	372,573	▼	2,038,649	▼	0,338	▼	0,8005	▼	0,0225	–	0,033	▼	4,45	▲	2,7	▼
	Lower Salt	ELS08	464,521	▼	583,833	▼	0,9935	–	1,275	▼	0,159	▼	0,175	–	5,3	–	3,85	▼
		NR01	1,204,508	▼	2,402,508	▼	3,415	▼	2,535	▲	0,1795	–	0,18	–	2,85	–	1,25	▼
		NR02	1,208,059	▼	2,969,869	▼	2,41	▼	3,59	▼	0,367	–	0,34	–	4,1	▲	2,6	▼
		NR03	911,810	▼	1,491,372	▼	2,155	▼	2,99	▼	0,2865	–	0,38	▼	3,85	▲	3,4	–
		NR04	1,002,799	▼	1,176,850	–	2,64	▲	3,555	▼	0,3745	–	0,345	–	3,25	▲	3,15	–
		NR06	2,854	▲	4,929	▼	0,05	–	0,05	–	0,0005	▲	0,001	▲	8,5	–	7,2	–
		NR07	886,389	▼	1,023,331	–	2,77	–	3,49	▼	0,3275	–	0,26	–	3,5	–	3,3	–
		NR08	327,376	▼	1,028,403	▼	2,125	▲	3,235	▼	0,358	–	0,421	–	5,85	–	5,7	–
		NR09	12,029	▼	61,733	▼	0,05	▲	0,125	▼	0,014	▲	0,045	▼	11.05	–	12,25	–
		NR10	686,700	▲	1,255,488	▼	4,65	–	3,75	–	0,19	–	0,155	–	10,3	▲	4,15	▼
		NR11	1,283,919	▼	2,707.451	▼	1,172	–	1,77	▼	0,085	▲	0,26	▼	3,95	▲	2,4	▼
		NR15	221,652	▼	527,853	▼	0,4775	▲	0,88	▼	0,204	–	0,29	▼	6,7	▲	6,8	–

			E. coli				PO_4-P				NH_3				DO			
TYPE	**CATCHMENT**	**SITE**	**2024**		**2025**		**2024**		**2025**		**2024**		**2025**		**2024**		**2025**	
		NR16			1,956,868				3,71				0,45				3	
		NR17	1,733	–	2,150	–	0,05	–	0,05	–	0,001	–	0,001	–	10	–	10,1	–
		NR19	5,872	▲	11,264	▼			0,05				0,0005				10,05	
		NR22	1,661,261	▼	2,766,421	▼	2,9	–	3,27	–	0,3765	–	0,53	▼	3,6	–	3,3	–
		NR24	65,000	▼	1,470,777	▼	4,95	–	4,65	–	0,057	▲	0,0845	▼	6,9	▲	4,1	▼
		NR25	61,310	▲			1,2175	▼	1,35	–	0,069	▼			9	▼		
		NR26	86,640	▼			1,15	▼	1,45	▼	0,068	▼			9,2	▲		
		MOS01	2,104	▼	4,904	▼	1,025	–	2,06	▼	0,0205	–	0,086	▼	4,25	–	3,3	–
		MOS02	739	▲	800	–	1,46	▲	1,15	–	0,004	▲	0,008	▼	5,75	–	6,1	–
		MOS03	5,567	▲	5,229	–	3,02	▼	1,65	▲	0,0075	▲	0,034	▼	5,4	▲	5,3	–
		MOS04	410	▲			1,7	▲	2,15	▼	0,003	▲			6,2	▲		
		MOS06	520	–			2,25	–	1,95	–	0,004	▲			7,2	▲		
		MOS07	11,795	▲	39,631	▼	4,015	▲	7,28	▼	0,0735	▲	0,056	–	5,1	▼	3,5	▼
		MOS08			4,367				3,26				0,003				8,9	
		MOS09			395				0,108				0,001				5,45	
		MOSAH03	2,400,521	▼	2,505,858	–	1,19	–	0,965	–	0,2225	–	0,185	–	5	▲	6,2	–
		MOSAH11	1,091		5,762	▼												
	Mitchells Plain	KHA04	264		344	▼												
	Muizenberg	CS01B			1,167				0,05				0,001				8,5	
		CS26			63,982				0,3485				0,166				6,85	
	Noordhoek	BWS01			640				0,05				0,002				7,7	
	Salt	ELS35			11,550				0,145				0,005				5,45	
		ELS37			1,097				0,05				0,00075				9	
		NR31	719	–	540	–	0,05	–	0,05	–	0,002	▼	0,001	▲	7,3	▲	5,9	–
		NR32	272	▲	333	–	0,05	–	0,05	–	0,002	▼	0,00075	▲	6,8	–	6,05	–
	Sand	CR01	331	▲	799	▼	0,05	–	0,05	–	0,002	▼	0,001	▲	6,75	–	8,4	–

			E. coli				PO_4-P				NH_3				DO			
TYPE	**CATCHMENT**	**SITE**	**2024**		**2025**		**2024**		**2025**		**2024**		**2025**		**2024**		**2025**	
		CR02	18,094	▼			0,104	▼			0,004	▼			8,4	–		
		CR03			78,657				0,162				0,007				6,95	
		CR04	170	–	288	▼	0,05	–	0,05	–	0,001	▼	0,001	–	6,9	–	7,5	–
		CR04A	624	▲	18,396	▼	0,05	▲	0,05	–	0,0005	▲	0,001	▼	5,8	–	6,3	–
		CR05			319				0,05				0,001				9,5	
		CR06	1,241	▲	822	▲	0,05	–	0,05	–	0,001	▼	0,001	–	9,4	–	9,1	–
		CR11	35,173	▼	380	▲	0,0845	▲	0,05	▲	0,004	▼	0,0005	▲	5,3	▲	4,85	–
		CR16	7,204	▲	20,544	▼	0,05	–	0,05	–	0,006	–	0,0075	–	10,4	–	10,55	–
		CR20	3,256		720	▲	0,105		0,05	▲	0,003		0,002	▲	6,2		8,2	▲
		CR21	9,925	▲	14,541	▼	0,05		0,05		0,005		0.006		9,65		9	
		CR22			572				0,05				0,001				9,7	
		CR29			1,603				0,05				0,00075				8,2	
		CR31			6,309				0,05				0,0025				9,6	
		CR32	998		526	▲												
		CR33	50,621		77,480	▼	0,05	▲	0,05	–	0,0025	▲	0,019	▼	9,35	–	9,05	–
		CS22	478	–	161	▲	0,05	–	0,05	–	0,001	–	0,002	▼	3,2	▼	4,7	▲
		DRRSC			4,615				0,05				0,0045				5,45	
		LPVMR	8,642	▼	1,891	▲	0,1745	–	0,14	–	0,0085	▼	0,0085	–	5,4	–	6,6	–
		LVC	149,639	▼	8,263	▲	0,125	▼	0,05	▲	0,012	▼	0,003	▲	8,9	–	9,55	–
		LVI	18,763		8,651	▲												
		SCV	1,710		2,454	▼												
	Silvermine	FHC	51	▼	23	▲	0,05	▼	0,05	–	0,0005	–	0,0005	–	9,45	–	9,4	–
		FHLH	106	▼	16	▲	0,05	–	0,05	–	0,0005	–	0,0015	▼	7,6	–	6,6	–
		SIL02	217	▼	113	▲	0,05	▼	0,05	–	0,0005	–	0,0005	–	5,8	–	5,9	–
		SIL04	539	▼	61,310	▼												
		SIL06	784	▲	6,402	▼												

			E. coli				PO_4-P				NH_3				DO			
TYPE	**CATCHMENT**	**SITE**	**2024**		**2025**		**2024**		**2025**		**2024**		**2025**		**2024**		**2025**	
	Sir Lowry's Pass	SIR01					0,1		0,1									
		SIR02	1,228	▼	3,557	▼	0,2195	▼	0,15	▲	0,058	▼	0,06		4,7	▲	6,7	▲
		SIR03	1,504	▲	2,068	▼	0,116	▼	0,05	▲	0,0125	▼	0,0125		8		7,5	
		SIR04					0,35	▼	0,2	▲								
		SIR05	16,920		14,467	–	0,1695		0,108	▲	0,051	▼	0,051	▲	10,6		9,3	
		SIR06																
		SIR07																
		SIR08	848,327	▼	1,036,417	–	3,71	▼	2	▲	0,744	▼	0,22	▲	3		2,1	▼
		SIR09			2,234				0,05								7,6	
	Soet	SOE02			2,610,444				4,33				0,24				0,9	
		SOEAH06			5,274				0,05				0,004				2,9	
		SOEAH10			3,235,566				1,5				0,16				1,9	
		SOEAH11			587				0,34				0,0005				7,4	
		SOEAH12	26	▲	86	▼	6,2	–	4,2	▲	0,0005		0,001	▼	4,5	–	4,9	–
	Sout	DG03	468	▲	480	–	5,645	–	4,65	–	0,001		0,001	–	7,1	–	7,6	–
		SOU01			123				0,05			–	0,0005				8,6	
		SOU02	171,233	▼	12,509	▲	0,204	▲	0,05	▲	0,0185	▼	0,015	–	5,65	▼	9,55	▲
	South Pen	BOK01	9,493	–	4,370	▲	0,143	–	0,05	▲	0,013	▲	0,005	▲	5,9	–	7,4	▲
		BOK02			79				0,05				0,0005				8	
		BOK03	81	▲	108	▼	0,05	▼	0,24		0,0005	–	0,00075	▼	7,8	–	7,05	–
		GC08	346	–	109	▲	0,235	–	0,05		0,003	▼	0,0035	–	6,5	▲	7,1	–
		SCH02			11				0,25	▲			0,001				9	
		SCH04	4,913	▼	8,348	▼	0,767	▼	1,1	▼	0,013	▼	0,02	▼	4	▼	3,9	–
		SMT01	637,364	▼	3,133,917	▼	0,872	▼	1,3		0,367	▼	0,34	–	2,2	–	2,1	–
	Zeekoe	LR02			2,322,811				1,545	▼			0,265				1,7	

			E. coli				PO_4-P				NH_3				DO			
TYPE	**CATCHMENT**	**SITE**	**2024**		**2025**		**2024**		**2025**		**2024**		**2025**		**2024**		**2025**	
		LR03	367,189	▼	2,709,046		1,19	▼	0,1025		0,257	▼	0,375	▼	6,7	▲	3,55	▼
		LR04	17,745	▼	8,158	▲	0,129	–	0,1025	–	0,008	–	0,01	▼	6,7	–	9,35	
		LR05	1,563,075	▼	2,927,609	▼	1,16	–	1,425	–	0,253	▼	0,38	▼	4,1	▼	2,2	▼
		LR06	900,847	▼	3,309,167	▼	1,48	▼	1,625	–	0,286	▼	0,45	▼	3,8	▼	2,2	▼
		LR07			16,625				0,05				0,015				9,45	
		LR08	36,693	▼	8,359	▲	0,132	▼	0,05	▲	0,041	▼	0,03	▲	10,5	–	11,45	–
		LR09																
		LR10																
		LR19A																
		LR19B																
		LR20A	3,496	▲	6,903	▼	0,2725	–	0,21	–	0,045	▼	0,026	▲	5,95	–	6,6	–
		LR20B	7,289	▼	3,869	▲	0,05	–	0,05	–	0,003	–	0,01	▼	7,5	–	7,35	–
		POC01	471,882	▼	183,313	▲	4,44	–	3,65	–	0,49	▼	0,51	–	4,3	–	4,3	–
		RVIRD	8	▼	3	▲	6,02	–	6,01	–	0,413	–	0,44	–	3,6	▲	3,7	–
		ZEV08	27	▲	15	▲	0,315	▼	0,49	▼	0,014	▲	0,04	▼	9,6	–	9,4	–
		ZEV5	4,465	–	5,306	–	0,4995	▼	0,32	▲	0,016	▼	0,0085	▲	4	–	3,35	–
Standing water	Diep	MAC	1,108	▲	200	▲	0,3045	–	0,51	▼	0,002	▼	0,001	▲	2,25	–	3,2	▲
		PEV1			127				0,63				0,001				3,6	
		PEV2	17	▲	15	–	0,3035	▼	0,48	▼	0,017	–	0,038	▼	9	–	9,2	–
		PEV3	10	–	15	▼	0,3085	▼	0,5	▼	0,018	▼	0,03	▼	9,3	–	9,2	–
		RTV02	27	▲	61	▼	0,313	▼	0,48	▼	0,017	▼	0,038	▼	8,9	–	9,2	–
		RTV17																
		RTV19																
		RTV34																
		RTV35																
		RTV36	12	–	23	▼	0,3065	▼	0,48	▼	0,022	▼	0,032	▼	9	–	9	–

			E. coli				PO_4-P				NH_3				DO			
TYPE	**CATCHMENT**	**SITE**	**2024**		**2025**		**2024**		**2025**		**2024**		**2025**		**2024**		**2025**	
		RTV37	16	–	36	▼	0,306	▼	0,48	▼	0,014	▼	0,025	▼	9	–	9,2	–
		RTVBUOY1	10	▲	9	–	0,3	▼	0,47	▼	0,016	▼	0,02	▼	9,1		9,5	
		RTVBUOY2	11	▼	8	–	0,3025	▼	0,484	▼	0,0175	▼	0,02		9,1		8,9	
		RTVBUOY4			640				0,47				0,105				7,8	
		RTVBUOY6			1,042				0,405				0,09				8,25	
		RTVD1			746,454				0,408				0,27				1,8	
		RTVD5																
	Else	GC02	50	▲	71	▼	0,05	–	0,05	–	0,002	▼	0,007	▼	6,55	▼	7,3	–
	Elsieskraal	ANG01	128	–	89	▲	0,05	▼	0,05	–	0,002	–	0,0035	▼	7,1	–	6,55	–
		ANG02	606	▲	582	–	0,05	▲	0,05	–	0,0075	–	0,01	▼	5,35	▲	6	–
		DOOR01	49	▲	50	–	0,05	▼	0,05	–	0,005	▼	0,014	▼	8,15	▲	7,75	–
		DOOR03			8,619,421				4,96				0,92				1,7	
	Kuils	BOP1			712,225				3,73				0,205				1,5	
		BOP2			88,547				4,1				0,093				5,8	
		BOP3	3,253,207	▼	3,659,316		1,55		1,43		0,195		0,16		2		3,1	
		BOP4			85				0,05				0,0005				3,5	
		KHA01			3,065,357				4,4				0,62				2,6	
	Lourens	DTO01			69,898				1,08				0,0625				2,2	
	Mosselbank	SAP1			3,825				0,53				0,003				4	
		SAP2			266,081				1,055				0,0595				2,5	
		SAP3	152,490	▼	326,022	▼												
		SAP4																
	Mitchells Plain	CS23	3,424,449	▼	2,480,815	▲	1,285	▼	0,82	▲	0,248	▼	0,19	–	3	–	3,6	–
		CS24	3,021,118	▼	1,955,675	▲	1,205	–	0,965	–	0,1825	–	0,175	–	3,2	–	5,7	▲
		KHA02	44	▲	66	▼	3,17	–	3,01	–	0,1465	▲	0,356	▼	7,9	–	8,6	–

			E. coli				PO_4-P				NH_3				DO			
TYPE	**CATCHMENT**	**SITE**	**2024**		**2025**		**2024**		**2025**		**2024**		**2025**		**2024**		**2025**	
	Noordhoek	KHA03	101	▲	55	▲	3,28	▲	3,375	–	0,0935	▲	0,261	▼	7,1	–	7,3	–
		WV02	171	▲	58	▲												
		WV05			81				0,05				0,0025				6,85	
		WV08			121				0,05				0,001				8,1	
	Salt	ELS32			13				0,05				0,01				8,8	
		ELS33	96	▲	49	▲	0,05	–	0,05	–	0,0025	▼	0,005	▼	7,2	–	7,55	–
		ELS34	2,146	▼	1,525	▲	0,05	–	0,05	–	0,003	–	0,004	▼	6,2	–	5,35	–
	Sand	LPVN	308	▼	202	▲	0,05	▲	0,05	–	0,013	▲	0,0195	▼	8,5	–	8,25	–
		LPVS	176	▼	92	▲	0,05	–	0,05	–	0,0095	▼	0,002	▲	9,9	▲	8,6	–
		LVO	512	–	83	▲	0,05	▼	0,05	–	0,009	▼	0,01	–	9,15	–	9,15	–
		OOG01	385	–	94	▲	0,05	▼	0,05	–	0,008	▼	0,01	▼	9,1	–	9,05	–
		PV03	239	▲	334	▼	0,05	–	0,05	–	0,006	▼	0,0095	▼	9,35	–	9,25	–
		PVWER	329	▼	222	▲	0,05	–	0,05	–	0,005	–	0,007	▼	9,1	–	8,2	–
		ZA01S			428				0,05				0,011				12	–
		ZA02S	223	▲	228	–	0,05	–	0,05	–	0,003	–	0,005	▼	8,7	–	7,8	–
		ZA03S	231	▲	298	▼	0,05	–	0,05	–	0,002		0,004	▼	7,65	–	7,9	–
		ZA04S	534	▼	111	▲	0,05	▼	0,05	–	0,016	–	0,015	–	9,8	–	11	–
		ZA05S	175	–	751	▼	0,05	–	0,05	–	0,01		0,01	–	10,8	–	11,25	–
		ZA06S	98	▲	73	▲	0,05	▼	0,05	–	0,008	▼	0,01	▼	8,8	–	8,8	–
		ZA07S	128	–	61	▲	0,05	▼	0,05	–	0,0085	▼	0,01	–	9,35	–	9	–
		ZA08S	224	–	54	▲	0,05	–	0,05	–	0,0095	▼	0,006	▲	9,4	–	9,7	–
		ZA09S	142	▼	107	–	0,05	▼	0,05	–	0,007	–	0,01	▼	9,2	–	10,4	–
		ZA10S	281	▼	96	▲	0,05	–	0,05	–	0,008	–	0,01	▼	9,55	–	9,85	–
		ZA11S	109	▲	92	–	0,05	▼	0,05	–	0,009	–	0,01	–	9,2	–	10,2	–
		ZA12S	183	▲	279	▼	0,05	▲	0,05	–	0,002		0,004	▼	8,2	–	7,9	–
		ZA13S	356		170	▲	0,05		0,05	–	0,001		0,0005	▲	7,2	–	6,1	–

			E. coli				PO_4-P				NH_3				DO			
TYPE	**CATCHMENT**	**SITE**	**2024**		**2025**		**2024**		**2025**		**2024**		**2025**		**2024**		**2025**	
		ZAWEIR			77,255				2,985				0,264				2,45	
	South Pen	GC02			651,605				3,94				0,36				2	
	Zeekoe	ESDP01			74				0,191				0,008				9,4	
		ESDP02	132	▲	72	▲	0,05	▲	0,181	▼	0,009	–	0,01	–	8,8	–	7,8	–
		RVS	75	▲	110	▼	0,368	–	0,392	–	0,09	–	0,0645	▲	11,7	–	11	–
		RVWEIR	46,669	▼	19,679	▲	1,14	▼	0,84	▲	0,289	▼	0,32	–	7,3	–	6,9	–
		ZEV1S	80	▲	133	▼	0,619	–	0,484	–	0,089	–	0,06	▲	9,85	–	10,7	–
		ZEV2S			79				0,497				0,03				11,3	
		ZEV3S	523	▼	237	▲	0,5015	–	0,451	–	0,108	–	0,07	▲	10,4	–	11,3	–
		ZEV4S	143	–	42	▲	0,327	–	0,414	▼	0,062	▼	0,039	▲	11	–	11,3	–

APPENDIX F

TREATMENT OF DATA

This section outlines how some of the more problematic or contextually complex aspects of the water quality dataset are dealt with in this report.

F1 REPORTING CYCLE NOMENCLATURE

The annual reporting period used in this report comprises the period from 1 October to 30 September in any given cycle and is given the year identity of the end of the period. Data for the period 1 October 2024 to 30 September 2025 are accordingly referred to as the 2025 dataset or the 2025 reporting period.

F2 TREATMENT OF DATA BELOW DETECTION LIMITS

Reporting on the results of laboratory analyses of water samples for different variables are subject to the limits of detection and limits of quantification of different analytical techniques. These data are reported as '< x', where x- = the limit of detection and/or quantification. By convention, such data are analysed in water quality reporting as 0,5 x the reported limit – thus a value reported as < 0,5 would be reflected in the dataset as 0,25.

This issue has, however, created problems over the last few years with regard to orthophosphate data. Up until December 2022, SSB's limits of detection were reported as < 0,01 mg P/ℓ for this variable. With effect from this date, however, the analytical equipment used by SSB for these analyses ceased functioning, and the laboratory now uses flow injection analysis colorimetry equipment with a limit of quantification (LOQ) of > 0,1 mg P/ℓ. This is an order of magnitude increase in the detectable concentrations of phosphorus. If the 50% reporting rule is used, and the data are analysed as 0,05 mg P/ℓ, they will at best lie within the 'poor' range for rivers/flowing systems.

Since there are no total phosphorus data available since December 2022 either, the level of phosphorus enrichment of vleis and other 'standing' waterbodies can also only be assessed using orthophosphate concentrations, and the default minimum 'poor' label is thus attached to these samples as well.

This has implications for tracking the trajectory of concentrations of this critical nutrient in the City's waterbodies, as high detection limits/limits of quantification may mask improvements in some systems, and will not indicate significant deterioration in others.

F3 TREATMENT OF DATA REPORTED AS GREATER THAN SPECIFIED LIMITS

Escherichia coli data are reported at times as '> x'. However, x is sometimes low, and within the range of acceptable. This makes interpretation difficult and the following conservative approach has been taken:

- Data reported as '>' any number below the unacceptable threshold were automatically rated as unacceptable;
- Similarly, (less frequent) reporting as '<' any number within the unacceptable range was also rated unacceptable. This is a risk-averse strategy to deal with data uncertainty and could result in some overestimation of unacceptable data;
- Data reported as '>' any value between unacceptable risk 1 and unacceptable risk 2 thresholds (**table 2.3**) were automatically reported as unacceptable risk 2;
- Data reported as '>' any value between unacceptable risk 2 and unacceptable risk 3 thresholds (**table 2.3**) were automatically reported as unacceptable risk 3;
- Data reported as '>' any value above unacceptable risk 3 thresholds (**table 2.3**) were automatically reported as that number, and accorded low confidence. This means that geometric mean data included in maps for different catchments may well underestimate actual *E. coli* contamination levels, as these were often well above level 3 threshold concentrations of 100 000.

F4 DATA CATEGORISATION

- Catchments (and some sub-catchments, for larger catchments) were used as the unit of analysis, as already described;
- Sites were analysed separately according to watercourse type (i.e. standing water (vleis, dams, detention ponds) and flowing water (rivers, canals, stormwater channels and coastal stormwater outlets);
- Functional estuaries were classified as to whether they were standing water or flowing systems – water quality data for the Diep River estuary/Milnerton Lagoon were classified as from a flowing water system, while Zandvlei was classified as a standing water system.
- Summary data presented in graphs in this report show data for river sites separately from vlei or other wetland and dam sites.

F5 MISSING TOTAL PHOSPHORUS DATA

No analyses of total phosphorus were carried out by the SSB with effect from December 2022, as a result of equipment failure. The SSB's analytical equipment requires replacement, and at the time of writing of this report, such replacement had not yet taken place.

F6 ASSESSMENT OF THE TRAJECTORY OF WATER QUALITY IN PRIORITY SUB-CATCHMENTS

- Median annual and seasonal data were calculated separately for the two current reporting years (2024 and 2025) for all key variables, except chlorophyll-a and *E. coli* data. Arithmetic mean data were calculated for the former, while geometric mean data were calculated for *E. coli* data, using the Hazen Method as recommended by WHO (2021), and interpreted as per table 2.3;
- Data showing changes in annual and seasonal data per variable between the 2024 and 2025 datasets were plotted on GIS maps:
    - The maps were produced for the water quality variables believed to be most indicative of catchment quality – PO_4-P; NH_3; DO and *E. coli;*
    - The mapped data were colour-coded per site for each variable considered, using the thresholds for target to unacceptable, as shown in **tables 2.1 to 2.3**;
    - In order to provide an indication of trajectory of change, data points were also coded to indicate improvement, degradation, or no real change. Significant 'change' was determined as an increase or decrease of 25% or more, compared to the previous; and
    - *Escherichia coli* data shown in the maps are presented as geometric means, rather than median values, this being the more appropriate way of treating these data (see Day et al., 2025) – but note that current reporting of *E. coli* data as '>' various values means that geometric means are not statistically accurate and may either overestimate or underestimate actual *E. coli* concentrations.

APPENDIX G

SUMMARY DATA FOR CHLOROPHYLL-A AND MICROCYSTIN TOXINS IN CAPE TOWN'S STANDING WATERBODIES (DAMS, DETENTION PONDS, VLEIS AND OTHER WETLANDS)

G1 CHLOROPHYLL-A

Chlorophyll-a is a pigment that occurs in green plants and is one of the primary pigments used in photosynthesis. In water quality assessments, it is used as a measure of algal growth, specifically of phytoplankton abundance.

The City monitors chlorophyll-a in many of its standing water systems. Thresholds for interpretation of these data are provided in tables 2.1 and 2.2 (section 2). Table G1 presents mean annual chlorophyll-a data for waterbodies where this variable was monitored in the 2024 and 2025 reporting periods.

Table G1

Mean annual chlorophyll-a data for monitored waterbodies in the 2024 and 2025 reporting periods.

CATCHMENT	WATERBODY NAME	REPORTING PERIOD	
		2024	2025
		mg/ℓ	mg/ℓ
Diep	Milnerton Lagoon	39,50	
	Rietvlei	32,07	35,39
	Zoarvlei	102,62	45,11
Noordhoek	Wildevoëlvlei	229,20	175,97
Salt	Elsieskraal dams	23,24	17,30
Sand	Die Oog	28,61	19,26
	Langvlei	54,49	41,75
	Little Princessvlei	83,10	53,79
	Westlake	51,92	40,80
	Zandvlei	46,23	40,58
South Peninsula	Glencairn Vlei	1,32	1,73
Zeekoe	Princess Vlei	103,24	103,59
	Rondevlei	46,92	95,57
	Zeekoevlei	336,96	588,90

G2 MICROCYSTIN TOXINS

Cyanobacteria (or blue-green algae) are a common and naturally occurring component of most recreational water environments (WHO, 2003). They are of potential public health concern because some types may, under certain conditions, produce a group of secondary metabolites known as microcystins, some of which are toxic.

Since microcystin toxin testing is expensive, it is not routinely included in the City's water quality tests but is instead undertaken when blue-green algal blooms have been detected. A 'bloom' is defined by the SSB as a cell count > 20 000 cells/mℓ. However, when field evidence suggests that bloom conditions are obvious (e.g. blue-green algal slicks), microcystin tests are carried out immediately, without the delay necessitated by microscopic enumeration of algal cells.

Thresholds for interpretation of these data are provided in **table 2.4** (section 2).

Figure G2 presents summary data for microcystin toxins, grouped by waterbody and analysed as percentages of samples within each risk category outlined in **table 2.4**.

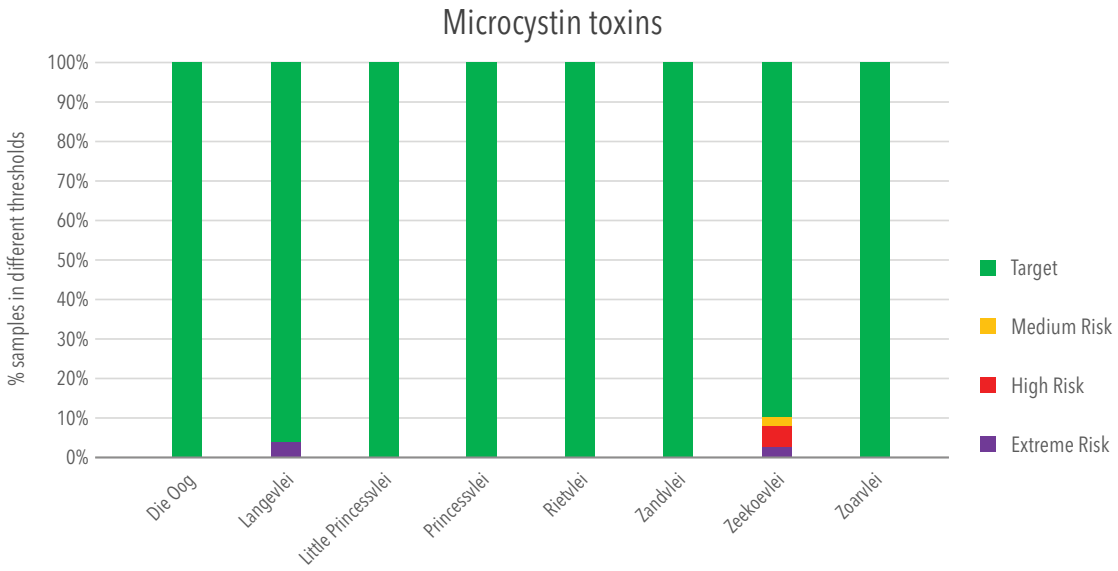


Figure G2

Summary data for microcystin toxins, grouped by waterbody and analysed as percentages of samples within each risk category.



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