CITY OF CAPE TOWN
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CAPE TOWN'S LIVEABLE URBAN WATERWAYS

A COMPENDIUM OF CASE STUDIES:

GUIDING THE TRANSITION TO A WATER-SENSITIVE FUTURE

Making progress possible. Together.

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A collaboration by the City of Cape Town's Catchment, Stormwater and River Management Branch of the Water and Sanitation Department, the Environmental Management Department, the Resilience Department, the Recreation and Parks Department, and the Urban Planning and Design Department 2022.

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Cover photograph:
Rietvlei Nature Reserve

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FOREWORD

In our new Water Strategy, we commit ourselves to becoming a water-sensitive city by 2040. A water-sensitive city is one where rivers, canals, streams and wetlands are healthy, accessible, inclusive and safe to use. While many of Cape Town's waterways are in a deteriorated state due to years of land-use, development and pollution in their catchments, it is not all bad news. A few waterways across town are in a relatively good or near-natural state. In some instances, the authorities have undertaken some award-winning rehabilitation projects, while in other cases, it is the hard work, passion and dedication of local residents, businesses and non-governmental organisations that has resulted in the good state of the waterway. This publication has been put together to recognise and celebrate this good work, and to learn and be inspired to do more.

To restore our waterways to a state we can all be proud of, it is crucial to foster a culture where Cape Town's communities feel a sense of collective ownership of, and responsibility towards, the rivers, canals, streams and wetlands in their neighbourhoods. We have already formed river health-related working relationships with a number of organisations, who are achieving promising results in their efforts to care for waterways in their areas. However, many more of these initiatives are needed before we will be able to turn the state of our waterways around. As such, I hope that this report spurs civic organisations, businesses and communities to join the City in revolutionising the way we think about the urban water cycle, help rehabilitate our rivers, and create a more resilient, water-sensitive and liveable Cape Town together.



Mike Webster
Executive Director:
Water and Sanitation

MESSAGE FROM A LIVEABLE URBAN WATERWAYS PARTNER

Four of us set out in our kayaks on a cool winter morning in May 2010 with the goal of paddling from Muizenberg to Milnerton, using only the vleis, rivers and canals. We had looked at the journey on the map, and it appeared feasible. Even the 27 km journey appeared doable in a single day, with time to spare. However, the state of the canals and rivers at the time was something we didn't know about. We spent a good deal of our time and effort dragging our kayaks along the banks, as the weed and pollution made it impossible to paddle. We ended the day by touching the sea at the mouth of the Salt river as a symbol of accomplishment.

It was more than just an adventure. During the first paddle, we coined two phrases. The first was **"The city's health is seen in its waterways"**. This emphasises how water quality affects the environment and people's health. The quality of water flowing into these waterways is a sign of how well the city is managing its water resources. The second was **"We are all connected to the city's waterways"**, which is slightly different. The legacy of apartheid and colonialism has affected where we live, and how exposed we are to the waterways around us. For some, the experience is positive, where surface water is an added value and creates an environment that people treasure. For others, however, the waterways are filthy, grimy and unhealthy. When we first started paddling the waterways, we recognised the potential for water as an enabling resource that could bridge the divide and create the links for Cape Town to become a more liveable and just city. These are essential ingredients if the City of Cape Town's commitment to a more resilient and water-sensitive city is to be achieved.

The Liveable Urban Waterways (LUW) programme is a much-needed effort to protect, regenerate and restore our waterways. It comes at a critical juncture. The recent Intergovernmental Panel on Climate Change's sixth assessment report (IPPC AR6) contains grim warnings. Worldwide, temperatures of rivers and lakes are being affected by global warming and heatwaves, having risen by up to 1 °C and 0,45 °C respectively in the past decade. More heat in our waters will leave less oxygen for aquatic creatures and life in our waterways, and will increase the risk of nutrient-rich waters triggering algal blooms. Extreme heatwaves will result in very high water temperatures and a further reduction in oxygen saturation. The AR6 report describes many other warning signs, and many are already evident in Cape Town's waterways.

The LUW programme provides an opportunity to address the city's waterways in a way that has never happened before. We can't continue to stare at a map to figure out the state of our rivers, without getting closer to the action. Climate change and increased urbanisation are colliding, threatening to render our cities uninhabitable because it is becoming too hot, monotonous and uncomfortable. The LUW programme is a bold attempt to counteract the bleak outlook of a metropolis that could become unhealthy to live in. The stories and case studies in this publication will motivate you to connect to people who are making a difference and who recognise that it is unacceptable for our waterways to deteriorate further. LUW is an ambitious plan, but could be a catalyst that inspires goodwill and hope.

The Peninsula Paddle began with four mavericks who, on subsequent paddles, were joined at times by nearly 100 likeminded people. It takes time. Nature will be the first to confirm our success when birds and aquatic species return to our waterways in abundance. We will all treasure that moment.



Dr Kevin Winter
Future Water Institute, University of Cape Town
Co-founder of the Peninsula Paddle
https://kevin-winter-uct.com/

DEFINING CONCEPTS

Bioswale: A shallow depression that filters stormwater runoff by directing the water through soil and vegetation.

Catchment: An area where water is collected by the landscape. The outside edge of a catchment is always the highest point, and gravity causes all rain and runoff in the catchment to run downhill, where it naturally collects in a waterway.

Climate change adaptation: Adjustments to the natural and human systems in response to climate change, usually focusing on actions to reduce its impact.

Climate change mitigation: Actions taken to reduce the causes of climate change, for example reducing greenhouse gas emissions.

Catchment, Stormwater and River Management (CSRM): The branch in the City of Cape Town's Water and Sanitation Directorate responsible for the hydrological management of catchments and the maintenance and rehabilitation of rivers.

Co-design: An iterative process that designs a solution to a problem in a collaborative way by drawing on the knowledge, skills, experiences and expectations of a diverse group of invested stakeholders.

Development: Any alteration to property, including, but not limited to, the construction or upgrade of buildings or other structures, fencing, infilling, paving and municipal services.

Ecosystem: A community of living organisms in conjunction with the non-living components of their environment, interacting as a system.

Ecosystem services: The many and varied benefits to people derived from the natural environment and from healthy ecosystems. These include provisioning, regulating, supporting and cultural services.

Eutrophication: The process by which a body of water becomes progressively enriched with minerals and nutrients.

Floodlines: Lines on a map or drawing depicting water levels likely to be reached by a flood having a specified recurrence interval.

Floodplain: The area adjacent to a watercourse that is susceptible to inundation by floods up to the 1:100-year recurrence interval.

Gabion baskets or mattresses: Wire mesh baskets that are filled with rock on-site to form flexible, permeable structures for erosion control and slope stability.

Green infrastructure (GI): The natural and seminatural open spaces, natural and 'engineered' ecological systems along with other environmental features that integrate with the built environment to provide a wide range of ecological, community and infrastructure services.

Grey infrastructure: Human-engineered infrastructure used in water resource management, such as canals, pipes and treatment facilities.

Landscaping: The process of making a piece of land more attractive by modifying visible features, such as planting trees and shrubs.

Liveable urban waterway (LUW): A waterway that accommodates flooding, has acceptable water quality, has a functioning ecology, is connected to the water table and floodplains, connects communities, and provides multiple ecosystem services, economic and social benefits.

Maintenance management plan (MMP): A site or area-specific plan compiled for watercourses to guide maintenance and management interventions.

Partnering: Establishing a long-term relationship based on trust and teamwork, and sharing risk and rewards.

Present ecological state (PES): A scientific measure of the ecosystem health of a waterway.

Recurrence interval: Sometimes called the 'return period'. The probability that the given event will be equalled or exceeded in any given year. A 1:50-year flood means that there is a 2% chance that the flood could occur in any year.

Rehabilitation: Actions that aim to improve some aspects of an ecosystem.

Resilience: The capacity to recover quickly from shocks and stresses.

Resource quality objective (RQO): A set of regulatory targets that define the quality of a water resource system.

Restoration: Actions that aim to return an ecosystem to its natural (historical) state.

Riparian zone/habitat: Includes the physical structure and vegetation of the areas associated with a watercourse that are commonly characterised by alluvial soils and are, to an extent, inundated or flooded with a frequency sufficient to support vegetation distinct from adjacent dry areas.

River corridor: Comprises the watercourse and associated wetlands, the floodplain, the ecological buffer and the area required for specific ecological, aesthetic, recreational and socioeconomic needs.

River corridor plan: A holistic plan for a reach of river that defines the interventions required to rehabilitate and manage the river corridor to meet water quality, water quantity, ecological and amenity objectives.

Stormwater: Water resulting from natural precipitation and/or the accumulation thereof, including groundwater and spring water ordinarily conveyed by the stormwater system, as well as seawater within estuaries, but excluding water in a drinking water or wastewater reticulation system.

Stormwater management system: In the Cape Town context, both the constructed and natural facilities used or required for the management, collection, conveyance, temporary storage, control, monitoring, treatment, use and disposal of stormwater. These include pipes, culverts, watercourses and their associated floodplains, whether over or under public or privately owned land.

Stormwater masterplan: A holistic plan for a drainage catchment that defines the interventions required to meet water quantity and quality objectives.

Sustainable urban drainage system (SUDS): A collection of water management practices that aim to align modern drainage systems with natural water processes. They often use built components that mimic natural features.

Target ecological category (TEC): The target ecosystem health of a waterway, as defined by the resource quality objectives.

Watercourse: A river, spring, stream, channel or canal in which water flows regularly or intermittently. It includes a vlei, wetland, dam or lake into which or from which water flows, as well as the bed and the banks of such watercourses, where relevant.

Water-sensitive city (WSC): A liveable city that gives due prominence to water in the design of urban areas, serves as a water supply catchment with a range of diverse water resources, provides ecosystem services and a healthy natural environment, and has water-sensitive communities who are water wise and engaged in decision making.

Water-sensitive design (WSD): An approach that ensures that development in urban areas is holistically planned, designed, constructed and maintained so as to reduce negative impacts on the natural water cycle and protect aquatic ecosystems.

Waterway: A general term used to describe any river, stream, canal, pond, channel, vlei or wetland.

Wetland: Land that is transitional between terrestrial and aquatic systems, where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and that typically supports vegetation adapted to life in saturated soils.

INTRODUCTION

SETTING THE SCENE

Waterways are an important part of the urban fabric and can enhance the quality of our lives and of the spaces around us. Many cities the world over, including Vancouver, Oslo, Seoul, Sydney, Sheffield, Munich, London, Singapore and New York, have acknowledged the benefits of urban waterways. They are using water-sensitive design, nature-based solutions and waterway rehabilitation to improve citizens' lives, adapt to climate change and enhance the liveability of their cities.

Closer to home, the eThekwini municipality has embarked on a transformative riverine management programme, which uses better catchment management approaches and river rehabilitation to improve livelihoods, enhance the environment, create jobs and build resilience to the impacts of climate change. The City of Johannesburg has also commenced with some innovative waterway rehabilitation projects.

In Cape Town, the vision is to have a water-sensitive city with waterways that are healthy, accessible, inclusive and safe, and where river corridors are restored and waterways improve the quality of life of the communities they flow through. This transition to a water-sensitive city demands a new paradigm and way of thinking about water in all its forms.



Cape Town's Water Strategy is available here:

https://resource.capetown.gov.za/documentcentre/Documents/City%20strategies,%20plans%20and%20frameworks/Cape%20Town%20Water%20Strategy.pdf

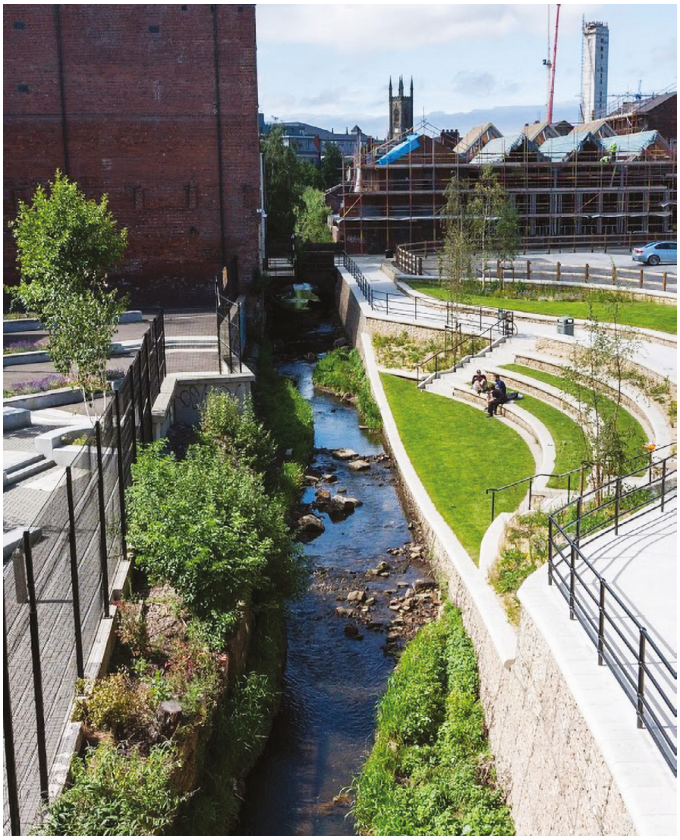


Singapore's Active, Beautiful, Clean Waters (ABC Waters) Programme aims to reconnect waterway ecosystems to the people and the surrounding environment. The river through Bishan Park was once a concrete canal and is now a river meandering through a parkland. Photo: Pagodashophouse (Creative Commons Attribution-Share Alike 3.0)





Closer to home in Johannesburg, the Paterson Park project naturalised a section of concrete canal into a river. Photos: Johan Barnard.



The Porter Brook in Sheffield was buried in a culvert for much of its length. Then in 2015 about 50m was daylighted – restoring the channel and creating the Matilda Street Park. Photo: SPRT Sheffield (Creative Commons Attribution-Share Alike 4.0).

THE CAPE OF RIVERS

Cape Town is blessed with many rivers, including the Diep, Liesbeek, Disa, Eerste, Silvermine, Lourens and Kuils, to name just a few. They mostly rise in the mountain ranges to the east, and the Table Mountain and Cape Peninsula mountains in the southwest. The city also has a wealth of small, shallow lakes and wetlands, known collectively as vleis, found mainly on the Cape Flats, including Zandvlei, Rondevlei, Zeekoevlei, Princessvlei, Zoarvlei, Paardevlei, Wildevoëlvlei and many others. This natural heritage of waterways and waterbodies is rarely found in other urban municipalities in the country.

These waterways are an important part of Cape Town and represent shared places of enormous potential significance for local communities, the environment and the economy. The state of urban waterways can have a significant impact on human health, property values, security, amenities and flood risk. From an ecological perspective, waterways and the spaces around them are vital corridors that connect mountainous areas with the coast and provide aquatic habitat. Many are also important sanctuaries for biodiversity and conservation. Moreover, they are green infrastructure corridors, able to provide a number of ecosystem services that benefit society.

Sadly, many of these ecosystems are highly threatened, and many of Cape Town's waterways are in a terrible state. Years of urbanisation, development, land-use change and pollution in their catchments have taken their toll. To make way for development, many wetlands were drained, and natural rivers were buried in pipes or converted into concrete canals. The natural river–wetland–aquifer continuum was broken, fundamentally altering the water cycle. Many waterways are now little more than pollution pathways, serving as convenient conduits to dump and discharge unwanted material, litter and wastewater. This results in elevated nutrient levels and the rapid growth of algae, which, when they die, can cause oxygen depletion. Invasive alien plants such as water hyacinth *(Eichhornia crassipes)* form dense mats, effectively choking the waterways, while others such as Port Jackson (*Acacia saligna)* soak up the water. Concrete canals are sterile places with little or no biodiversity and can attract litter, illegal dumping and asocial behaviour. In some places, our waterways are not suitable for recreation and are unsightly, and regarded as unsafe and undesirable as public gathering spaces.

The current state of Cape Town's waterways presents an opportunity missed. But there is hope. A few waterways, particularly the upper reaches of some of the rivers flowing from the mountains, are still in a near-natural or good ecological state. Moreover, some waterways have been rehabilitated and now function more naturally, are home to diverse indigenous plants and animals, have reasonable water quality, and are regularly used by communities. In essence, they are liveable urban waterways.



The Spaanschemat river eventually flows into the Keyser river and onwards to Zandvlei. Both of these river corridors will be rehabilitated under the Liveable Urban Waterway programme. Photo: Andrew McDonald.

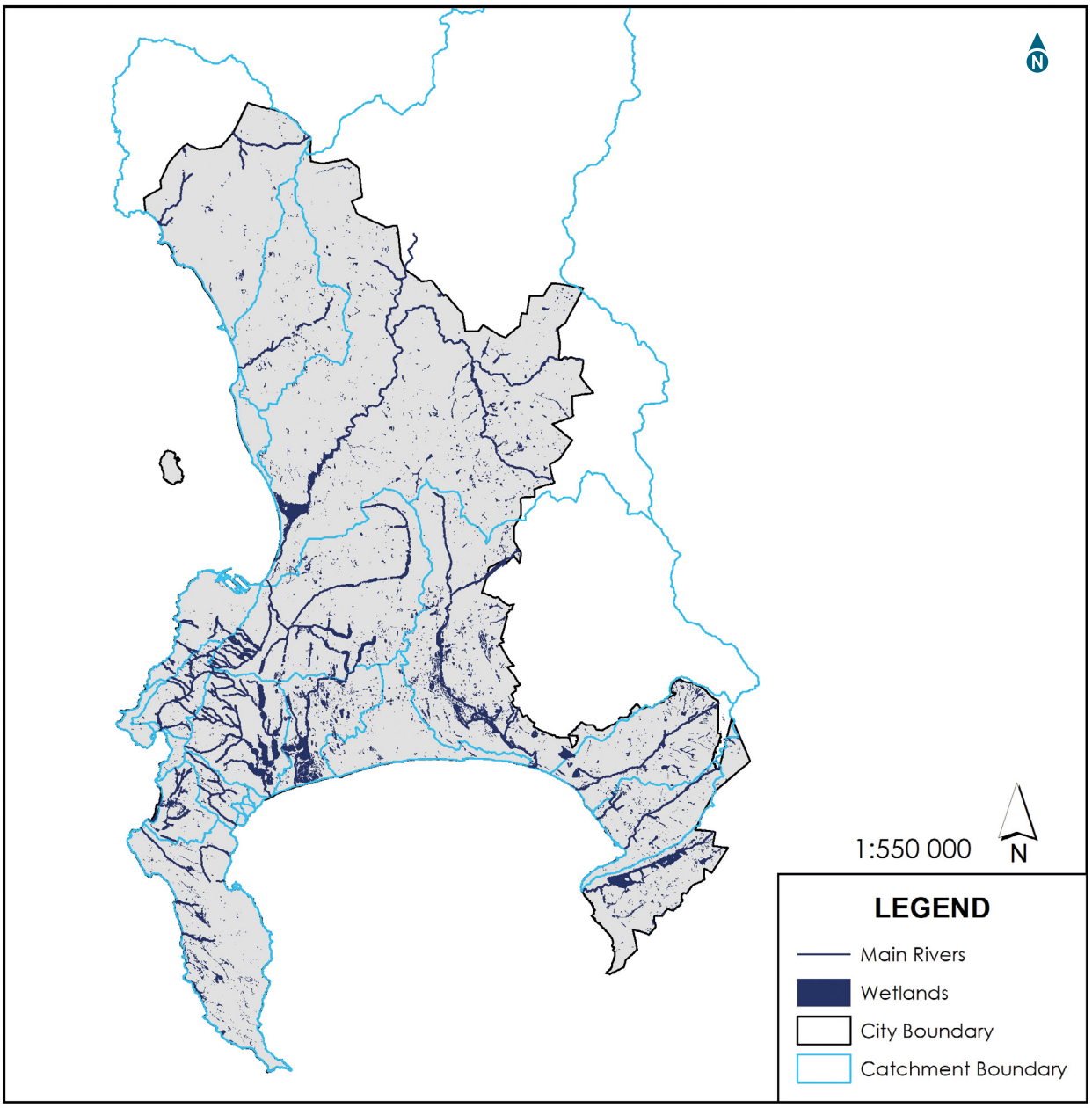


Figure 1: *Map of Cape Town showing the main catchments, rivers and wetlands. In total there are nearly 2 000 km of rivers and 11 000 ha of wetlands in the city.*

THE IMPORTANCE OF OUR WATERWAYS

An aquatic ecosystem generates many benefits and services to society. These are called ecosystem services, many of which are freely provided and mostly taken for granted, yet are vitally important for our health and well-being. Therefore, the sustainable functioning of these ecosystems should be the aim of authorities, catchment and water managers, and broader society. There are several classification systems of ecosystem services, including the Economics of Ecosystems and Biodiversity, the Millennium Ecosystem Assessment, and the Common International Classification of Ecosystem Services. Broadly, ecosystem services can be divided into the following categories:

- **Provisioning services** include products resulting from ecosystems, such as food and water resources, materials, fibres, genetic and biochemical resources, and mineral resources.
- **Regulatory services** are the benefits resulting from the regulation of ecosystem processes, such as temperature and climate regulation, flood protection, water purification and treatment, mitigation of natural risks and disease, erosion and sedimentation control, and pollution filtration.
- **Cultural services** include non-material benefits resulting from ecosystems, such as recreation and well-being services, religious and spiritual services, aesthetic value, education and cultural heritage.
- **Supporting services** are those that support the other services and include soil formation, the nutrient and carbon cycle, and the water cycle.



When our waterways and other natural environments are adversely affected by urbanisation, development and land-use, they lose their ability to provide these services. This, in turn, has a negative impact on our health and well-being. Unfortunately, this is the case with many of Cape Town's waterways.



The Khayelitsha wetlands provides many important ecosystem services, including recreation and education.

A BRIEF HISTORY OF WATERWAY REHABILITATION IN CAPE TOWN

Centuries of development and urbanisation have resulted in massive, and perhaps irreversible, damage to many of Cape Town's waterways. Rapid urban expansion, land-use and the city planning policies and stormwater engineering practices of the 1950s and 1960s have left their mark in the form of drained wetlands and canalised, straightened and buried waterways. Yet there have been many excellent projects, some even visionary for their time, to rehabilitate, restore and improve some of the city's lost waterways. This compendium of case studies touches on a few of these.

The timeline below shows some of the waterway rehabilitation projects undertaken by the authorities and communities since 1994.

- **1994** Rondevlei
- **1996** Diep river Constantia (see case study 7)
- **1997** Blouvlei wetland (see case study 3)
- **1998** Raapenberg wetland
- **1998** Keyser river
- **1998** Silvermine wetland (see case study 9)
- **1999** Zandvlei Park Island (see case study 4)
- **2000** Hout Bay river
- **2000** Langevlei canal
- **2000** Moddergatspruit
- **2000** Edith Stephens Nature Reserve (see case study 10)
- **2003** Upper Liesbeek river (see case study 1)
- **2008** Khayelitsha Wetland Park (see case study 6)
- **2008** Green Point Urban Park (see case study 2)
- **2008** Kirstenhof wetland (see case study 8)
- **2010** Skilpadsvlei conservation area (see case study 5)
- **2015** Water Street garden (see case study 11)
- **2020** Lourens river
- **2021** Kuils river

THE LIVEABLE URBAN WATERWAY PROGRAMME

The Liveable Urban Waterway (LUW) programme is an initiative by the City of Cape Town (hereinafter 'the City') in collaboration with various partners and stakeholders to give effect to the commitments in the City's strategies on climate change, water, resilience and the environment. LUW is developing a systematic, proactive and collaborative approach to waterway rehabilitation across Cape Town. Ultimately, it will use water-sensitive design, nature-based solutions and green infrastructure to achieve multiple benefits for society, the environment and the economy.

So, where did the concept of a 'liveable urban waterway' originate? In September 2018, the City partnered with 100 Resilient Cities to host a collaboration laboratory, or 'co-lab'. A number of local, national and international stakeholders participated. Through a series of interactive sessions, various issues around water resilience were discussed and possible solutions proposed. One such solution was the concept of liveable urban waterways:

> **"... to shift towards the idea of the city as a liveable catchment system, and away from the narrower focus on water services. Local water corridors are currently largely unliveable. Yet if transformed – with interventions such as a series of bio-filters and a network of restored canals and waterways cared for by communities – these green-blue corridors can be invaluable".**

Since its inception, the LUW programme has made some great progress. An implementation framework has been developed that provides the blue print for how the programme will unfold. The programme is led by a transversal team of officials representing five City departments. A total of eight waterway rehabilitation projects are currently underway across Cape Town, in total over R100 million of investment in waterway rehabilitation. Hopefully this is just the start. This compendium of case studies, together with other initiatives, are an important part of stakeholder engagement, partnering and learning.



A COMPENDIUM OF CASE STUDIES

The best way to learn is to tap into the experience of others. This compendium of case studies has been put together with that in mind. By showcasing Cape Town waterways that are healthy, accessible, inclusive and safe to use, it aims to recognise the good work done by many people and organisations, be inspired by their visionary thinking, and be motivated to improve more of our waterways.

The compendium includes 11 examples of waterways that meet some of the liveability criteria (see "Measuring liveability" below). The case studies cover a wide range of waterway locations, uses, typologies and rehabilitation approaches. It is hoped that, as the LUW programme unfolds over time, more of Cape Town's waterways will be improved, and that there could be further editions of this compendium in the future.

MEASURING LIVEABILITY

Various elements make a waterway liveable. A liveable waterway is healthy, is at the heart of the communities it flows through, brings people together and connects them with nature. Importantly also, it provides various benefits to society, the economy and the environment. These are fundamental requirements for a water-wise and water-sensitive city. To be liveable, therefore, a waterway needs to meet most of the following six criteria:

- **Have an acceptable water quality:** Liveable urban waterways have water of a quality that is acceptable for the context and the purpose it is used for. At a minimum, its water should be largely free from sewage, litter and alien invasive plants and animals, and able to sustain indigenous aquatic life.
- **Make space for the water:** Liveable urban waterways accommodate flooding as a natural phenomenon and convey, store and treat floodwater in a way that does not pose an unacceptable risk to surrounding communities.
- **Have a functioning ecology:** Liveable urban waterways provide a diverse habitat structure to support a functioning ecology and a healthy biodiversity of indigenous aquatic and riparian life. They provide for connectivity, enabling animal movement and plant dispersal.
- **Connect the waterway to the water table and floodplain:** Liveable urban waterways are hydraulically connected to the aquifers beneath them and the floodplains and wetlands adjacent to them. This allows water to move naturally, recharging groundwater and sustaining wetlands.
- **Connect communities and are used and enjoyed by all:** Liveable urban waterways can be linear pathways linking mountains to the sea, connecting upstream and downstream communities, and connecting communities around them. They are multifunctional spaces where people come to relax, enjoy themselves, learn and exercise.
- **Provide a range of ecosystem services and economic and social benefits:** Liveable urban waterways are green infrastructure and use natural processes to treat and store water, reduce flooding, improve biodiversity, trap sediments, recycle nutrients, reduce heat and assimilate carbon. They may provide jobs, food and materials, or the water may be lawfully abstracted for use.

It is important to be able to demonstrate the liveability of a waterway using measurable indicators. For this reason, the LUW programme has developed a monitoring framework that allows liveability to be measured. The six liveability criteria each has indicators that can be measured both prior to and following a rehabilitation project. The table on the next page shows how each of the liveability criteria is scored on a rating scale from 1 to 5.

ELEMENTS OF LIVEABILITY	RATING SCALE				
	1	2	3	4	5
Make space for the water	The waterway can contain less than a 1:10-year flood	The waterway can contain a 1:10-year flood	The waterway can contain a 1:20-year flood	The waterway can contain a 1:50-year flood	The waterway can contain a 1:100-year flood
Have an acceptable water quality*	Water quality trend shows *E. coli* quantities greater than 10 000 cfu**/ 100 ml most of the time	Water quality trend shows *E. coli* quantities of 4 001–10 000 cfu/ 100 ml most of the time	Water quality trend shows *E. coli* quantities of 2 501–4 000 cfu/ 100 ml most of the time	Water quality trend shows *E. coli* quantities of 1 001–2 500 cfu/ 100 ml most of the time	Water quality trend shows *E. coli* quantities of less than 1 000 cfu/ 100 ml most of the time
Have a functioning ecology	PES*** rated E or F – very poor condition. Habitat irreversibly modified.	PES rated D – poor condition. Habitat heavily modified.	PES rated C – fair condition. Habitat degraded/fair.	PES rated B – good condition. Habitat near natural/good.	PES rated A – natural condition. Habitat natural.
Connect the waterway to the water table and floodplain	Less than 10% permeable area or connectivity to floodplain	10–20% permeable area or connectivity to floodplain	20–50% permeable area or connectivity to floodplain	50–80% permeable area or connectivity to floodplain	80–100% permeable area or connectivity to floodplain
Connect communities and are used and enjoyed by all	Completely disused space, or used for only criminal or asocial activities	Very occasionally used space, used infrequently by a community for typically a single type of activity	Occasionally used space, used a few weeks of the year by a community for typically a single type of activity	Fairly well-used space, used most weeks of the year by a diverse community for more than one type of activity	Very well-used space, used every week of the year by a diverse community for more than one type of activity
Provide a range of ecosystem services and economic and social benefits	Has a negative impact	Provides no benefit	Provides a single benefit	Provides two benefits	Provides more than two benefits

** Acceptable water quality depends on the use of the water. According to the National Water Quality Guidelines, intermediate-contact recreational water should contain less than 4 000 cfu/100 ml, and full-contact recreational water should contain less than 400 cfu/100 ml.*

*** 'Colony-forming units', a measure of bacteria in a water sample.*

**** 'Present ecological state'. See "Waterway ecostatus" on page 170 for more information.*

For the case studies in this compendium, a liveability rating was determined based on available information. Where information was not available, the particular criterion was not scored. The scores are represented in a diagram, an example of which is shown on the next page.

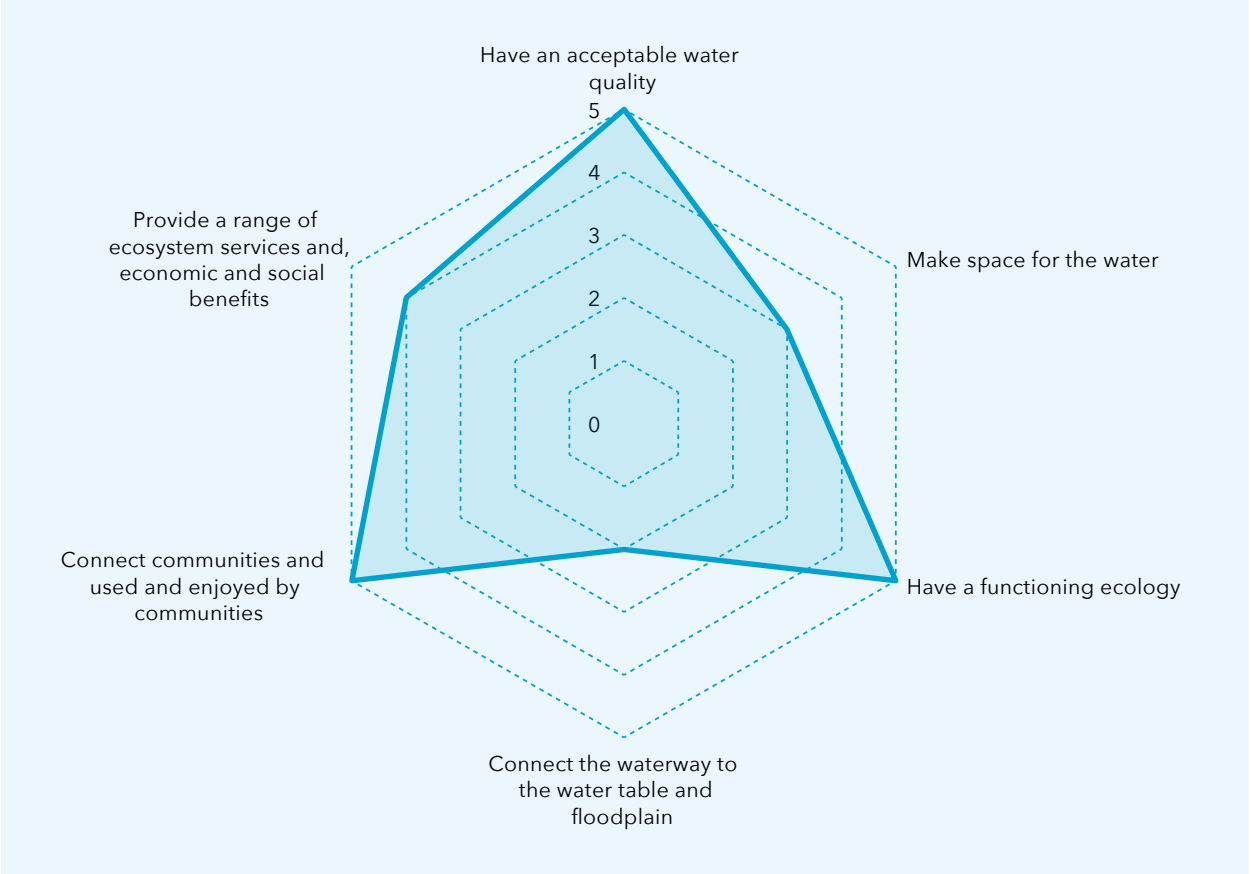


Figure 2: Example of a radar diagram showing liveability elements and their rating.

SOURCES OF INFORMATION

The information in the case studies in this compendium comes from various sources, including other case studies, research reports, maintenance management plans, stormwater master plans, catchment plans, engineering reports, and water quality and ecological data. The excellent publication **Rivers and wetlands of Cape Town – caring for our rich aquatic heritage** was also widely used. In addition to the abovementioned information, a number of structured interviews were conducted with stakeholders, many of whom were closely involved with the development of the projects or the ongoing maintenance of the spaces. Each site was also visited, photographs taken and, if necessary, additional data collected. Please refer to the **References and further reading** section for a list of the information sources for each case study.



Many of Cape Town's parks, like Wynberg Park, have waterways flowing through them.

CASE STUDIES



1 Upper Liesbeek river garden



2 Green Point Urban Park



3 Century City canals and Intaka Island



4 Zandvlei Nature Reserve



5 Skilpadsvlei conservation area



6 Khayelitsha Wetland Park



7 Diep river Alphen greenbelt



8 Kirstenhof wetland



9 Silvermine wetland



10 Edith Stephens Nature Reserve



11 Water Street garden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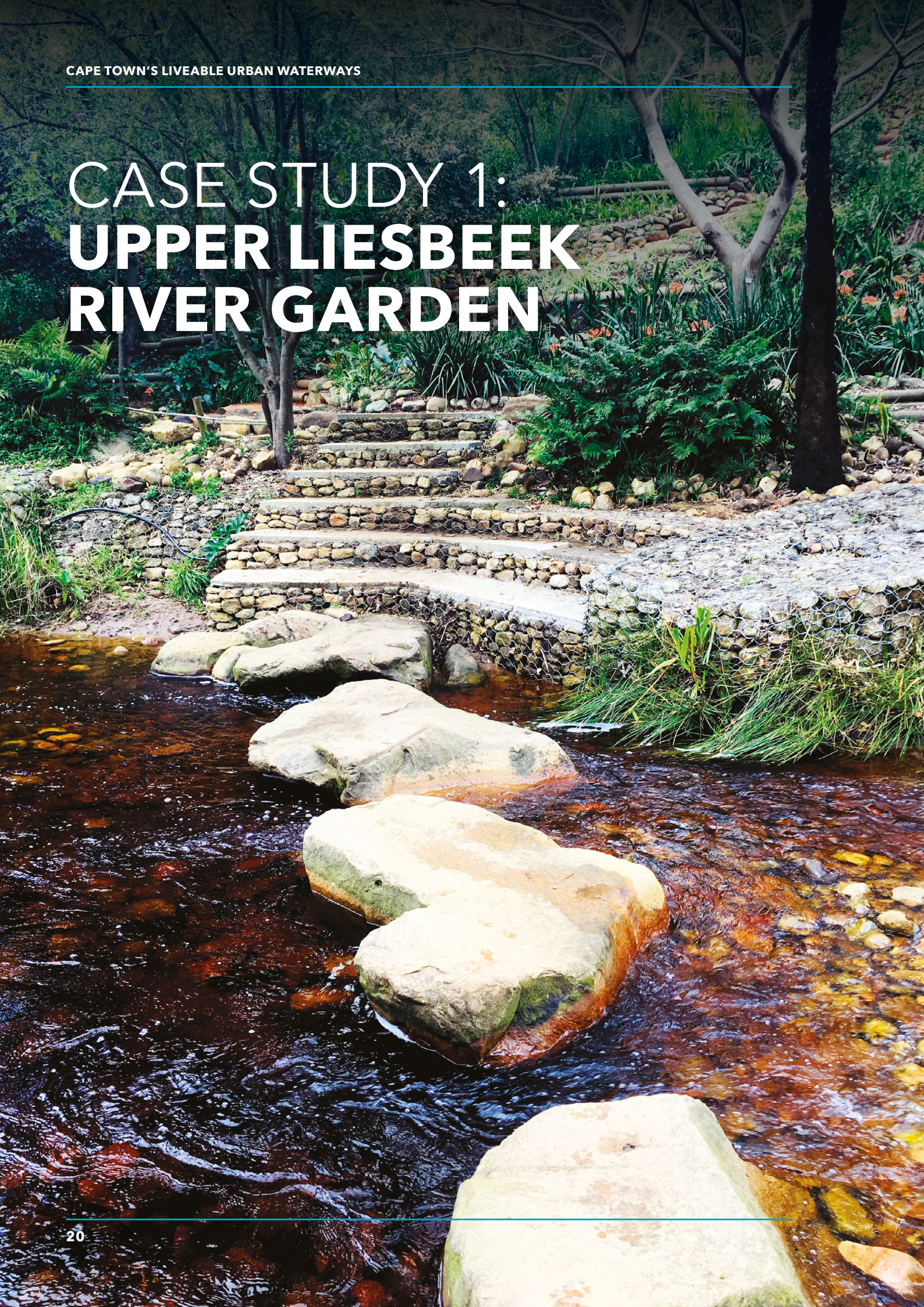
CASE STUDY 1: **UPPER LIESBEEK RIVER GARDEN**



1.1 INTRODUCTION

The Upper Liesbeek river garden is situated alongside the upper reaches of the Liesbeek river as it flows through the neighbourhoods of Bishopscourt Village and Fernwood in Newlands. The headwaters of the river originate above Kirstenbosch Botanical Garden, and along its course, the river is fed by numerous streams flowing down the eastern slopes of Table Mountain. The river is 9 km long and joins the Black river about 2 km from its mouth in Table Bay.

The name 'Liesbeek' is thought to be derived from the old Dutch words for 'reed' (*lies)* and 'stream' (*beeck, beecq).* For centuries, the Liesbeek river has been a source of grazing, water and fertile soils for those who were situated near its banks. Even today, the springs that feed the river remain important as a source of high-quality water used by the Newlands brewery and local residents, who collect the water for home use.

In the early 1900s, urbanisation rapidly increased as buildings and roads were built next to the river. Heavy winter rainfall caused frequent flooding as a result of development in the floodplain and the loss of wetlands next to the river. Because of this, most sections of the middle and lower river were canalised between 1952 and 1962.

Thankfully, the Liesbeek river today still retains some of its natural form and beauty, particularly the upper reaches above Paradise Road, where the river flows in a near natural, cobbled channel. The remainder of the river is contained in a concrete canal for most of its length from Paradise Road through Newlands and Rondebosch, until just before the N2 highway. From here, the river flows in a constructed earth channel, and a concrete canal in certain sections, to its confluence with the Black river.

Waterway name	Liesbeek river
Catchment name	Salt
Intervention type	Waterway garden
Key stakeholders	☑ Friends of the Liesbeek ☑ Upper Liesbeek River Garden team ☑ Bishopscourt Village Residents' Association
Key dates	Commenced in 2003. Ongoing
Cost	Approximately R2,2 million to date

1.2 INTERVENTION

The upper stretch of the river is one of the few parts of the river that is not canalised or flowing in a constructed earth channel. Until 2003, the area was largely overgrown with alien invasive plants such as lantana *(Lantana camara)*, Port Jackson *(Acacia saligna)* and bramble *(Rubus flagellaris)*, and the space was used as a dumping ground. Security was an issue, and after an armed robbery in the neighbourhood, the local residents took it upon themselves to transform this disused and unsafe space. The vision was to transform the space around the river into a community garden with the aim to create a healthy river, conserve the area, and provide a space for the community to enjoy.

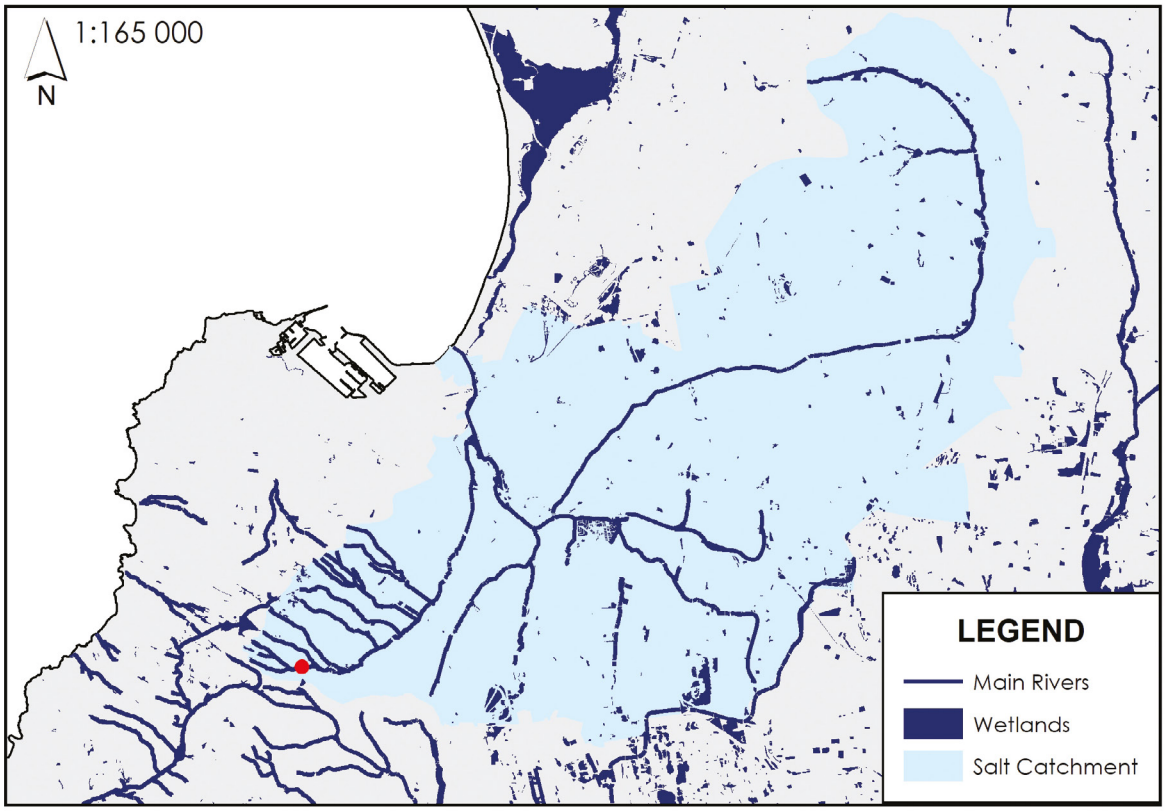


Figure 3: *Map of the catchment and location of the Upper Liesbeek river garden.*



In the beginning the space was very overgrown, but soon a new garden was taking shape. Photo: Joan Parker.

The City assisted by clearing some of the invasive plants. However, this was once-off, and residents volunteered to continue with the clearing thereafter. In 2004, a gardener was employed for three days a week and was the first of what would end up being a growing maintenance team.

As the garden grew over time, hard landscaping was introduced, including pathways surfaced with wood chips and gravel, and the river banks were protected with rock gabions in places. In 2008, a timber boardwalk was built with assistance from Table Mountain National Park (who provided the design specifications), a volunteer surveyor and the City (who paid for the construction). The garden now has numerous timber benches as well as log and recycled-plastic tables and seating for people to relax and enjoy the area. The hard landscaping aesthetic is natural to blend in with the garden setting.

Soft landscaping has included many indigenous trees and shrubs that create a wonderful garden setting along the river corridor. This plant material was procured in various ways, including purchased, grown in the small on-site nursery, or donated by the Kirstenbosch Garden Centre, the City's Newlands tree nursery and by residents and visitors. Planting interventions using indigenous ribbon grass *(Setaria megaphylla)* have been very successful in helping to stabilise the steep banks and protect the river edge.

1.3 FUNDING, GOVERNANCE AND PARTNERSHIPS

The intervention started as a community-led project that relied entirely on volunteers providing their time and expertise. From around 2004, funding became available, primarily via donations from residents. In addition, initial donations were made by local estate agents. These were followed by the Rowland and Leta Hill Trust, Nussbaum Foundation, National Lottery Distribution Trust Fund and others, together donating almost R840 000 since 2004.

The residents of Bishopscourt Village have donated since the start of the project, and Fernwood residents since 2013. Approximately R1 400 000 has been donated by residents. At the beginning of each financial year, a fundraising campaign is started that asks residents to contribute R1 500 for the year or R125 per month. SnapScan is also used successfully to raise funds from visitors who do not live in the area. The City has also contributed funds for the boardwalk and the repair of the stepped paths and gabions.

The finances of the garden are managed by the Bishopscourt Village Residents' Association in a dedicated account and are audited each financial year. The garden coordinator reports to the Bishopscourt Village Residents' Association Committee at their bimonthly meetings and also sends regular newsletters to funders and residents.

The ongoing running costs of the garden are many. Besides staff wages, there are expenses for staff clothing, airtime and refreshments, as well as purchasing of logs, tools, potting soil, plants, trees, tree stakes and other nursery and gardening requirements. An annual budget prepared in June each year ensures that the garden remains financially sustainable, and the staff component is adjusted annually according to the available budget. A two-year grant from the National Lottery funded the appointment of a horticulturist in 2011, and resident and other donations enabled the horticulturist to be employed until 2015. Since 2019, generous funding from residents and the Nussbaum Foundation has enabled the appointment of a garden manager, who is essential for the day-to-day running of the garden.



The Liesbeek river through Paradise Park was turned into a concrete canal in 1952. Photo: Independent Newspapers.

An intervention such as this can only succeed with the help of many people and organisations, and strong partnerships have developed over time. The well-established Friends of the Liesbeek in particular has been an important partner.

Good communication and relationships are also needed with City officials in the Road Infrastructure, Water and Sanitation, and Recreation and Parks departments. These relationships enable the quick resolution of sewer spillages or the coordination of public open space maintenance, for which the City is responsible. Recreation and Parks also assists with removing the garden waste on a weekly basis.

1.4 CHALLENGES

Funding has always been one of the main challenges, as the garden relies on donations. Without funding, staff cannot get paid and the garden would not be maintained. Certain matters are beyond the residents' capacity, such as constructing gabions, removing solid waste, attending to pollution, and clearing blocked stormwater outlets.

An on-site staff presence from Mondays to Fridays and the constant stream of visitors, especially on weekends, deter vandals, but there is no after-hour supervision. At times, flowers are stolen and vagrants light fires, overnight and leave behind litter in the garden.

The extensive and persistent seed bank of alien invasive plants meant that the team had to continuously remove small trees and saplings, and it took over 10 years for their efforts to make a noticeable difference. Many mature alien invasive trees upstream next to the river edge continue to drop seeds.

The river water that flows through the garden is usually of an excellent quality and contains little pollutants. Unfortunately, blocked sewers upstream can contribute to spikes in *E. coli* at times. Pet waste and litter can also be a source of pollution, and dog walkers are encouraged to pick up after their pets, while visitors are reminded to take their litter home or use the bins provided.

1.5 OUTCOMES AND LESSONS

Initially, the Upper Liesbeek river garden was catalysed by safety concerns. Over time, however, it has been transformed into an amenity that provides social, environmental and economic benefits for both local residents and visitors, and further enhances the desirability of the area.

The garden is very well used throughout the week by residents, visitors, school groups and garden clubs. It is especially popular over weekends for picnics, walks, runs, birthday parties and other special occasions, and most recently also wedding photos. Because the water is usually safe for contact, it is one of the few stretches of river in Cape Town where children can safely play in the water, and where students and scholars have access to an educational resource.

The garden has generated a number of environmental benefits too. Thirsty alien invasive plants have been removed and replaced with indigenous species that attract a myriad of wildlife. The river banks have been stabilised, preventing erosion, and space has been opened up to allow the river to flow in its natural course.

Over the years, many people have also gained employment from the garden. Staff have had opportunities to attend courses and training programmes, and some have progressed to more permanent and skilled jobs.








The numerous tables and seats are regularly used by visitors to sit and relax. A network of pathways throughout the garden make for an exciting place to explore, and relax as they enjoy the tranquility of the surrounds.

The success of the Upper Liesbeek river garden illustrates the importance of remaining committed to a cause and being proactive and pragmatic. Other key lessons include the value of fundraising and community buy-in, and how more funds can be unlocked through demonstration.

The project is an excellent example of a community-led waterway improvement approach. Through a combination of vision, hard work, perseverance and financial support from the community and donors, a previously underused waterway has been turned into a thriving community asset. In addition to its ecological benefits, it will provide years of benefit and enjoyment to residents and visitors alike.

KEY LESSONS

- Well-managed open spaces, and especially those with water, can add value to properties and make neighbourhoods more attractive and liveable. Poorly maintained open spaces have the opposite effect.
- The importance of community buy-in, support and ongoing involvement in management cannot be overstated.
- Rehabilitation projects do not have to be large and complex. Many successful projects started small. Local champions, often from the community, are critical to get these projects off the ground. Learning-by-doing and gaining support through demonstration are further important elements.
- Partnerships between civil society, non-governmental organisations and the public sector are important to get projects started and to ensure their sustainable management. Such partnerships can be informal and rely on good relationships, regular communication and teamwork. More formalised partnerships can be overly complex and are not always the answer to ensure collaboration. However, in some instances, formal partnerships are necessary and can also assist with funding allocation. Whether formal or informal, any partnership takes time and energy, and often relies on a few champions on all sides to sustain it.
- All waterway rehabilitation projects cost money both to implement and maintain. Common funding sources include donations from local residents, businesses and other donors. Some projects also raise funds through SnapScan, partnering with the municipality, or generating revenue from recycling.

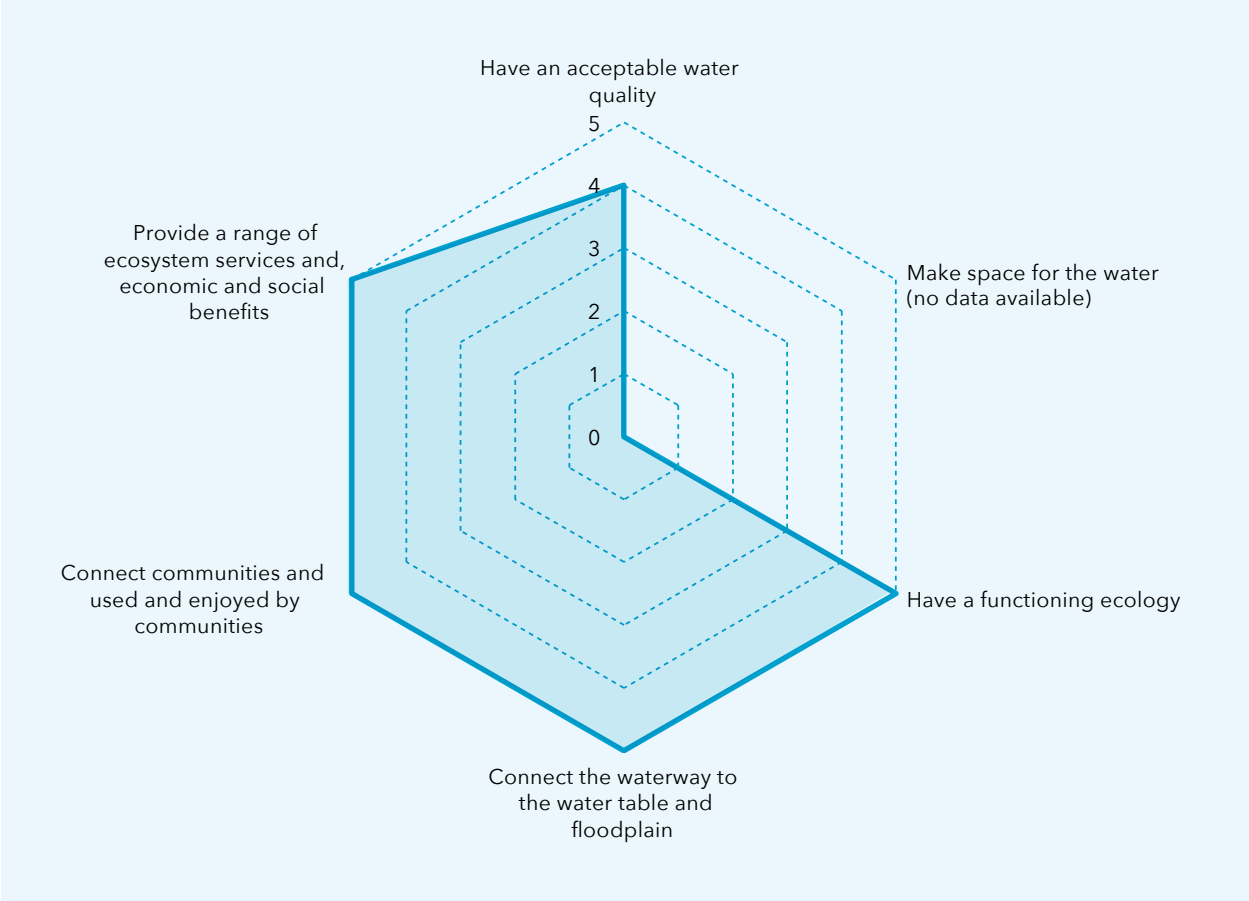


Figure 4: *Elements of liveability for the Upper Liesbeek river garden (2021).*



The shade-loving bush lily (Clivia miniata) with its beautiful orange flowers grows well under the large trees.

FRIENDS GROUPS

Friends groups are volunteer groups affiliated to the Wildlife and Environment Society of South Africa (WESSA) that encourage public participation in caring for the Earth. They comprise volunteers who band together to conserve, rehabilitate or prevent the destruction of a natural area or place of special interest.

Under the guidance of the relevant landowner or authority, Friends groups do physical work such as eradication of alien invasive plants, erosion control, signage development, construction and repair of hides, walkways, jetties, bridges, pathways and fences, plant surveys, animal and bird censuses, and various other tasks. Many Friends groups raise funds for the direct benefit of their natural environment, and they may seek sponsorships and donations from local businesses and benefactors for specific public–private partnership projects.

Cape Town has many active Friends groups who work in and around waterways and river corridors, many of whom are doing wonderful work to improve our waterways. These include the Friends of the Liesbeek, Friends of the Constantia Valley Greenbelts, Friends of Kirstenhof Wetlands, Princessvlei Forum, Friends of Silvermine Nature Area, Friends of Die Oog, Friends of Park Island, Friends of Zeekoevlei and Rondevlei, Friends of Hout Bay River, Renew the Elsieskraal, Mosselbank River Conservation Team and Friends of Rietvlei, to name only a few.

Courtesy of Sarah Alcock, WESSA
https://wessa.org.za/

FRIENDS of KIRSTENHOF WETLAND

FRIENDS OF SILVERMINE NATURE AREA
NO 036-877-NPO

CONSTANTIA VALLEY GREENBELTS
FRIENDS OF CONSTANTIA VALLEY Greenbelts
NPO/101/980

Friends of the Liesbeek

WESSA
PEOPLE CARING FOR THE EARTH

ZANDVLEI TRUST

Friends of Park Island

LIST OF TREES

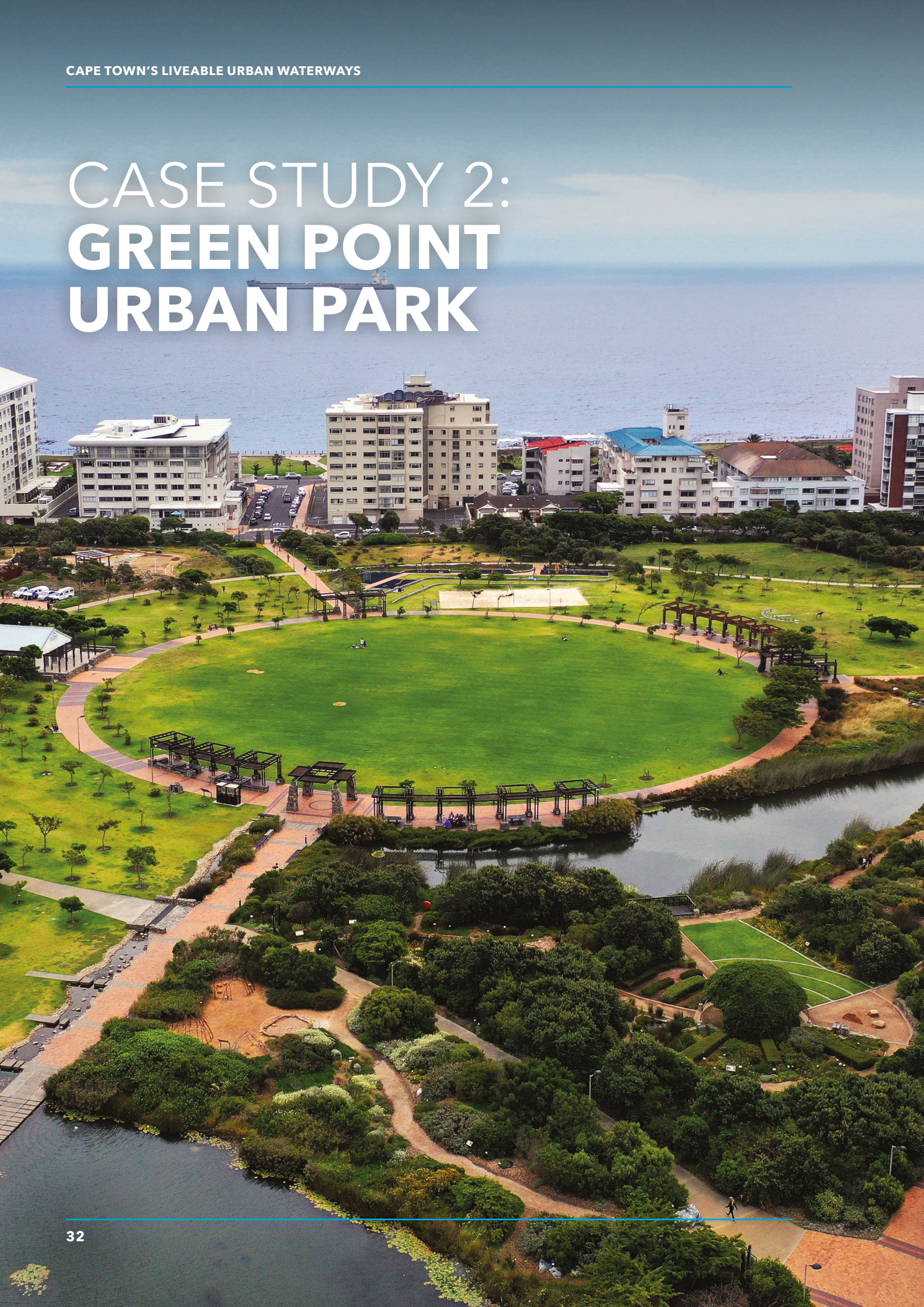
- Assegai tree *(Curtisia dentata)*
- Bastard saffronwood *(Cassine crocea)*
- Bird berry *(Psychotria capensis)*
- Bladder nut *(Diospyros whyteana)*
- Bloubos *(Diospyros lycioides)*
- Blue kunibush *(Searsia glauca)*
- Boekenhout *(Rapanea melanophloeos)*
- Broom cluster fig *(Ficus sur)*
- Cabbage tree *(Cussonia spicata)*
- Camphor bush *(Tarchonanthus camphoratus)*
- Cape ash *(Ekebergia capensis)*
- Cape chestnut *(Calodendrum capense)*
- Cape holly *(Ilex mitis)*
- Coast silver oak *(Brachylaena discolor)*
- Common coral tree *(Erythrina lysistemon)*
- Common spike-thorn *(Gymnosporia buxifolia)*
- Common wild currant *(Searsia pyroides)*
- Fever tree *(Vachellia xanthoploea)*
- Forest elder *(Nuxia floribunda)*
- Hard pear *(Olinia ventosa)*
- Henkel's yellowwood *(Podocarpus henkeli)*
- Karoo boer-bean *(Schotia afra)*
- Kei apple *(Dovyalis caffra)*
- Keurboom *(Virgilia oroboides)*
- Knysna boxwood *(Heteropyxis natalensis)*
- Lavender tree *(Heteropyxis natalensis)*
- Mickey Mouse bush *(Ochna serrulata)*
- Monkey thorn *(Senegalia galpinii)*
- Natal guarri *(Euclea natalensis)*
- Natal mahogany *(Trichelia emetica)*
- Natal plane *(Ochna natalitia)*
- Natal wild pear *(Dombeya rotundifolia)*
- Outeniqua yellowwood *(Podocarpus)*
- Paper bark *(Vachellia sieberiana)*
- Pistol bush *(Justicia adhatodoides)*
- Pom pom *(Dais cotinifolia)*
- Quinine tree *(Rauvolfia caffra)*
- Real yellowwood *(Podocarpus latifolius)*
- Red beech *(Protorhus longifolia)*
- Rooiels *(Cunonia capensis)*
- Silky bark *(Maytenus acuminata)*
- Silver tree *(Leucadendron argenteum)*
- Sneezewood *(Ptaeroxylon obliquum)*
- Soap dogwood *(Noltea africana)*
- Tree aloe *(Aloidendron barberae)*
- Turkey berry *(Canthium inerme)*
- Water berry *(Syzigium cordatum)*
- Water pear *(Syzygium guineense)*
- White ironwood *(Vepris lanceolata)*
- White karee *(Searsia pendulina)*
- White milkwood *(Sideroxylon inerme)*
- White pear *(Apodytes dimidiata)*
- White stinkwood *(Celtis africana)*
- Wild almond *(Brabejum stellatifolium)*
- Wild laburnum *(Calpurnia aurea)*
- Wild olive *(Olea africana)*
- Wild peach *(Kiggelaria africana)*
- Wild pear *(Dombeya rotundifolia)*
- Wild plum *(Harpephyllum caffrum)*

Courtesy of Joan Parker, Upper Liesbeek River Garden Coordinator
The City's Green Infrastructure Programme Tree Guideline can be found here:
https://resource.capetown.gov.za/documentcentre/Documents/Procedures,%20guidelines%20and%20regulations/Green_Infrastructure_Programme_%20Trees.pdf



The stepping stone crossing is much loved by children as they search for tadpoles and race their boats. Photo: Altus de Wet.

CASE STUDY 2: **GREEN POINT URBAN PARK**



2.1 INTRODUCTION

Green Point Urban Park (GPUP) is nestled between the Atlantic Ocean and Signal Hill in the suburb of Green Point. The park was built on what used to be known as Green Point Common. Historically, the area was a shallow seasonal vlei and was used by the Khoekhoen for grazing cattle. The early settlers called the wider area the *waterplaats* (waterhole). By the early 20th century, the vlei had been filled in, and in 1923, the land was granted to the citizens of Cape Town for a commonage.

Green Point Common was used for a plethora of sporting activities, including horseracing, rugby, cricket and golf. However, from the mid-20th century onwards, the space started to become dilapidated and crime-ridden. Despite this, the municipality remained interested in the space and developed visions and concept plans, although none were ever implemented. Then South Africa was granted the rights to host the 2010 FIFA World Cup, and in 2006, Green Point Common was specifically chosen as the preferred site for a stadium. This ultimately resulted in budget being made available, and in 2008, approval was granted to transform Green Point Common into an urban park and sporting precinct for the World Cup.

Waterway name	Green Point Urban Park
Catchment name	City
Intervention type	Regional park with new wetland creation
Key stakeholders	City of Cape Town
Key dates	Construction between 2008 and 2011. Operations ongoing
Cost	Approximately R60 million for construction and R3,6 million per annum for operations

2.2 INTERVENTION

In preparation for the 2010 FIFA World Cup and to enable construction of the stadium, the entire precinct was redeveloped. This allowed for the construction of a 12,5 ha public park – Green Point Urban Park – on the western edge of the common. The purpose was to create a quality public open space and leave a legacy once the World Cup was over. Significant changes were made to Green Point Common and the surrounding area. The new Cape Town Stadium was constructed, parts of the Metropolitan golf course were realigned, the Green Point athletics stadium was refurbished, and the common fields were rebuilt and realigned to make space for the new park. The stadium and some of the surrounding spaces were completed in time for the FIFA tournament, and shortly after, in February 2011, Green Point Urban Park was officially opened.

OvP Landscape Architects designed the park, strictly guided by ecological principles. A biodiversity garden showcases the indigenous vegetation found in the area, raises awareness of the unique biodiversity of the Cape floristic region, and demonstrates indigenous horticultural and gardening practices. The biodiversity garden houses over 300 plant species, while the rest of the park contains about 30 species. A combination of interpretive signage and educational art provides visitors with a range of messages about the value of biodiversity and conservation.

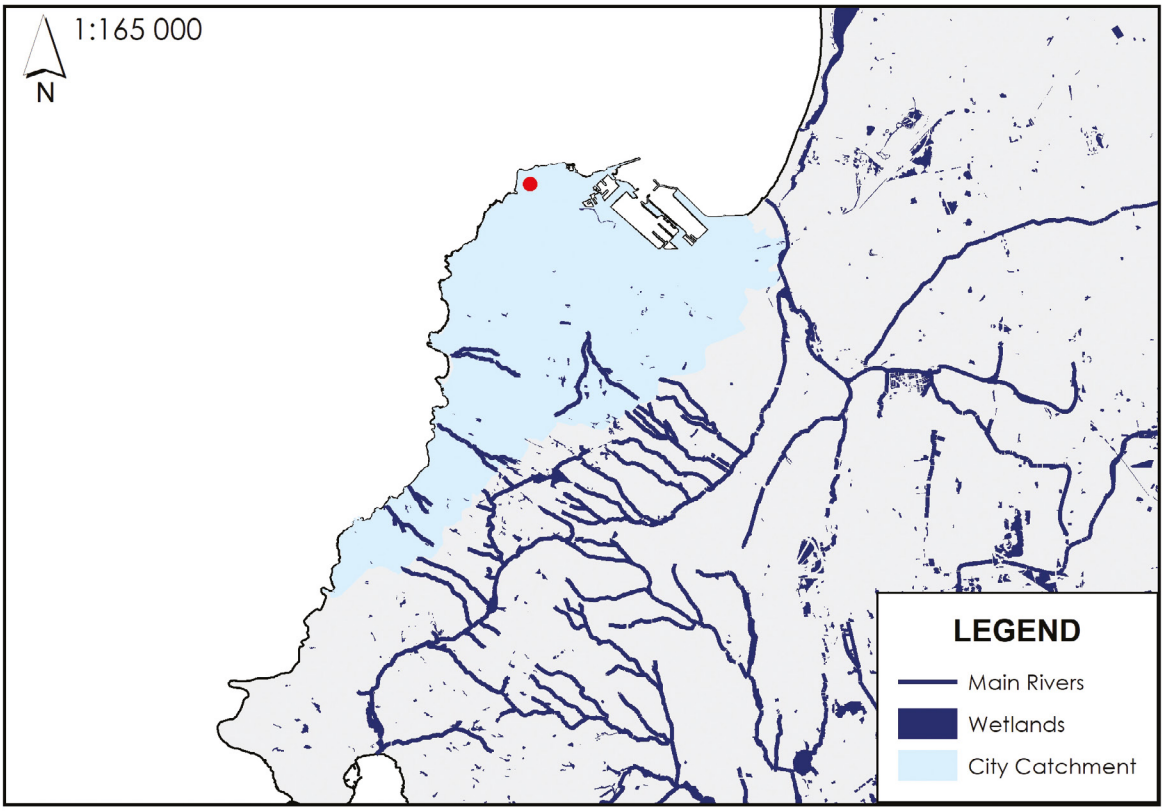


Figure 5: *Map of the catchment and location of the Green Point Urban Park.*



Panoramic view of Green Point Common, Cape Town. Taken on 23 May 1959. Photo: Independent Newspapers.



The biodiversity garden showcases Cape Town's unique fynbos.

Water had always been an important part of the history of the area, so the new park had to incorporate water as a central design feature. Since water conservation and demand management was an objective of the Green Goal programme (see "Green Goal programme" on page 38), one of the interventions implemented in the park was the use of alternative water sources for irrigation. In 2008, a feasibility study concluded that the harvesting of spring water was the most cost-effective way to reduce the use of potable water for the irrigation of the park. Water is sourced from the original *stadsfontein* (city fountain), which was constructed in 1853 on the slopes of Table Moutanin in Oranjezicht. As the name suggests, this was the main source of water to Cape Town for many years, and even today, nearly two million litres a day flow from the various wells.

The use of spring water for irrigation influenced the redesign of the park, ensuring optimal use of the water through a number of water features, including wetlands and ponds. The spring water is gravity-fed via a piped system to the park, where it emerges from below the ground as if from an artesian well. From here, the water is split: some goes directly into the irrigation system, and the remainder flows over a textured surface and into the upper pond, from where it cascades down a rock-lined channel and enters the lower pond and wetlands. The ponds provide some 25 000 m³ of capacity. Low-flow irrigation fittings have been installed to reduce flow rates, and landscaping is predominantly indigenous, further reducing the need for frequent irrigation. A hydroturbine in the upper pond can generate electricity from the spring water supply, although it has not been commissioned.

Water quality is monitored through an extensive testing regime. On a weekly basis, the water is checked and the results are sent to specialists who then advise on management interventions. The specialists visit the park every quarter and provide a report. Dissolved oxygen is used as an indicator of water quality, as it is quick and easy to measure. For the most part, dissolved oxygen levels have been very healthy, allowing aquatic life to flourish.

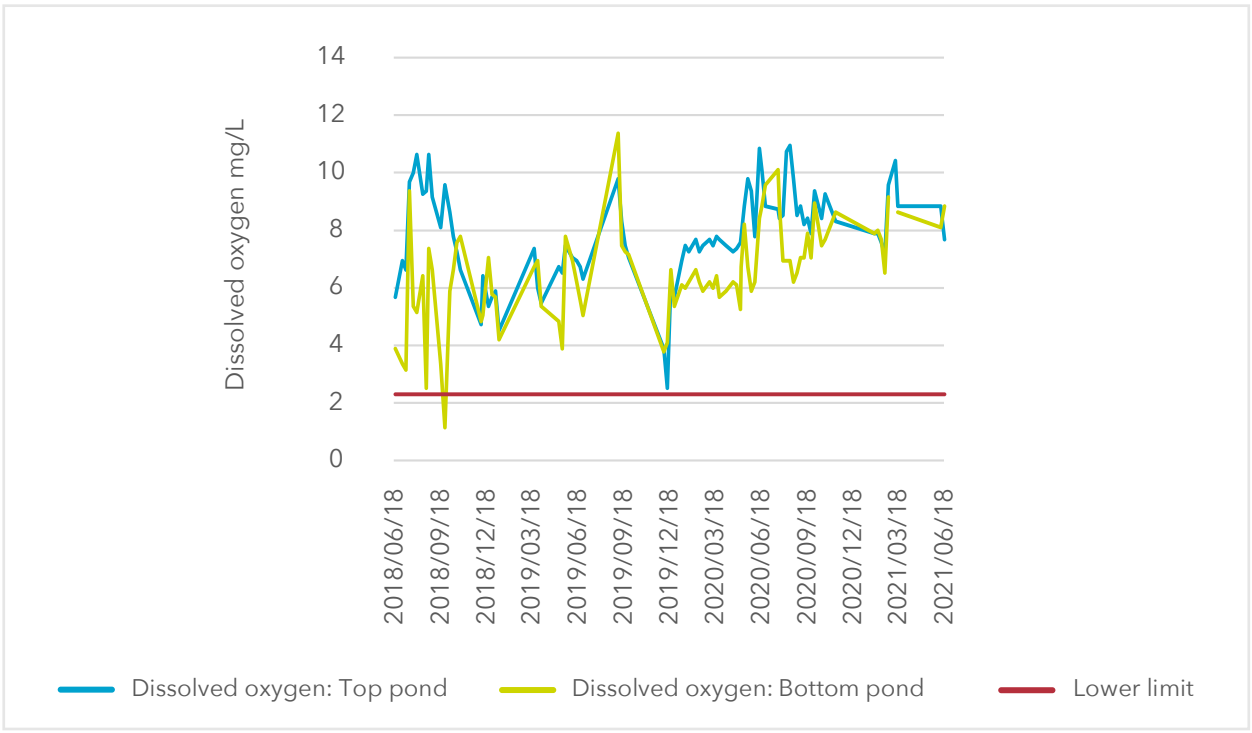


Figure 6: Graph of dissolved oxygen in upper and lower pond.



Figure 7: Map of the park (courtesy Cape Town Stadium).



Water lilies (Nymphaea nouchali) and fish flourish in the ponds.

GREEN GOAL PROGRAMME

As an official initiative of the 2010 FIFA World Cup, the Green Goal programme focused on incorporating socially and environmentally responsible decision making into the planning, organisation and implementation of the World Cup to leave a positive environmental legacy. As a participant in the Green Goal programme, Cape Town committed over R10 million in direct funding to implement the Green Goal Action Plan through 42 projects across nine environmental target areas over a period of four years. The programme achieved many noteworthy successes, such as waste-to-landfill reduction, the use of public and non-motorised transport, water savings, energy and carbon reduction, and city beautification, thereby significantly reducing the environmental impact of the event. As a result, the Green Goal programme scooped the International Olympic Committee (IOC) sport and environment award in 2011. The legacy report can be found on the City website here:

https://resource.capetown.gov.za/documentcentre/Documents/City%20research%20reports%20and%20review/2010_FIFA_World_Cup_host_city_Cape_Town_Green_Goal_legacy_report.pdf



Pathways invite you to the water's edge.

2.3 FUNDING, GOVERNANCE AND PARTNERSHIPS

The budget for hosting the 2010 FIFA World Cup came from various sources, and the requirements were set out in a joint business plan by the City and the Western Cape provincial government (hereinafter 'Province'). Various national government departments also provided funding in line with the state's guarantees contained in the bid documentation and host nation agreement. The total cost for the infrastructural work in Cape Town amounted to some R12,4 billion, of which the City contributed about R2,6 billion. The cost to upgrade Green Point Common and the precinct was about R576 million, of which around R60 million was spent on Green Point Urban Park.

The park is currently managed by the City's Strategic Assets Department. A dedicated park manager is responsible for the day-to-day management of the park and is supported by one employee. All maintenance functions are outsourced, including security, landscape maintenance, cleaning and building maintenance. Park safety and security is important, so the security contractor provides an around-the-clock service. The landscaping contractor employs some 16 people, while the building maintenance contractor uses a team of three part-time. In the 2019/20 financial year, landscaping and maintenance costs came to approximately R300 000 per month.

2.4 CHALLENGES

Transforming Green Point Common posed some unique challenges. Among others, the space was initially not the preferred location to build a stadium. At the time, some in the community felt that the 2010 FIFA World Cup would commercialise the area and reduce the public open space, which to them was unacceptable. Numerous meetings, public engagements and negotiations ensued, and it was in response to the community's concerns and needs that the City pledged to build a new precinct with a world-class urban park that would eventually become a long-term public asset.

From an operational perspective, the biggest challenge is to keep the park in top shape: there is always grass to cut, trees to prune, litter to collect and facilities to keep clean and safe. Another challenge is providing sufficient water to sustain the public open spaces and landscaping all year round. The 2017 drought made water management more difficult, as other stakeholders also started using the spring water. Achieving the right flow balance and ensuring that there is sufficient flow through the system is also tricky. Any error in this regard can cause the water in the ponds to become stagnant, which results in lower oxygen levels, unpleasant smells and algae growth.



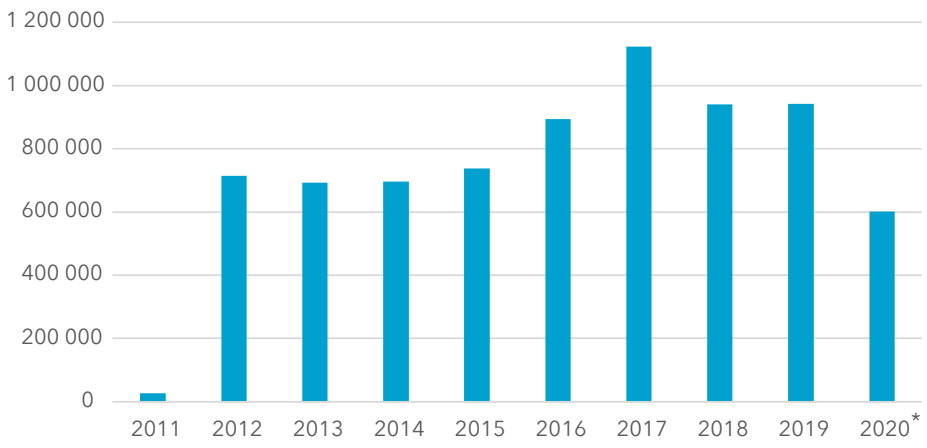
The park, nestled between Signal Hill and the ocean.



2.5 OUTCOMES AND LESSONS

The design of the park was based on the concepts of universality and inclusivity, and this is reflected in its diverse users and uses today. The various elements and facilities of the park make it a popular attraction for visitors and local residents alike. It provides a well-used and important connection along the pretty tree-lined pedestrian boulevard that runs between Somerset Road, Mouille Point lighthouse and the beachfront promenade. Features include expansive lawns for playing and relaxing, hundreds of mature trees providing shade and habitat, pathways for walking, cycling and jogging, various children's play areas, a fitness area and volleyball court, an amphitheatre, a coffee shop, toilet facilities, a biodiversity garden and an experiential garden. The interconnected ponds and wetlands, and the vistas across the lake to the stadium, add to the liveability of the space. The clever use of water provides a welcome habitat for wildlife, including otters, ducks and frogs, and a focal point for park visitors.

Consequently, having such a space in the inner city poses multiple benefits. The park offers people an amenity and a public space in which to relax and unwind. The biodiversity garden, experiential garden and aquatic ecosystems provide education opportunities and a habitat for wildlife.



**Drop off in 2020 due to Covid-19 pandemic lockdown restrictions.*

Figure 8: *Total number of visitors to Green Point Urban Park per year.*

The success of the 12,5 ha Green Point Urban Park makes it a model for how other public spaces in the city could be planned, constructed and managed. Having been in operation for over 10 years, the original vision of becoming a people's park and a multipurpose space has certainly been achieved. Green Point Urban Park is perhaps the greatest legacy of the 2010 FIFA World Cup in Cape Town, providing daily benefits to residents and visitors from far and wide.



Contrasting textures and colours, and the clever use of water features make for an appealling space.



The tree-lined boulevard runs the length of the park connecting Main Road to the promanade.



As water fills the buckets on one side of the water wheel, the extra weight turns the wheel and drive shaft. Water-driven mills like this were commonly used in years gone by to grind wheat into flour and to crush spices.

KEY LESSONS

- Strategic projects, initiated for whatever reason, need to ensure that water is a central design feature and must embrace the principles of collaborative planning, water-sensitive design, sustainable drainage and green infrastructure.
- Safety is paramount for people to want to use a waterway. A well-maintained space – little or no litter, demarcated pathways, mown grass, trimmed trees and clear sight lines – is perceived to be safer. And as the site attracts more people as a result, this assists with further safety.
- Post-project maintenance is critical for the sustained success of any waterway rehabilitation project. If projects are not properly maintained and become overgrown and unsightly, this affects people's connection with the space.

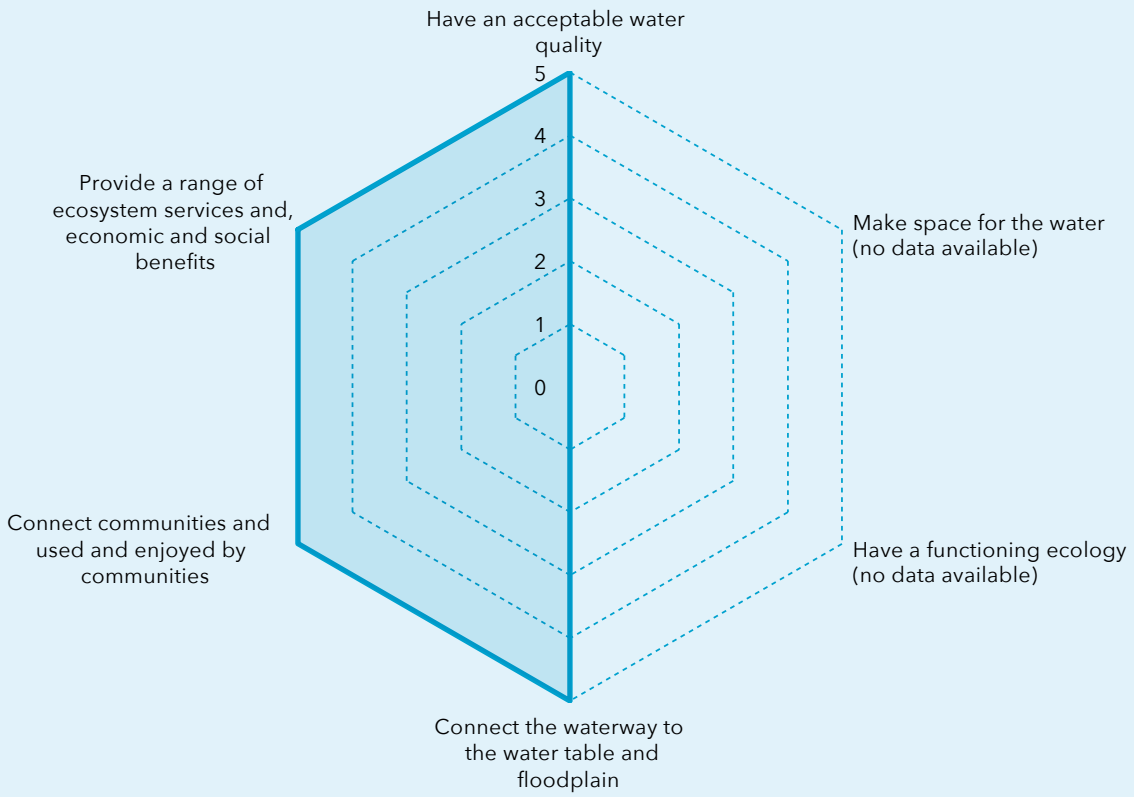


Figure 9: Elements of liveability for the Green Point Urban Park (2021).

CASE STUDY 3: **CENTURY CITY CANALS AND INTAKA ISLAND**

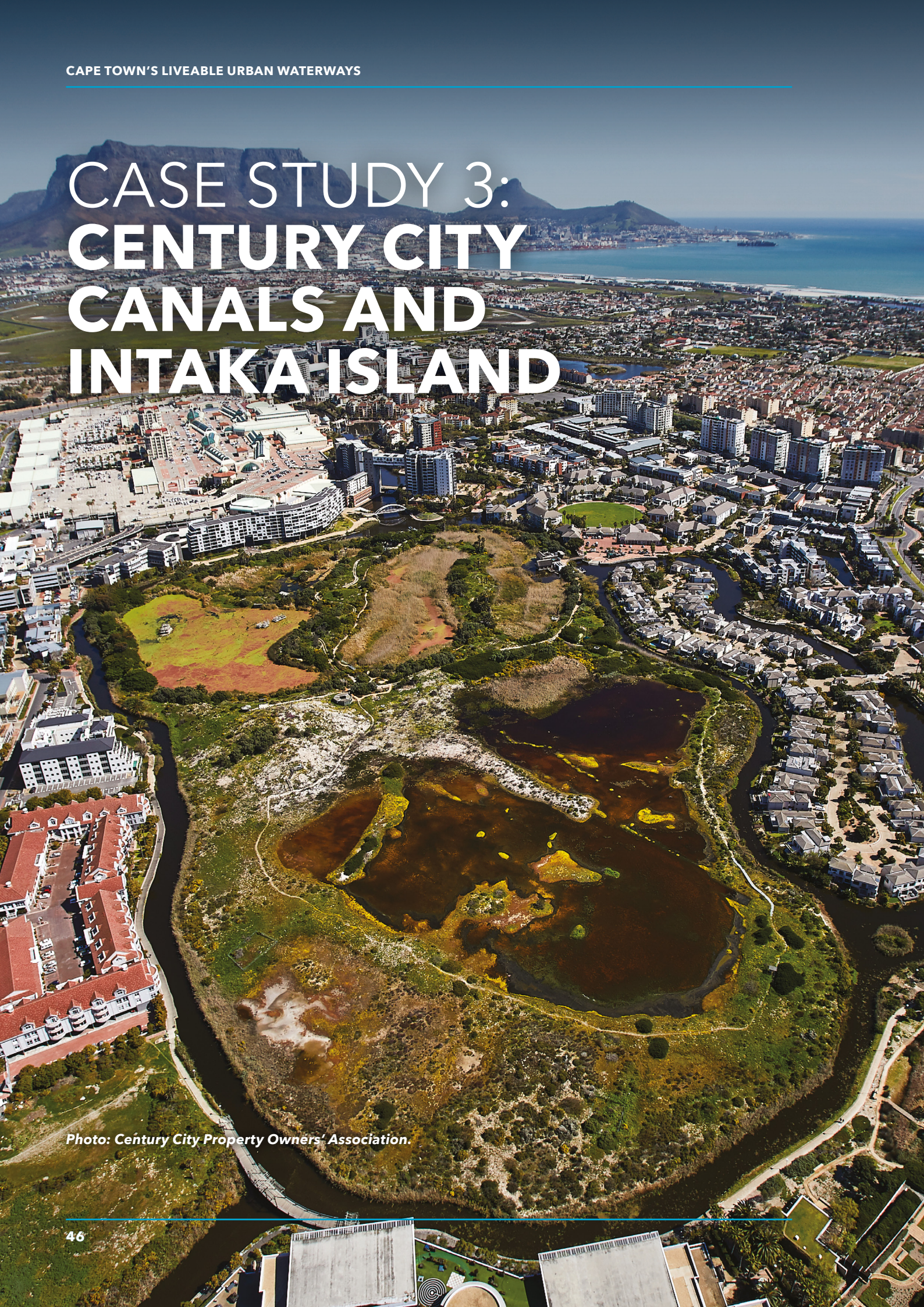


Photo: Century City Property Owners' Association.

3.1 INTRODUCTION

Century City, one of the largest mixed-use developments in South Africa, is located north of the N1 highway at its intersection with the N7. It offers a mix of residential developments, from waterfront houses to apartment blocks, and is also a sought-after corporate address. Facilities on offer include the Canal Walk shopping centre, numerous hotels and restaurants, conference facilities, health and wellness services, and many other leisure and amenity facilities.

The development is located in the extensive northern catchment of the Diep river, which covers almost 1 500 km^2. Previously, the 250 ha area was undeveloped Cape Flats sand fynbos, largely covered in invasive alien vegetation, mainly Port Jackson *(Acacia saligna)*. Prior to the development of Century City, there were several ephemeral pans in the area, some of which flooded in winter and dried up in summer. This gave the area its colloquial name of *Sewepannetjies* ('seven pans'). Another pan, Blouvlei, had turned into a permanent waterbody as a result of the stormwater inflow from the nearby Summer Green development. The area was a haven for waterbirds such as herons, egrets, ibises, spoonbills, cormorants and darters. In 1995, some 1 800 pairs of waterbirds nested in the trees surrounding Blouvlei, making it one of the largest waterbird colonies in the Western Cape. This part of the development eventually became Intaka Island. ('Intaka' is the isiXhosa word for 'bird'.)

Waterway name	Blouvlei
Catchment	Diep (northern)
Intervention type	Mixed-use development with wetland rehabilitation
Key stakeholders	☑ Monex Development ☑ Rabie Property Group ☑ Century City Property Owners' Association ☑ Blouvlei and Intaka Island Environmental Committee
Key dates	Construction from 1997. Operations ongoing
Cost	Unknown construction costs. Approximately R2,5 million per annum for operations

3.2 INTERVENTION

Monex Development began developing the site, having purchased the land from Ilco Homes. A comprehensive environmental impact assessment (EIA) process commenced in 1994, followed by rezoning of the land from residential to mixed-use. Planning approvals were granted in 1996, and construction started in 1997. Planning permission was granted subject to the preservation of the ephemeral pans and the creation of a permanent waterbody, where a representative number and diversity of the bird species that formerly bred at Blouvlei could find a safe place to breed. This requirement resulted in 16 ha being set aside for conservation, which would become Intaka Island in the heart of the development site.

Water is an important part of the open space system at Century City and features prominently in the urban structure and precincts. In total, there are 8 km of engineered canals, including the Grand Canal, and a network of smaller, narrower canals that meander around the site. Intaka Island consists of 8 ha of constructed wetland and 8 ha of natural seasonal wetland, which is a remnant of what would have been present throughout the area historically.

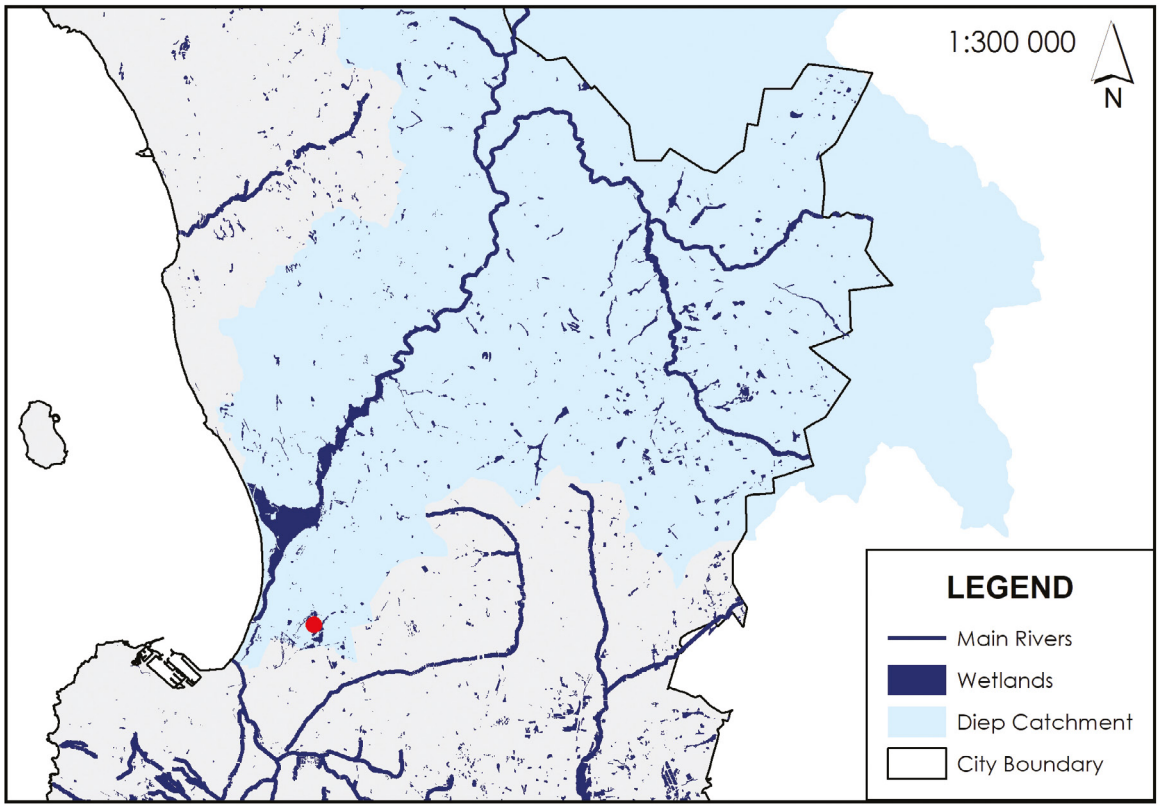


Figure 10: *Map of the catchment and location of the Century City canals and Intaka Island.*



The wetlands were designed to provide a water purification function as well as to provide habitat. Photo: CCPOA.



A spot on the water's edge for some quiet reflection. Photo: Andrew McDonald.

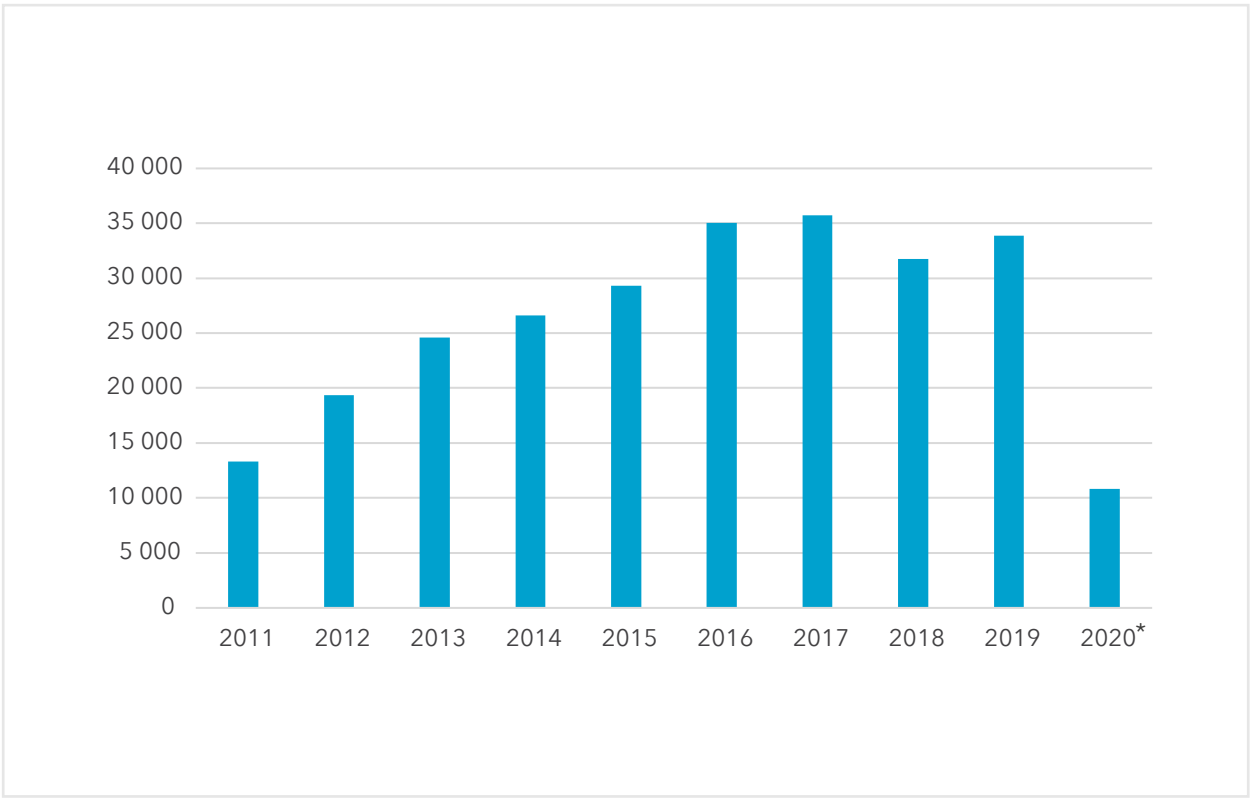


Figure 11: Map of Intaka Island (courtesy CCPOA).

Sustainable urban drainage systems (SUDS) have been used throughout the development such as wetlands and ponds, vegetated bio-swales, infiltration basins, rainwater harvesting facilities and some permeable pavement. The 8 km of canals and 8 ha of constructed wetland are a form of regional stormwater control, with the canals alone providing some 83 000 m^3 of storage. The hydrological functioning of the seasonal pans depends solely on groundwater and rainfall.

These water systems are important, not just for stormwater management, but also because people are drawn to open spaces with water. Indeed, as the site was being developed, the land adjacent to the water was the most attractive for property developers, tenants and residents, and today, some of the most expensive real estate is located next to the canals. The network of smaller canals and adjacent walkways provide opportunity for active recreation such as jogging, cycling, paddleboarding and canoeing. Soft landscaping is attractively used and pedestrians can access the water edge through a number of well-placed pocket squares.

The wetland constitutes the heart of the development. Reserved for nature conservation, it is a tranquil place for passive recreation – birdwatching, walking and quiet reflection. The seasonal pan comprises rare ephemeral pans and Cape Flats sand fynbos habitats, and the diversity of plants and birds give the area a high conservation value. As a result, CapeNature declared the site a voluntary conservation site in 2006. Over the years, more than 200 locally indigenous plant species have been established in the nature area, making this one of the most extensive fynbos revegetation schemes in South Africa. The Century City nursery propagates and supplies many of the plants and the ongoing restoration work takes place under the guidance of a specialist botanist.



**Drop off in 2020 due to Covid-19 pandemic lockdown restrictions.*

Figure 12: *Total number of visitors to Intaka Island per year.*

The constructed wetlands were designed to fulfil the role of water purification, improving the water quality in the wider Century City canal system and providing additional ecological and social benefits. Water entering the wetland passes through four treatment cells, after which the cleaned water is fed back into the canals. Ongoing water quality monitoring is conducted throughout the precinct under the guidance of a freshwater specialist. Quality testing has shown that the water meets the non-contact recreational guidelines, making it safe for activities such as canoeing.

Over the years, several facilities and resources have been developed to promote recreational and tourism use. The Eco Centre forms the hub of Intaka Island and is managed and its educational programme overseen by a qualified teacher, who is assisted by a team of trained rangers. There are also footpaths, benches, viewing shelters, bird hides, boardwalks, a renewable-energy classroom, an activity centre, a lapa and a launch-boat deck. A pamphlet and map for self-guided tours are available, and informative posters and bird identification charts are displayed. A portion of the nature trail also offers wheelchair access. Guides have been trained to conduct educational tours and assist visitors. The Eco Centre runs a full-time curriculum-based environmental education programme, which is utilised by over 90 schools from across the Western Cape province. Curriculum-based worksheets have been developed for use by learners as part of their visit to Intaka Island, and the Intaka Island website (http://www.intaka.co.za/) is a valuable resource that is continuously updated to ensure ongoing relevance.

Visitor numbers initially increased year on year and have more recently plateaued at around 35 000 per annum. The Covid-19 restrictions have also taken their toll in this regard.



The view across the seasonal pans. These are fed only by rainfall and groundwater.





The canals are edged with pretty flower gardens and pathways.



Directional signage points the way around the trails.



A network of walkways and raised boardwalks circle the wetland.



A waterfront house on the edge of the canal is very sought after.



The heronry was built to mimic the natural nesting sites that would have been common around the original Blouvlei. Below each is a tank to catch the gauno, thereby reducing the nutrients in the water.

ENVIRONMENTAL GOALS

Goal 1: Promote the functioning, sustainability and value of Intaka Island and the associated canal system against the backdrop of the ongoing planning and development of Century City.

Goal 2: Maintain formal conservation status for Intaka Island and investigate other potential designations.

Goal 3: Provide ongoing and effective management for Intaka Island and the associated canal system.

Goal 4: Sustain the natural hydrological and ecological functioning of the seasonal pans.

Goal 5: Maintain the water quality in the constructed wetlands and associated canals so that they serve the desired ecological and social purposes.

Goal 6: Re-establish and maintain locally indigenous plants, the 8 ha seasonal pan zone, and establish and maintain Western Cape indigenous plants in the constructed wetlands zone.

Goal 7: Manage the habitats at Intaka Island to support the feeding, roosting and breeding of wild birds.

Goal 8: Sustain viable populations of locally indigenous amphibians, fish, reptiles and small mammals on Intaka Island, provided that this is compatible with the sustainable ecological functioning of this area.

Goal 9: Develop and maintain the tourism, recreation and education potential of Intaka Island in a manner compatible with the other goals.

Goal 10: Create awareness among Century City's tenants, residents, employees and visitors as well as the general public of the ecological and social value of Intaka Island.

Courtesy of Blouvlei Intaka Island Environmental Committee. 2019. Environmental Management Plan for the Operational Phase of the Wetlands and Canals at Century City, Cape Town. Prepared for the Century City Property Owners' Association (CCPOA).

3.3 FUNDING, GOVERNANCE AND PARTNERSHIPS

The Century City Property Owners' Association (CCPOA) is the custodian of Century City and responsible for the management of the entire Century City precinct, including the wetlands and canals. CCPOA have wide-ranging responsibilities, which include site security, access control and traffic management; management of the stormwater system, wetlands and canals; conservation and management of Intaka Island; landscaping and maintenance of public areas; maintenance of all infrastructure, such as roads, bridges, lighting and fencing; as well as marketing, communications and financial management. Money is raised through levies paid by property owners, and representatives of the property owners serve on the CCPOA board.

In 2010, a trust was established to fund environmental education at Intaka Island, raise money to construct the Eco Centre, and pay for ongoing operational costs. The combined annual operational budget for Intaka Island is around R950 000. When the entire canal system is included, the budget increases to approximately R2,5 million per annum.

An environmental monitoring committee – the Blouvlei Intaka Island Environmental Committee – was established in 1996 to oversee the implementation of the environmental management plan (EMP). The committee has continued to meet every few months. It includes representatives of the CCPOA, CapeNature, the City, the Friends of Rietvlei and specialist botanical and ornithological consultants. The CCPOA employs an environmental manager, who is responsible for the implementation of the EMP.

3.4 CHALLENGES

Challenges are inevitable with a development of this nature. Initially, there was some disagreement between the different stakeholders. The implementation of an EIA at a time when this requirement was fairly new in South Africa was a major achievement, and played an important part in getting all stakeholders' buy-in for the conservation of the wetlands. The EIA considered three options, namely conserving 21 ha, 16 ha and 8 ha of wetland. The option of 16 ha was agreed to, with additional habitat being provided in the canals. Eventually, the entire precinct was developed with water as a key design informant.

From an operational point of view, various challenges require ongoing management. Water quality in the canals and wetland is a major challenge, necessitating innovation and adaptive management. Pondweed *(Potamogeton)* and common reed *(Phragmites australis)* need to be cleared from the constructed wetlands from time to time. Other factors affecting water quality include sewer leaks, nutrient loading from birds (particularly the heronries) and the impact of carp on water quality. Barley straw has been used successfully to manage algal blooms.

Other challenges include managing the bird, mammal and fish populations. Initially, there was some difficulty in getting birds to breed. A novel approach was developed, using branches to create islets in the wetland ponds, thereby emulating the former Blouvlei wetland where birds bred in flooded trees. In 2010, water mongoose *(Atilax paludinosus)* was first detected, which had a negative impact on the bird population. Since then, the mongoose population have been closely monitored and managed. Having been illegally introduced into the canals, the alien fish species of carp has also been successfully removed. Fishing is no longer permitted in the wetlands and canals to discourage the potential introduction of more alien fish.

Moreover, the ongoing care and maintenance of the various sustainable drainage installations proves challenging. Natural systems and sustainable drainage installations often require a different maintenance approach than conventional systems. The frequency and nature of vegetation control and the occasional specialist input needed from professionals, such as aquatic ecologists and botanists, can also increase the cost of maintenance. Fortunately, however, a development as vast and desirable as Century City is able to raise sufficient budgets through levies to be able to pay for the specialist maintenance of the water and sustainable drainage systems.



Canoeing, paddleboarding, dragon boat racing and jogging along the bank are but a few of the activities enjoyed. Photo: CCPOA.

3.5 OUTCOMES AND LESSONS

Century City has become a prime example of how the built and natural environments can co-exist in harmony for their mutual benefit. The development has also shown how collaboration between developers, government and society can have a positive outcome.

Water is now a focal point in the development and may very well have contributed to the desirability of the neighbourhood. This is well demonstrated in the Island Club residential development, which generated R200 million in sales within a week of its launch in May 2003. Estate agents confirmed that one of the most influential selling points was the water and canals surrounding the apartments. A 2005 study investigated the value of Intaka Island using both hedonic pricing and contingent valuation methods. The study concluded that, although undervalued as an environmental resource at the time, Intaka Island did offer public benefits, which people were prepared to pay for. In addition, at the time of the study, the prices of residential apartments with a water view attracted a premium compared to similar units further away from the water edge. Interestingly, the same did not apply to commercial properties, suggesting that other factors were at play in determining the price of these properties.

Sustainable drainage systems and water features have been used successfully throughout the development. Due to their multifunctional design, these systems also provide more than just stormwater management benefits, but offer many social and ecological benefits too. Century City is considered one of the first developments of this scale in the country that implemented water-sensitive design and sustainable drainage principles. These water features generally, and Intaka Island in particular, are very popular with school groups, birders and photographers; the canals are used by canoeists and paddleboarders, and there is a parkrun route around the canals. This is a good example of how what was initially a constraint to development can turn into a signature feature of the entire area.

The development is a major economic hub in Cape Town, drawing local and international corporates and visitors to Century City and surrounds. It has been hailed as a uniquely successful union of conservation and property development, and has won numerous awards.

KEY LESSONS

- Strategic projects, initiated for whatever reason, need to ensure that water is a central design feature and must embrace the principles of water-sensitive design, collaborative planning, sustainable drainage and green infrastructure.
- Successful waterway rehabilitation projects have a range of objectives and anticipated benefits. The multipurpose use of waterways provides better social, ecological and economic dividends, while projects with a single use or benefit are less likely to provide a good return on investment.
- Well-considered plans must set out the vision, define management objectives and outline the actions necessary to achieve the vision. This is particularly important when various parties have a role to play or an interest in the waterway. To this end, catchment, river corridor, wetland management and environmental management plans are useful to bring stakeholders together and guide the collaborative management of the area.

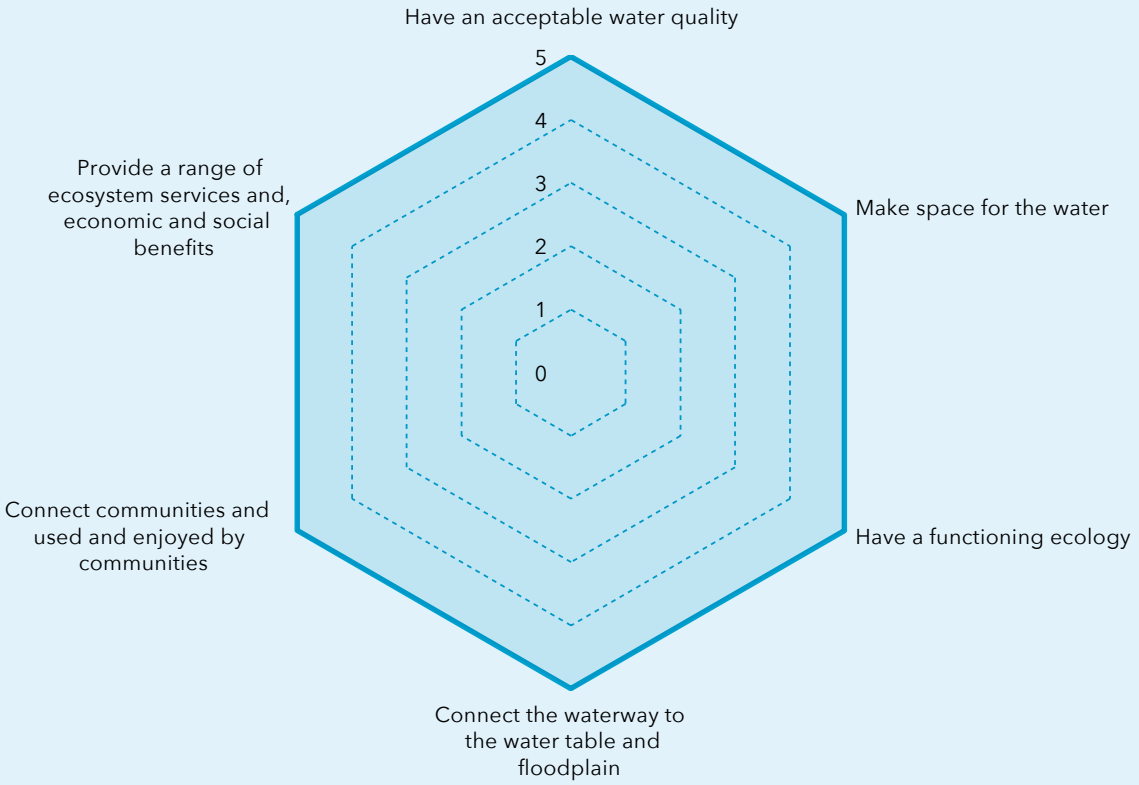
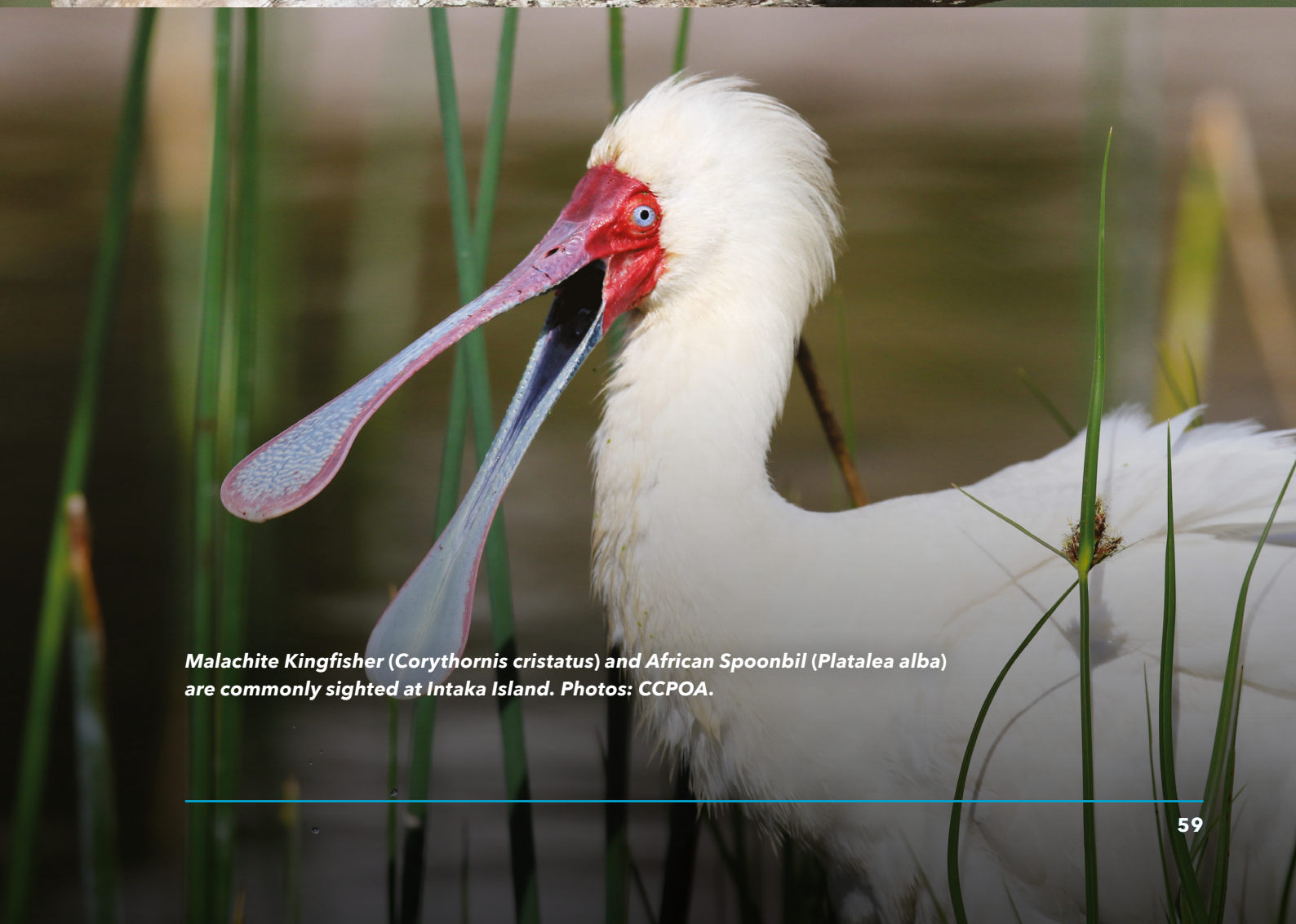


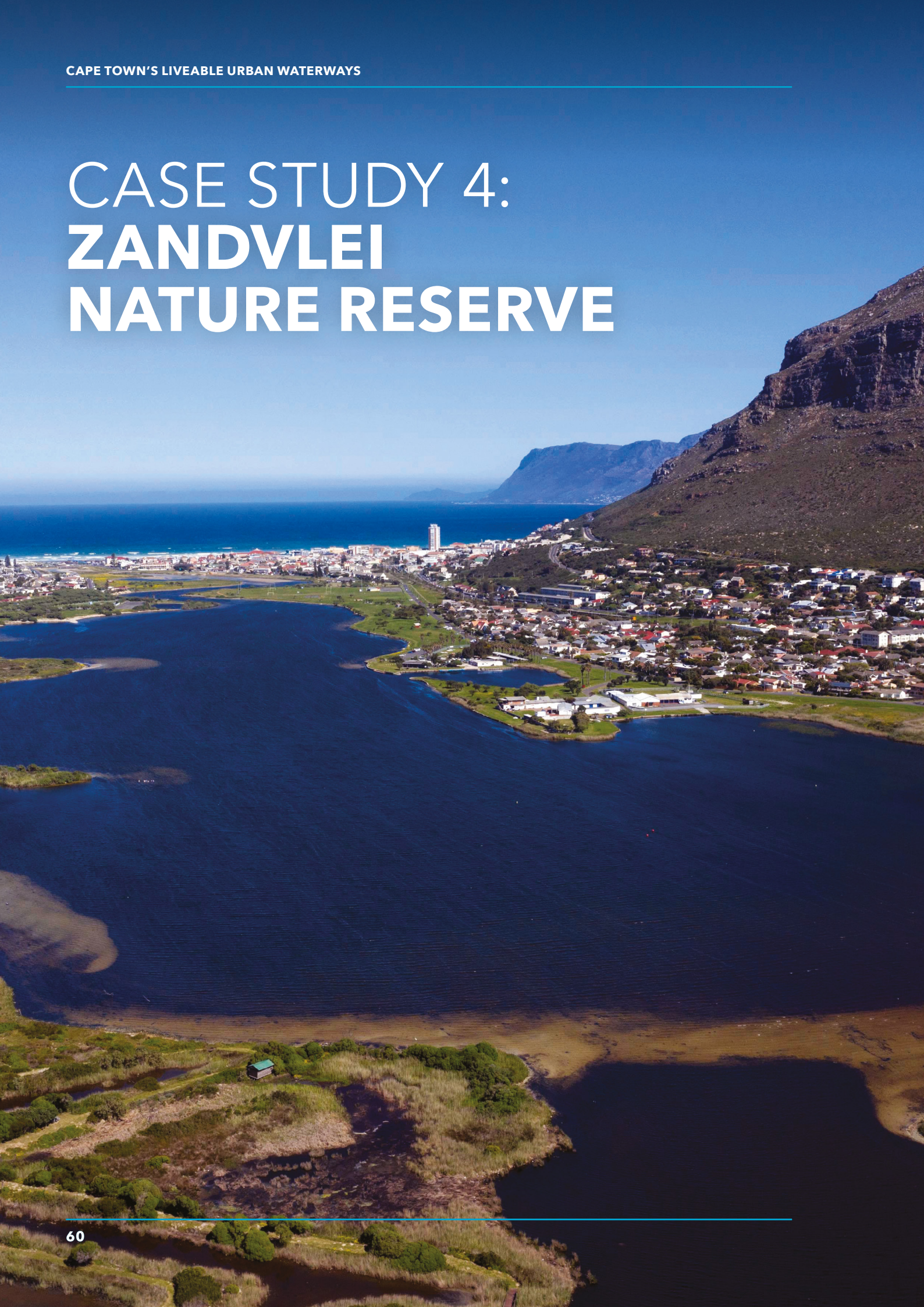
Figure 13: Elements of liveability for the Century City canals and Intaka Island (2021).





Malachite Kingfisher (Corythornis cristatus) and African Spoonbil (Platalea alba) are commonly sighted at Intaka Island. Photos: CCPOA.

CASE STUDY 4: **ZANDVLEI NATURE RESERVE**



4.1 INTRODUCTION

The Zandvlei estuary is located between the suburbs of Muizenberg to the south, Lakeside to the west, Marina da Gama to the east, and Steenberg and Coniston Park to the north. It is the largest of the eight estuaries on the False Bay coastline and accounts for 80% of the estuarine area in the bay. Flowing into the estuary are the Westlake and Keyser rivers, entering through a reedbed wetland to the northwest, as well as the Langevlei and Sand canals, which are concrete canals that enter the estuary to the northeast. The catchment is called the Sand catchment and extends for about 90 km^2, draining the eastern slopes of the South Peninsula mountains from Wynberg Hill, through Constantia, Steenberg and Westlake, to Muizenberg.

The vlei is 2,5 km long and, at its widest point, only 500 m wide. It is regarded as a shallow estuarine lake with depths of 0,7–1,3 m. The wetland area covers some 60 ha, and the main waterbody extends over 56 ha. There is also Marina da Gama and the outlet channel, which connects the vlei to False Bay. The habitat is estuarine, with salinity ranging from near-fresh in winter months to near-marine in late summer. Under natural conditions, the vlei would have dried up at times, such as when inflows reduced and when the mouth was closed, allowing the water to evaporate. The exit to the sea now consists of a 20 m wide concrete channel, and the water level in the estuary is controlled either by a rubble weir situated in the channel, or a sand bar that periodically closes the mouth.

The estuary is home to more than 437 indigenous plant species, 30 indigenous fish species, 172 bird species, 24 mammal species, 27 reptile species and seven amphibian species (including the endangered western leopard toad (*Sclerophrys pantherina*)).

Zandvlei, which forms part of the Zandvlei Nature Reserve, is a popular recreational area and is home to canoe and yacht clubs, the Zandvlei recreational park, Park Island, the Sea Scouts and a camping and caravan site, among other facilities.

Waterway name	Zandvlei estuary
Catchment name	Sand
Intervention type	Nature reserve
Key stakeholders	☑ City of Cape Town ☑ Zandvlei Trust ☑ Zandvlei Protected Area Advisory Committee ☑ Sand River Catchment Forum ☑ Friends of Park Island ☑ Marina da Gama Residents' Association
Key dates	Nature reserve first established in 1984
Cost	Approximately R1,8 million per annum for operations

4.2 INTERVENTION

Zandvlei and surrounds have a long and varied history. In 1673, the Dutch settlers – the VOC – established a cattle post on the shores of the vlei, and in 1744, a fortified post was established there under Sergeant Wynand Willem Muys, after whom the suburb of Muizenberg was named. After the upgrade of the road from Cape Town to Muizenberg and the later construction of the railway lines, development in the area quickly accelerated.

The first major modification to the vlei was in 1947, when dredging commenced. This was followed by the canalisation of the outlet channel and the construction of a rubble weir in the 1950s. Reclamation of the western edge of the vlei in the 1960s and the construction of Marina da Gama in the 1970s further changed the vlei and its surrounding areas.

Marina da Gama, a housing development of some 1 350 homes grouped around a number of waterways and canals, is located to the east of the estuary. When construction began on the development, Park Island was created. This 20 ha island on the eastern shore of the vlei was designed to be central to both the Marina da Gama development and the Zandvlei estuary. Over the years, extensive community involvement has seen Park Island turn into a major asset.

In 1984, a small portion of the vlei and the surrounding wetlands was proclaimed as a nature reserve. In 2006, 204 ha were proclaimed as the Zandvlei Nature Reserve. The proclaimed area was expanded to 220 ha in 2015 in terms of the National Environmental Management: Protected Areas Act, No. 57 of 2003. The boundaries of the reserve now include the entire vlei, the Westlake wetlands, the Sand river mouth, Marina da Gama and its waterways, along with Park Island.



The views across the water are stunning. Photo: Cherry Giljam.

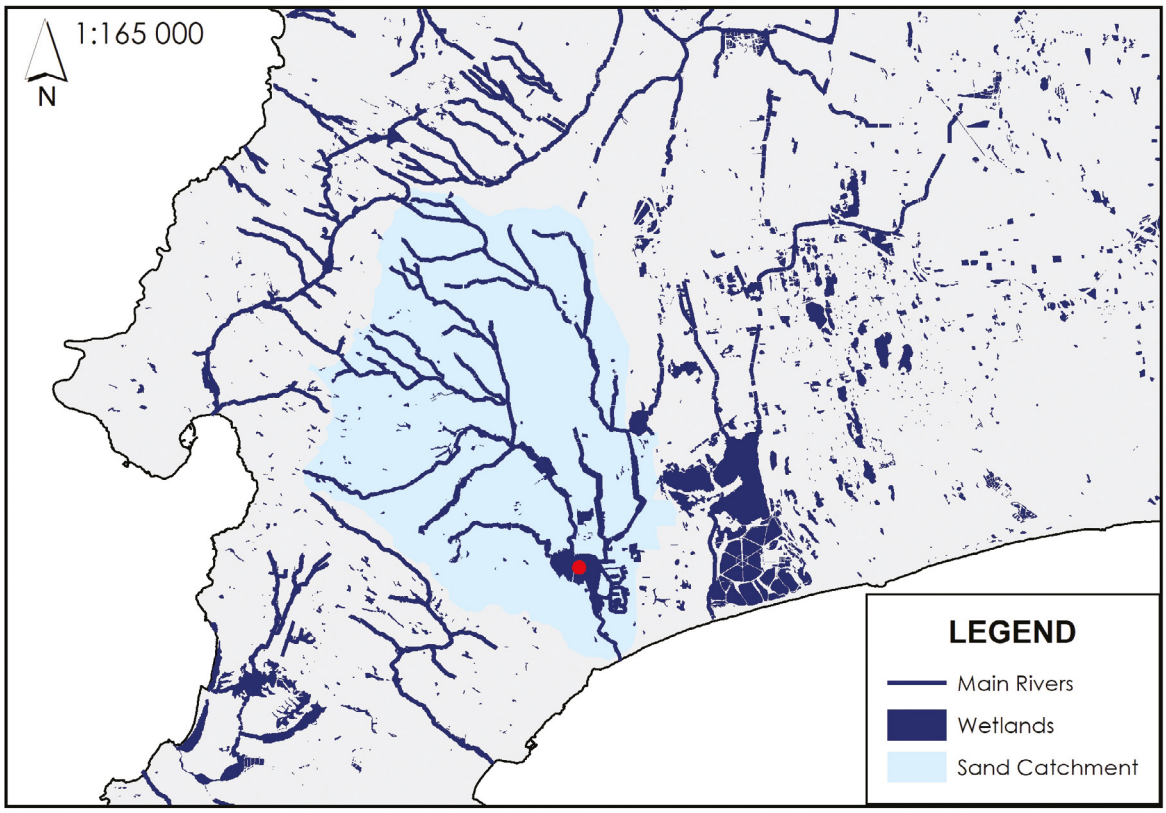


Figure 14: *Map of the catchment and location of the Zandvlei Nature Reserve.*



A walk around the estuary to one of the bird hides is a great way to connect with nature. Photo: Cherry Giljam.



Marina da Gama with its artifical canals where a waterfront property can attract a premium.



Sailing is one of the many water sports offered. Photo: Cherry Giljam.

HISTORY OF ZANDVLEI

The following brief timeline lists key events in the history and modification of Zandvlei:

- **1673** Dutch settlers establish a cattle post on the shores of the vlei
- **1744** Establishment of a fortified military post
- **1795** Battle of Muizenberg, which resulted in the British taking control of the Cape from the Dutch East India Company (VOC)
- **1814** Upgrades to the track running from Cape Town to Muizenberg
- **1851** First hotel opens
- **1866** Plans to drain the vlei to use the land for farming
- **1882** Railway line built across the northwestern edge of the vlei
- **1884** First rowing regatta
- **1907** Establishment of the Lakeside Boating Association (today the Imperial Yacht Club)
- **1907** Original bridge across the mouth replaced
- **1939** Plans proposed to dredge the vlei and stabilise the water level
- **1946** Serious siltation and weed infestation resulted in the closure of the yacht club
- **1947** Dredging of the vlei started
- **1950s** Canalisation of the outlet channel and construction of a weir
- **1960s** Reclamation of the western bank and the establishment of additional recreational areas
- **1970s** Construction of Marina da Gama development
- **1984** A small portion of the vlei and the surrounding wetlands proclaimed a nature reserve
- **1988** Establishment of the Zandvlei Trust
- **1990s** Studies into how best to manage Park Island
- **1999** Rehabilitation of Park Island completed
- **2006** Proclamation of 204 ha Zandvlei Nature Reserve
- **2015** Zandvlei Nature Reserve extended to 220 ha
- **2021** Extended vlei closure due to pollution
- **2022** Studies into dredging and other improvements

EXECUTIVE MAYOR'S PRIORITY PROGRAMME

The City has committed to progressively delivering enhanced basic services and a healthy urban environment in a bid to improve Capetonians' quality of life. In its Water Strategy, the City also expresses its aim to transition to a water-sensitive Cape Town – one that integrates the urban water cycle, builds resilience and protects sensitive natural ecosystems – by 2040. To honour these commitments, water quality in the city's waterways needs to be improved. For this reason, the Executive Mayor has established the sanitation and inland water quality priority programme.

The overall objectives of the programme are as follows:

Sewer spills – Reduce frequency, duration and impact of sewer spills, and improve the response time to address spillages. This will be achieved by more proactive cleaning of critical sewers and pump-station wet wells, developing solutions to address illegal discharge of stormwater into the sewer system, enhancing the capacity of sewer teams, and investing more in sewer pipe replacements.

Sewer pump station performance – Improve reliability and performance of sewer pump stations. This will be achieved by increasing investment in electrical, telemetry and mechanical equipment upgrades, enhancing the capacity of the pump station and maintenance teams, and establishing a staffed control room with an initial focus on pump station monitoring.

Wastewater treatment plant performance and capacity constraints – Increase wastewater treatment capacity, improve the overall quality of treated wastewater, and reduce wastewater operational incidents. This will be achieved through continued investment in plant and equipment upgrades, especially at Zandvliet, Macassar and Potsdam wastewater treatment works.

Pollution of waterways and recreational vleis – Improve water quality of catchment areas, and work towards the permanent opening of the recreational vleis. This will be achieved by rehabilitating a number of canals, dredging some of the vleis, purchasing new equipment to manage weeds, modification of the weirs and outlets of some of the vleis, and developing pollution abatement plans for the priority catchments.

Communication, innovation and partnerships – Improve awareness and stewardship in communities, and effectively communicate and partner with residents on environmental pollution issues, including water quality. This will be achieved by sharing water quality data with the public, supporting existing and establishing new catchment partnerships, and enhancing communication and partnership capacity.

Significant additional funding has been committed to pay for the programme. The already considerable project funding has been expanded by another R158 000 000 in capital budget and R478 000 000 in operating budget.

Appropriate directors will be accountable for the implementation of the different workstreams. Progress will be regularly reported to the Executive Director and the City Manager, who is the programme sponsor and will direct the administrative response to align with the Mayor's political priorities.



A flock of great white pelicans (Pelecanus onocrotalus) gather on the water to feed. Photo: Cherry Giljam.

THE ZANDVLEI TRUST

In 1988, a group of enthusiastic birders found a good spot on the peninsula for watching wild birds of both the land and water variety. Strandfontein sewage works, situated just north of the Zandvlei estuary, had been attracting a variety of species, but the area was unknown at the time. After an outing with binoculars and bird books, the group sat down to discuss their find. They agreed that the area needed to be protected from any form of human development such as housing, factories and the like. The birders pledged to look after the area and decided to establish the Zandvlei Trust.

The word 'trust' signified that the general public could put their trust in the committee who headed up the organisation. It was not a money trust. The organisation was soon registered with the City administrators as a non-profit to allow the public to donate funds and claim tax benefits.

Today, the Zandvlei Trust has an intimate membership base, yet has retained some clout in terms of getting the City to ensure that Zandvlei and surrounds are kept in a pristine condition for fauna and flora, and all who make use of the area. As with most other megacities and their open spaces, there have been challenges, such as broken sewage pumps, which cause the vlei to close from time to time. Another challenge was when severe summer heat caused an algal bloom in 2012. Zandvlei Trust met the challenge head on and supported the City where it could. Many environmental impact assessments were conducted where high-rise buildings were to be erected, and stalwart Zandvlei Trust members did the necessary work to ensure that some apartment blocks were reduced to only five storeys. The trust also helped establish, and continues to maintain, the Westlake garden opposite Lakeside shopping centre. Moreover, the committee ensured that only indigenous vegetation was planted on the island along the Blue Route from Constantia to Bergvliet.

Recently, the trust helped fund much of the Strandveld Circle, an indigenous garden circle, and the adjoining nursery of locally indigenous plants, both of which are healthy and growing, enjoying visits by school learners and plant lovers. Two experimental, larger-than-life wire clawless otters, Thelma and Louise, have also been mounted in strategic spots to counteract the ongoing litter challenges on the grounds around the vlei.

Courtesy of David Muller, Zandvlei Trust
https://zandvleitrust.org.za/

A BRIEF HISTORY OF PARK ISLAND



Late 1960s The island was originally part of the eastern shore of Zandvlei. Construction of the main Marina da Gama north-south canal and the two outlets into Zandvlei resulted in Park Island. Most of the island's shoreline was artificially hardened to combat wave erosion in keeping with the canals of Marina da Gama. Sand dredged from the canals was placed on the eastern section of the island to an elevation of 6 m. The island is connected to the suburb of Marina da Gama by a road bridge. It was seen as a unique location, offering wonderful vistas and a priceless amenity for local residents.

Early 1970s Anglo American (the developers of Marina da Gama) ceded Park Island and its basic infrastructure to the municipality, provided that it remained as an extension of the adjoining residential areas for leisure activities. At the time, the few paths on the island were not maintained, the only vegetation was Port Jackson *(Acacia saligna)*, willow *(Salix spp)* and rooikrans *(Acacia cyclops)*, and the only animals were the Cape dune mole rat *(Bathyergus suillus)*, mole snakes *(Pseudaspis cana)* and striped mice *(Rhabdomys spp)*. Birdlife was minimal.

Late 1970s Visitors could drive onto the island and park their vehicles in the car park. During office hours, there were two municipal employees on-site. At night, however, the island attracted unsavoury elements. Park Island became an attractive prospect for developers, who planned everything from a nine-hole golf course to housing.

Early 1980s Ward funding was allocated for the gate and fencing at the entrance to Park Island, which enabled the area to be secured at night. A study was commissioned to ascertain how best the island could be developed to enhance both the Zandvlei estuary and the community. The main recommendation was to return the island to natural endangered strandveld vegetation, and eventually incorporate it into the existing Zandvlei Nature Reserve.

1999 The national Working for Water programme sought to remove all invasive alien vegetation on Park Island, causing a public outcry. The newly appointed Zandvlei Nature Reserve manager – the first to hold this position – saw this as an ideal opportunity to rehabilitate the island with threatened coastal strandveld vegetation, with the vision to include the island into the Greater Zandvlei Estuary Nature Reserve in time. With support from the Marina da Gama Association and residents, the Friends of Park Island organisation was formed to facilitate the process as an ongoing partnership, which remains active to this day.

March 1999 The rehabilitation plan for the island was completed in a solid collaboration between the Zandvlei Nature Reserve team, Kirstenbosch Botanical Garden and the local

community. A public participation process followed and environmental impact assessments were done. Within a few months, the invasive alien vegetation was removed and burnt, and the internal canals were opened up to the estuary. The Rowland and Leta Hill Trust sponsored the two pedestrian bridges, and they have kindly continued with financial support over the years, the most recent contribution being the third pedestrian bridge. The local community was approached to help finance the purchase of the vast number of trees and plants that were needed, and to assist with planting. The response was incredible, both in cash and effort.

2002 The Greater Zandvlei Estuary Partnership won the coveted Cape Times/Caltex environmental award. The partnership comprised City officials working alongside Zandvlei communities and organisations in the interest of conservation and rehabilitation.

2003 Park Island started to mature as the plants became established and attracted a diversity of birdlife. Thirty tortoises obtained from the Society for the Prevention of Cruelty to Animals (SPCA) were released, followed by five endangered Cape Flats hares *(Lepus capensis)* and 14 Cape gerbils *(Gerbilliscus afra)*. The tortoises have since bred and are now often seen during summer. The gerbils bred prolifically, only for the entire population to 'crash' in the first year of the drought. Of the hares, only one remains. Other recorded animals include the Cape grey mongoose *(Herpestes pulverulentus)*, Cape clawless otter, *(Aonyx capensis)* water mongoose *(Atilax paludinosus)*, porcupine *(Hystrix africaeaustralis)*, Cape grysbok *(Raphicerus melanotis)*, spotted genet *(Genetta tigrina)* and caracal *(Caracal caracal)*.

2004 The vegetation on Park Island was being added to every year at the Friends of Park Island Community Arbour Day, focusing on different areas and projects on the island each year. While most wanted the island to be included in the Greater Zandvlei Estuary Reserve, it was critical that it maintained its own special 'low-intensity/leisure' zoning to continue providing for the activities and access to the island that had traditionally been allowed and enjoyed.

2005 As municipal resources were becoming scarce, the Friends of Park Island took on a more proactive role in maintaining Park Island. At the same time, the litter polluting the reed beds on the island had become excessive. With financial contributions from the community, tools and equipment were purchased, and staff were employed to work two days a week.

2006 The Zandvlei Nature Reserve was finally proclaimed.

Every year since 1999 The Friends of Park Island organisation organises and manages weekly maintenance of the island, annual planting and revegetation drives, and special projects. They continue to support and complement the efforts of the Greater Zandvlei Estuary Nature Reserve team, and no activity is embarked on without their input.

Courtesy of Cherry Giljam, Friends of Park Island

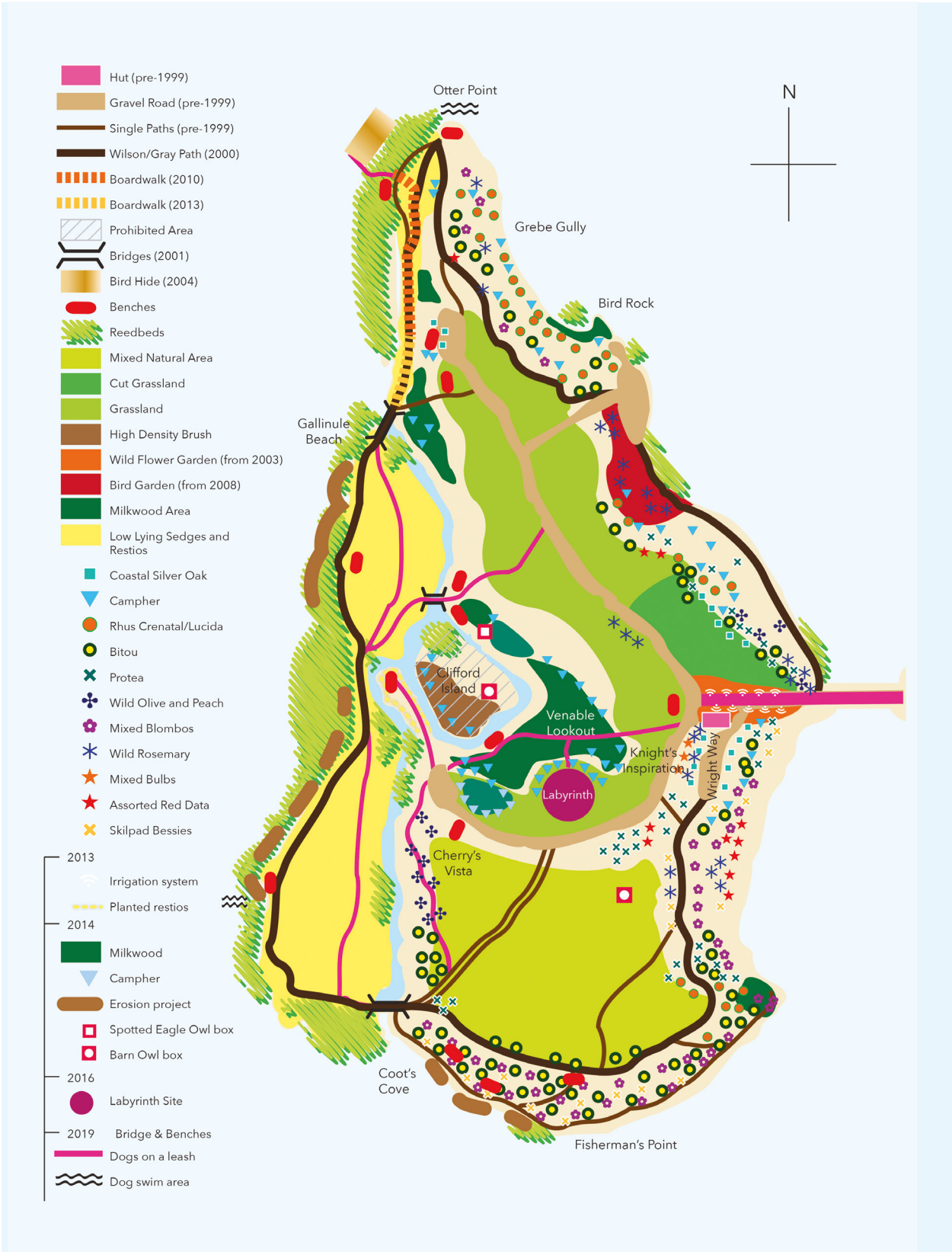


Figure 15: Map of Park Island (courtesy of Friends of Park Island).



The control of sediment, particularly at the estuary mouth, is necessary as the estuary is no longer a natural system.

4.3 FUNDING, GOVERNANCE AND PARTNERSHIPS

Management of Zandvlei estuary and its surrounds is the responsibility of various stakeholders. The reserve is managed by the Biodiversity Management Branch in the City's Environmental Management Department. The reserve manager is responsible for day-to-day management of the reserve and its various projects and activities. Ongoing maintenance and rehabilitation projects are covered from the operational budget and amount to some R1 800 000 per annum. Costs increase to R4 300 000 when salaries and wages are included.

Estuaries are recognised as particularly sensitive and dynamic ecosystems. For this reason, the National Environmental Management: Integrated Coastal Management Act, No. 24 of 2008, requires estuarine management plans (EMPs) to be prepared to ensure efficient and coordinated estuarine management. In 2018, the Zandvlei EMP was developed (the EMP is currently being updated).

The document included the following as management priorities:

- ☑ Mouth conditions, water levels, salinity and sedimentation
- ☑ Water quality
- ☑ Pondweed *(Potamogeton)*
- ☑ Invasive alien species
- ☑ Biodiversity, conservation and planning
- ☑ Education, awareness and communication

The Zandvlei Protected Area Advisory Committee (ZPAAC) was established in 2015 in terms of the National Environmental Management: Protected Areas Act, No. 57 of 2003, and its regulations. The ZPAAC facilitates broad participation in the management of the protected area and represents all stakeholders' interests. Membership of ZPAAC is wide-ranging and includes the reserve manager, local ward councillors, CapeNature, the Zandvlei Trust, the Cape Bird Club, the Peninsula Canoe Club, the Marina da Gama Association, the Imperial Yacht Club, the Friends of Park Island, Nature Connect, Province and various private members. The committee is constituted as an advisory rather than a decision making body, and meetings are typically held a few times a year.

Some of the other groups in the Zandvlei area include the Marina da Gama Association (MDGA), which is the homeowners' association for the Marina da Gama development. The Friends of Park Island is a self-funded group who partners with the reserve in the ongoing rehabilitation, maintenance, project management and daily access to Park Island since 1999. The Zandvlei Trust, in turn, was established in 1988 as a community-led public-benefit organisation dedicated to protecting the natural resources of Zandvlei. They undertake a range of projects, including awareness and environmental education drives, garden and tree planting, recycling initiatives, invasive vegetation clearing, management of the wetland, maintaining litter booms, and monitoring water quality, flora and fauna. The Sand River Catchment Forum was established around 1998. This City-civil society initiative focuses on issues in the wider catchment.

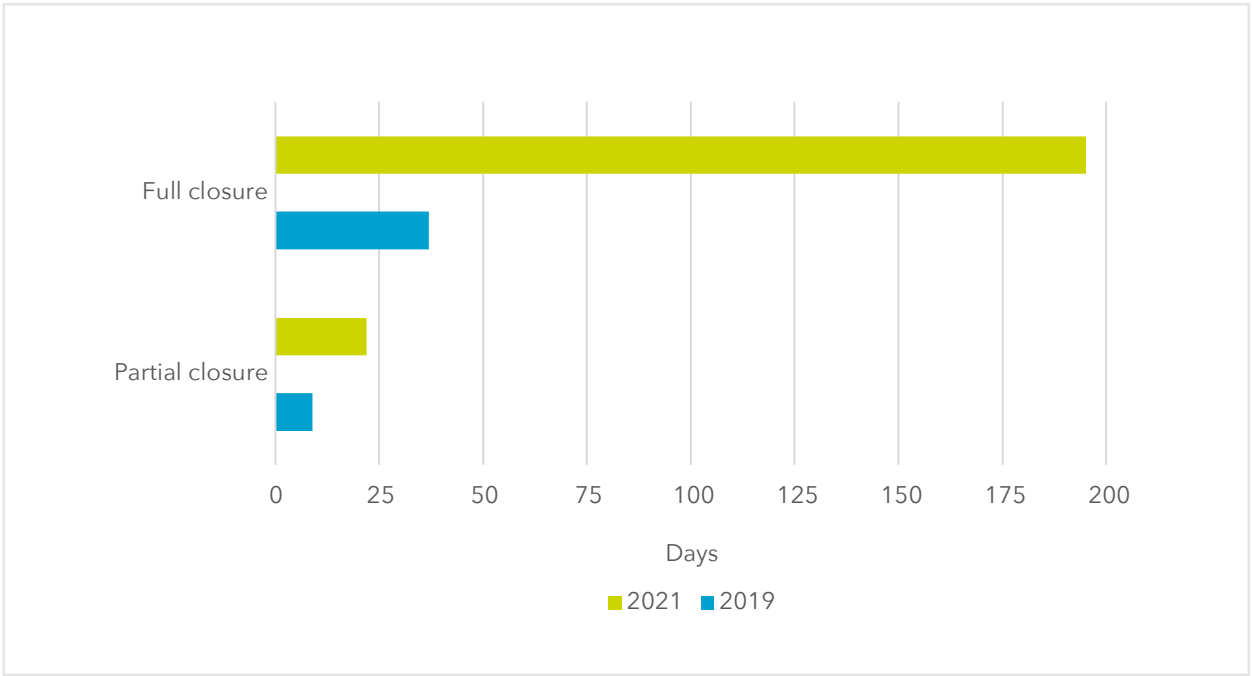
4.4 CHALLENGES

Since the late 1800s, the estuary has faced a number of environmental challenges. Developments such as the construction of the railway lines and road bridges, canalisation of the estuary mouth, construction of a rubble weir at the estuary mouth, development of Marina da Gama, the canalisation of upstream rivers and urbanisation in the catchment have all contributed to a significant alteration of the natural function and state of the estuary. The upstream catchment is large with numerous rivers, all of which have been affected by urban development and been modified in various ways. This has resulted in a general deterioration of water quality and an artificial flow regime.

Historically, the estuary was used and valued primarily for recreational pursuits. It was only from the mid-1980s that the estuary became recognised for its importance in terms of conservation and environmental and ecosystem services.

Particular environmental challenges include deteriorating water quality (such as nutrients and bacteria) and sedimentation. As the natural ebb and flow of the system has been drastically altered, the vlei has accumulated large quantities of silt. This requires occasional dredging, especially at the mouth. To flush out nutrients and sediment, allow seawater to enter the vlei and control levels to prevent flooding, the mouth periodically needs to be manually opened or closed.

Water quality can be poor at times, often because of litter and sewage in the water. The years 2019 to 2021 were particularly bad in terms of sewage spills into the vlei, many of which were attributed to sewage pump station failures. When high levels of pollution are reported, the vlei may need to be closed to recreational users as a health precaution. The waterbody was closed to all forms of recreation between July 2021 and June 2022, which likely had a significant negative impact on the local economy and environment.



*No data available for 2020.

Figure 16: *Total number of closure days.*

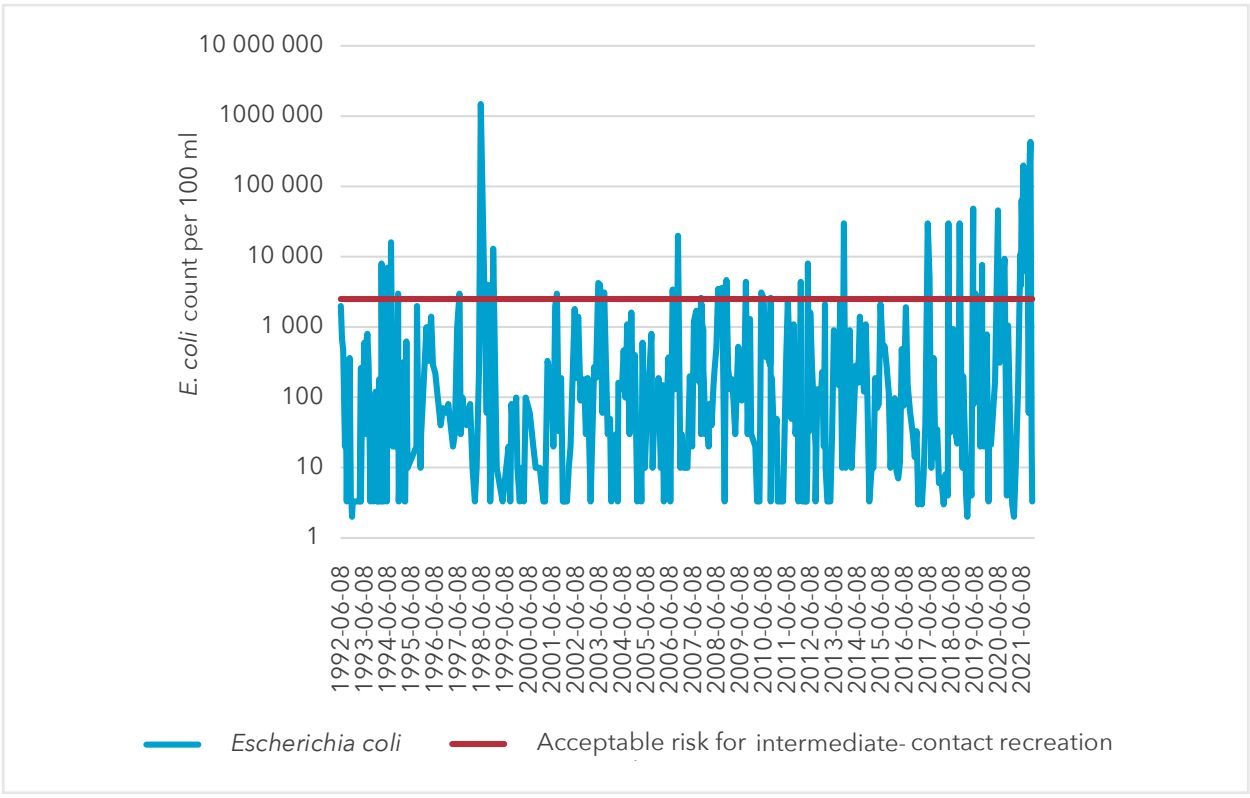


Figure 17: *Water quality sample results at Zandvlei central near the yacht club.*



Litter is an ongoing issue and needs to be captured before it enters the vlei. Photo: Kyran Wright.



A Cape Grysbok (Raphicerus melanotis), one of the many mammals found in the nature reserve. Photo: Cliff Dorse.

These issues have been recognised, and the City is responding through various programmes. The Executive Mayor is championing sanitation and inland water quality as one of his priority programmes. Consequently, considerable investment is planned in the coming years to improve water quality entering the vlei. Under the umbrella of the LUW programme, plans are under way to rehabilitate the Sand and Langevlei canals as they converge in Coniston Park, and to use this space to treat stormwater before it enters the vlei. A number of river, wetland and canal rehabilitation projects are also planned in the catchment, which will collectively contribute to improvements in catchment health, biodiversity and water quality.

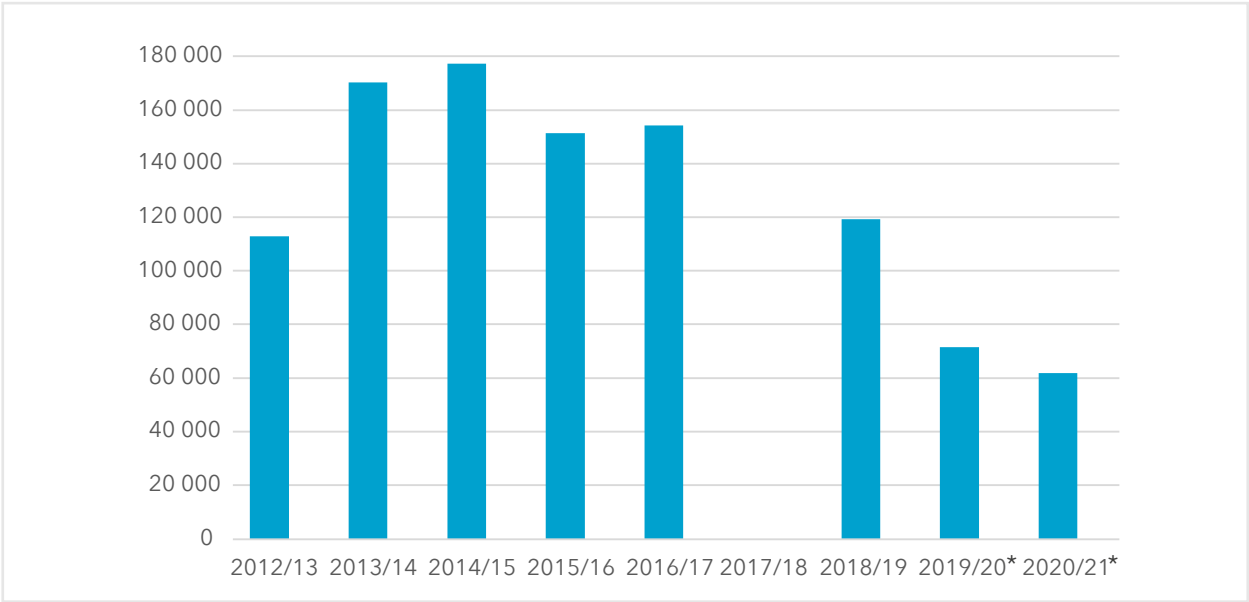
4.5 OUTCOMES AND LESSONS

The Zandvlei estuary and its surrounds are a major recreation and conservation area in the south peninsula. Every year, the area attracts thousands of visitors who come to admire the views, enjoy the peace and tranquility of the outdoors, visit the nature reserve, and participate in numerous recreational activities, including picnics and braais, fishing, canoeing, sailing, windsurfing, paddleboarding, dog walking, birdwatching, jogging and cycling. It is not surprising, then, that a 2002 study estimated the recreational value of the vlei at between R1 million and R5 million per year. The current value is likely to be significantly more. The vlei also provides many ecosystem goods and services, many of which are free. These include water purification, flood protection, nutrient recycling, feeding and nursery areas for important angling fish, and habitat for rare and endangered plants and animals.

The Marina da Gama residential development offers residents direct access to the water edge, while enabling a variety of water activities. Park Island is central to Marina da Gama and Zandvlei, offering residents and visitors various leisure activities while enjoying the vast water and mountain vistas. It is a cherished part of the vlei: the indigenous gardens create a beautiful environment to be in and attract an abundance of wildlife, especially birds. Adding to the visitor's experience is a natural labyrinth, maintained pathways, boardwalks, benches, pedestrian bridges, the bird hide, as well as daily dawn-to-dusk secure and easy access.

Similarly, some properties in Muizenberg and Lakeside have easy access to the vlei banks and wonderful views across the waterbody. Research undertaken in 2002 suggested that the premium for the first row of houses bordering the vlei, overlooking the landscaped and managed public open space, could be 7–12%. This premium reflected the perceived value of the open space, access and views offered. The further the properties were from the vlei edge, the lower the premium, and according to estate agents, homes bordering on unmanaged reedbeds were relatively difficult to sell due to safety concerns. This research suggests that well-managed open spaces, and especially those with water, can add value to properties and make neighbourhoods more attractive and liveable.

The various stakeholder groups all have a part to play in the management of this important area. Coordination between these groups is no easy task, but is possible with open and transparent communication and strong leadership. Despite the challenges in managing such a large and complex environment, it is the passion and coordinated efforts of the various stakeholders and individuals that make Zandvlei such a successful conservation area and attractive destination.



**Drop off in 2020 due to Covid-19 pandemic lockdown restrictions.*

Figure 18: *Total number of visitors to the Zandvlei Nature Reserve per financial year.*

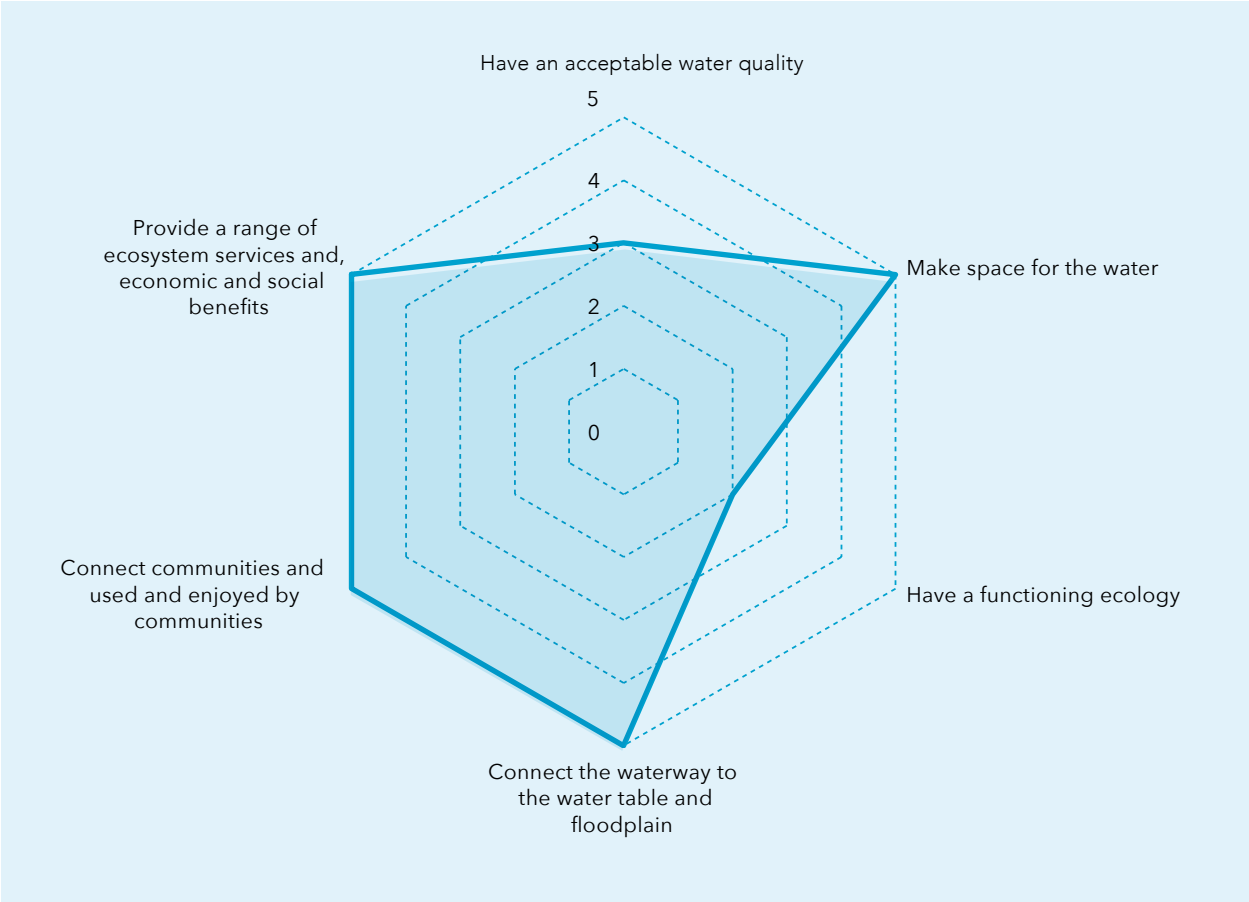


Figure 19: *Elements of liveability for the Zandvlei Nature Reserve (2021).*

KEY LESSONS

- Well-managed open spaces, and especially those with water, can add value to properties and make neighbourhoods more attractive and liveable. Poorly maintained open spaces have the opposite effect.
- The importance of community buy-in, support and ongoing involvement in management cannot be overstated.
- Rehabilitation projects do not have to be large and complex. Many successful projects started small. Local champions, often from the community, are critical to get these projects off the ground. Learning-by-doing and gaining support through demonstration are further key elements.
- Well-considered plans must set out the vision, define management objectives and outline the actions necessary to achieve the vision. This is particularly important when various parties have a role to play or an interest in the waterway. To this end, catchment, river corridor, wetland management and environmental management plans are useful to bring stakeholders together and guide the collaborative management of the area.
- Partnerships between civil society, non-governmental organisations and the public sector are important to get projects started and to ensure their sustainable management. Such partnerships can be informal and rely on good relationships, regular communication and teamwork. More formalised partnerships can be overly complex and are not always the answer to ensure collaboration. However, in some instances, formal partnerships are necessary and can also assist with funding allocation. Whether formal or informal, any partnership takes time and energy, and often relies on a few champions on all sides to sustain it.
- Pollution and poor water quality are major threats to the liveability of our waterways. Everyone has a shared responsibility to improve water quality, including residents, businesses and the authorities.

PENINSULA PADDLE: A CALL TO ACTION

The Peninsula Paddle started in 2010 with the aim of paddling approximately 15 km across the peninsula from Muizenberg to Table Bay through the canals and waterways of the Cape Flats. Started by four urban adventurers, the paddle also had a secondary motive, namely to hold the City and residents to account for the poor state of Cape Town's waterways, challenging them to act. At its inception, the Peninsula Paddle coined the phrase "The health of the city can be seen in its waterways". At that time, and over a period of 10 years, large sections of the paddle route were blocked with litter, solid waste and water hyacinth *(Eichhornia crassipes)*. To help address the problem, the City utilised its Expanded Public Works Programme (EPWP), which saw a number of unskilled and semiskilled teams cleaning up the waterways. However, the problem is larger and requires a fundamental shift in how we manage our waste as a city.

There are, however, certain gems along the route that stood out as waterways that are used by its citizens for recreation, community picnics and public gatherings, including the Zandvlei Estuary Nature Reserve. Starting the paddle at Zandvlei, with a beautiful sunrise across the waters of the vlei and Muizenberg mountains as a backdrop, is always a special occasion.

Unfortunately, even after a decade, pollution is not gone. In fact, we now see another threat rising, namely that of sewage pollution and sewer spills entering our waterways, rendering them too polluted for recreation. Thus, the challenge to Capetonians is not past. Rather, it should be intensified to reclaim our waterways as liveable urban waterways for recreation and community enjoyment along the riparian banks. The initial intention of the Peninsula Paddle is now reflected in the vision of the City's Water Strategy, particularly commitment 5, namely to make Cape Town a water-sensitive city by 2040.

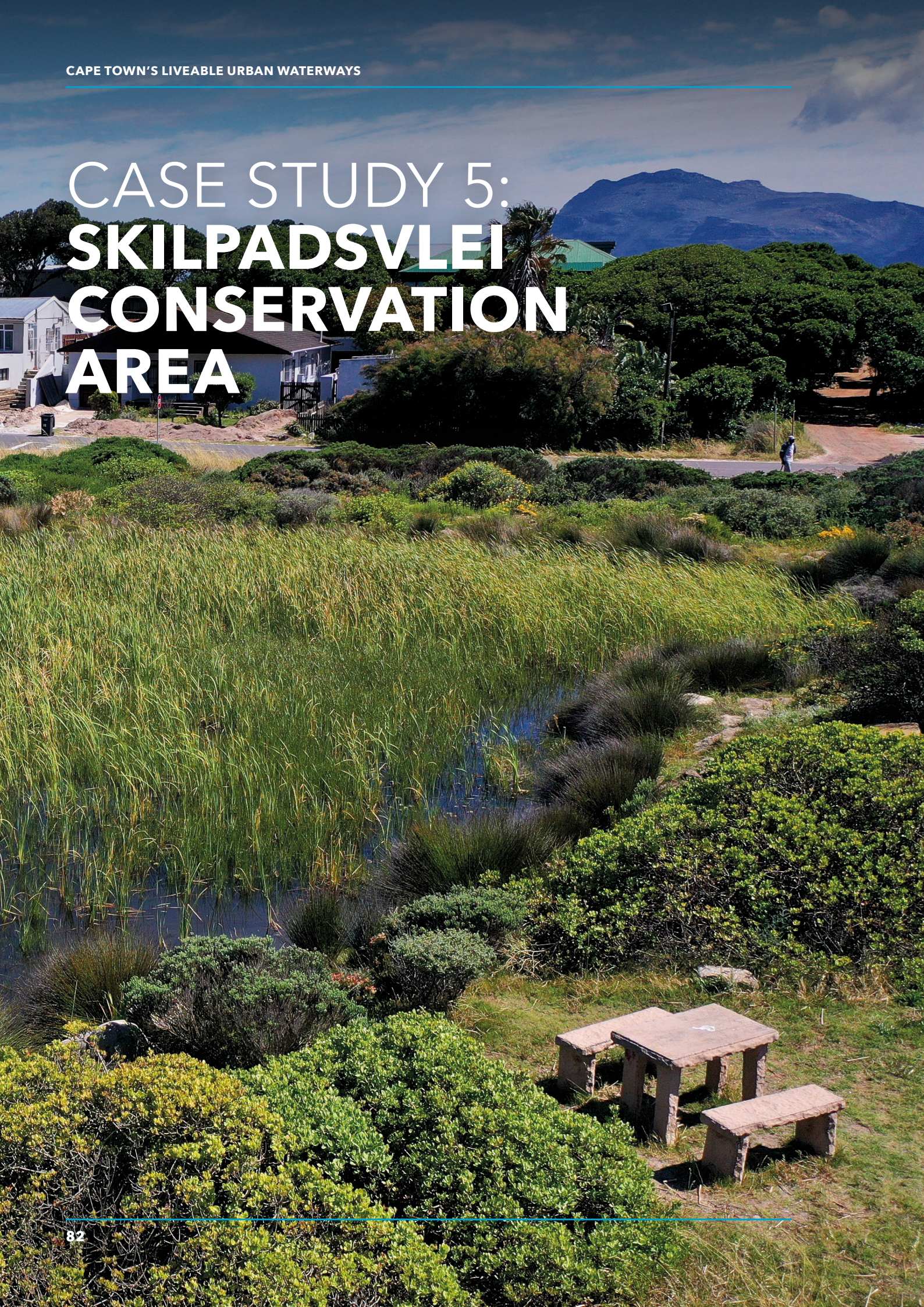
Courtesy of Dr Kevin Winter and Alistair Lee, co-founders of the Peninsula Paddle





The annual Peninsula Paddle starts the journey in Zandvlei. Photos: Alistair Lee and Peninsula Paddle.

CASE STUDY 5: SKILPADSVLEI CONSERVATION AREA



5.1 INTRODUCTION

Skilpadsvlei conservation area is located in the heart of Kommetjie in the southern peninsula. Historically, the area was a coastal wetland, which would have been a common sight along the coastline of the southern peninsula before the mid-20th century. Then, in the 1940s, the site was filled in, which resulted in the destruction of the only known breeding site of the endangered western leopard toad *(Sclerophrys pantherina)* in the Kommetjie area.

Waterway name	Skilpadsvlei
Catchment name	South Peninsula
Intervention type	Wetland rehabilitation
Key stakeholders	☑ City of Cape Town ☑ Kommetjie Environmental Awareness Group ☑ Kommetjie Ratepayers' and Residents' Association ☑ Wildlife and Environment Society of South Africa
Key dates	Construction from 2010 to 2011. Operations ongoing
Cost	Approximately R450 000 for construction

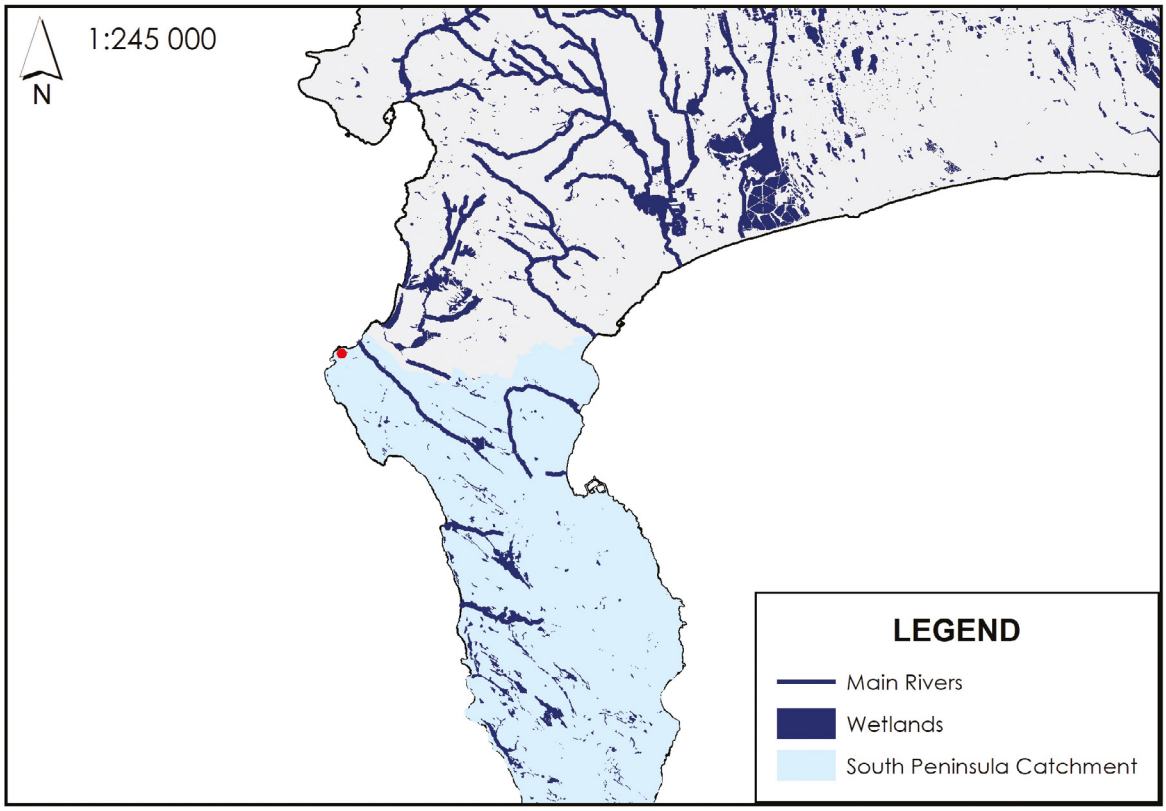


Figure 20: *Map of the catchment and location of Skilpadsvlei conservation area.*

5.2 INTERVENTION

Around 2010, City officials in the Environmental Management Department discussed potential projects, and the Skilpadsvlei restoration project was ultimately selected based on its perceived feasibility and potential benefit to an endangered species. The project aimed to restore the wetland into a functional ecosystem, thereby recreating the breeding site for the endangered western leopard toad. The restoration also entailed infrastructural upgrades to improve the recreational value of the open space for the local community.

Environmental Management spearheaded the effort and established partnerships with the Kommetjie Environmental Awareness Group (KEAG), the Wildlife and Environment Society of South Africa (WESSA) and local residents. The project entailed four phases. Phase 1 involved detailed planning, securing approvals, securing funding and stakeholder engagement. Phase 2 consisted of the excavation of the main waterbody and development of infrastructure for enhancement of the public open space. Phase 3 saw the implementation of the seasonal wetland areas adjacent to the main wetland. Finally, phase 4 involves ongoing maintenance and monitoring.

The excavation of the main wetland commenced in 2012. A mechanical digger separated out large rocks for landscaping use, and clean soil was taken off-site with tipper trucks to be used in a nearby housing project in Ocean View. In total, 1 920 m^3 of clean sand was excavated. Sloping of the edges was done with the digger and smoothed over with rakes.

The wetland was designed to be seasonal, holding water only in the wet months and completely drying out in summer. It was, however, important to ensure that there would be sufficient water in the main wetland for a full breeding cycle of the western leopard toad between July and December. The wetland needed sufficient water up until at least the end of January. It was solely fed by groundwater, with no stormwater or other flow into the waterbody, which is important to ensure suitable water quality for the endangered toads.

The surrounding areas were restored to a shallower seasonal wetland system that would require less long-term maintenance and ideally support different complementary biodiversity. Once the main excavation was complete in autumn of 2012, planting was immediately done to make use of the winter rainfall. Locally indigenous plant species that were commercially available and from local genetic source material were selected. Due to budget constraints, planting was limited initially, and species diversity was added over subsequent planting seasons. Planting has included Cape thatching reed *(Elegia tectorum)*, sour fig *(Carpobrotus edulis)*, Cape Flats conebush *(Leucadendron levisanus)*, waterblommetjie *(Aponogeton distachyos)* and some search-and-rescue material from nearby sites.

Some invasive alien clearing was also undertaken and is still ongoing to provide the indigenous plants with an opportunity to establish. The existing pedestrian desire line that ran diagonally across the site was retained, and the path was formalised with a wooden boardwalk. Signage was installed, and old bollards were replaced. The desire line running parallel with the site was also upgraded to facilitate pedestrian use during the rainy season, when the old path used to be completely inundated. Skilpadsvlei conservation area has subsequently become one of Cape Town's most productive breeding sites for western leopard toad and has qualified for a formal conservation agreement with CapeNature as a biodiversity agreement site. The project also won a national wetland award in 2014.

WESTERN LEOPARD TOAD

The western leopard toad *(Sclerophrys pantherina)* is a charismatic species that is in danger of extinction. This large toad, named for the leopard-like spots on its back that are unique to each toad, only occurs in the coastal region extending from the Cape Peninsula and Cape Flats area to the Agulhas Plain. The majority of its known breeding sites are unprotected waterbodies in public open space or on private land. The few protected sites are surrounded by urban sprawl that threatens and restricts the foraging areas of the toads. Therefore, the cooperation of residents whose gardens form foraging and sanctuary areas is vital for the continued survival of this endangered animal. Another major threat is road traffic, and many toads are killed when crossing roads to and from their breeding grounds in late winter to early summer. In addition, the introduction of exotic fish species, and excessive abstraction from and pollution of the waterbodies in which these toads breed, can further diminish their numbers and affect their breeding success. Moreover, these significant urban threats have been further increased by the introduction of the guttural toad *(Amietophrynus gutturalis)*. This explosive breeder naturally occurs in the northeastern parts of South Africa, but was introduced to Cape Town, where it now competes for resources with the western leopard toad. To help manage the guttural toad invasion, please email **invasive.species@capetown.gov.za.** Importantly, the western leopard toad is a protected species. Collecting, translocating, keeping or selling them is illegal. To learn more about leopard toads and become more toad-friendly, visit:

http://www.leopardtoad.co.za.
Courtesy of Suretha Dorse, City aquatic ecologist



The pond provides excellent habitat for the western leopard toad. Photo: Suretha Dorse.



A bird's-eye-view of the site with the ocean beyond.



5.3 FUNDING, GOVERNANCE AND PARTNERSHIPS

The project was co-funded by the City's Environmental Management and Transport, Roads and Stormwater departments. A further contribution came from Water and Sanitation for alterations to a stormwater trench that used to overflow with sewage from the Kommetjie pump station located next to the wetland. The total project cost was approximately R450 000.

Ongoing maintenance of the space is essential to ensure that it remains attractive and functional. Removal of invasive plants is undertaken by Environmental Management's Invasive Species Unit, and the Biodiversity Management Branch provides resources to propagate plants and planting, as well as specialist guidance on management. Recreation and Parks serves as the custodian of the public open space and assists by removing dumped garden refuse and builder's rubble, carrying out repairs, replacing signage and mowing the unplanted edges. Most of these activities have been funded from operational budgets, while others are done by volunteers without any budget allocation.

A number of local community groups were involved in the project planning and implementation, and continue to play an active part in ongoing maintenance of the wetland. The Kommetjie Environmental Awareness Group (KEAG) became a very valuable project partner and was closely supported by the Kommetjie Ratepayers' and Residents' Association (KRRA). During the project, KEAG secured funds from the Rotary Club and contributed generously to pay for the cladding of the pump station building to improve aesthetics. Various neighbouring landowners were equally supportive and provided regular site updates when City officials could not be there, and even provided food to the teams working on-site. This collaboration contributed to a sense of community ownership, which continues to this day.

Partnerships remain instrumental for the sustainability of the project. Some maintenance activities, such as mowing of verges, are done by KEAG, who also provided a picnic table, which has turned out to be very popular among families. The Western Leopard Toad Conservation Committee (WLT-CC) fulfils a critical monitoring role, especially during the toads' breeding season, monitoring their breeding activities. The ongoing support from the local community, who have ultimately taken ownership of the area, has been a critical factor in the success of the project.





The pond starts to take shape. Photos: Suretha Dorse.






The project is an excellent example of ecosystem restoration, transforming a disued space into a biodiversity showcase. Photos: Suretha Dorse.

5.4 CHALLENGES

As with many projects of this nature, securing sufficient funding was difficult. However, co-funding from a number of stakeholder departments helped overcome this challenge.

Alien grass invasion, particularly kikuyu grass *(Pennisetum clandestinum)*, is a significant problem in the area. Invasive grass species are difficult to control and will outcompete indigenous plants if not controlled with regular follow-up management in the wetland area. The wetland area itself requires constant maintenance to prevent bulrushes *(Typha capensis)* and common reeds *(Phragmites australis)* from becoming established.

The severe drought, along with the associated increased abstraction of groundwater by surrounding residents, reduced the groundwater levels in Kommetjie to the point where the main excavation dried up completely in May 2019, for the first time.

Unfortunately, there have also been some acts of vandalism: some vegetation was removed after planting, and the access signage was vandalised. Well-meaning, but perhaps misinformed residents planted some hybrid plant species they had obtained from local nurseries, and also introduced alien fish to the pond. Fortunately, however, these events have been few and kept to a minimum thanks to community support and neighbouring properties alerting officials. The neighbourhood has an active community watch to deter crime and vandalism, and the increased use of the space has also contributed to a sense of safety when on-site.

5.5 OUTCOMES AND LESSONS

One of the main objectives of the project was to restore the breeding site of the endangered western leopard toad. Since 2012, the site has had a number of successful breeding events and has seen a significant increase in the local population of the species. Vegetation growth is well managed to ensure that there is enough open water for breeding to continue. Other frog species have been recorded as well, including the Cape river frog *(Amietia fuscigula)*, flat caco *(Cacosternum platys)*, Cape sand frog *(Tomopterna delalandii)*, clicking stream frog *(Strongylopus grayii)* and the common platanna *(Xenopus laevis)*. This is an excellent indication of the high-quality habitat and water. The rehabilitation of the previously disturbed land significantly increased local biodiversity, and reports from a local specialist also confirmed that the resident bat population has benefited greatly from the wetland as a food source.



Informative signage leads you to the boardwalk and beyond.

The area is mostly used by local residents for activities such as walking, picnicking and jogging. Families also visit the site to hear and see the western leopard toads and other wildlife, including reptiles, bats and mammals. Local schools use the site for outdoor environmental education.

The implementation phase of the project provided an opportunity to support local businesses that could help with the construction of the boardwalk, cladding of the pump station and the supply of locally indigenous plant species. The maintenance requirements of the wetland also provide job-creation opportunities, as local residents (through the City's Invasive Species Unit) assist with planting as well as alien and invasive plant removal.

What was a disturbed piece of public open space for many decades has been turned into a valued and protected habitat and a well-used community amenity. The project also resulted in a positive partnership between the City and the local community, and has been hailed as exemplary in this regard.

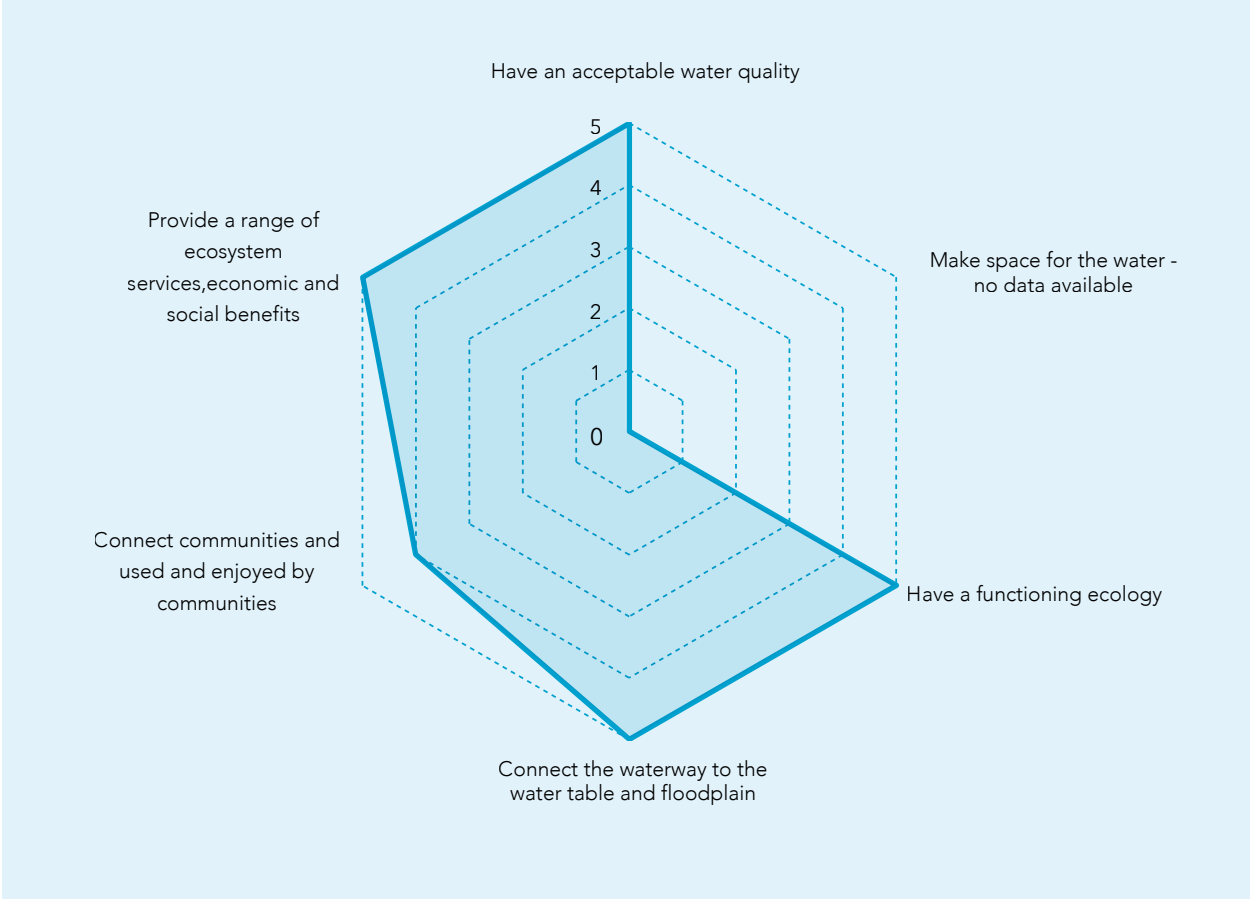


Figure 21: *Elements of liveability for the Skilpadsvlei conservation area (2021).*

KEY LESSONS

- The importance of community buy-in, support and ongoing involvement in management cannot be overstated.
- Rehabilitation projects do not have to be large and complex. Many successful projects started small. Local champions, often from the community, are critical to get these projects off the ground. Learning-by-doing and gaining support through demonstration are further important elements.
- Partnerships between civil society, non-governmental organisations and the public sector are important to get projects started and to ensure their sustainable management. Such partnerships can be informal and rely on good relationships, regular communication and teamwork. More formalised partnerships can be overly complex and are not always the answer to ensure collaboration. However, in some instances, formal partnerships are necessary and can also assist with funding allocation. Whether formal or informal, any partnership takes time and energy, and often relies on a few champions on all sides to sustain it.
- Post-project maintenance is critical for the sustained success of any waterway rehabilitation project. If projects are not properly maintained and become overgrown and unsightly, this affects people's connection with the space. Post-project maintenance must be considered at the project planning phase already and must look for opportunities to involve the community, such as using Friends groups to assist with some maintenance.



A bird's-eye-view of the site with the sewer pump station clearly visible right next to the space, showing how vulnerable aquatic ecosystems are to pollution.

CASE STUDY 6: KHAYELITSHA WETLAND PARK



6.1 INTRODUCTION

The Khayelitsha Wetland Park is situated south of the Khayelitsha wetlands, bordered by Silvertown to the south, Makhaza to the east and the 9 South African Infantry (SAI) Battalion military base to the north. The park covers some 45 ha and is part of the greater Khayelitsha wetland system – an extensive area of wetlands of over 350 ha that spans the N2 and extends all the way to the Eerste river estuary. It is fed by water from the Kuils river that enters through several culverts under Spine Road and the N2 and exits via a drainage channel that meanders through the rest of the wetland park and ultimately links with the Eerste river.

In its original state, the Kuils river flowed from its source in Durbanville until it reached the Cape Flats. Here, it meandered through a series of seasonal braided channels, surrounded by a mosaic of dune slack wetlands and shallow, inundated pools called *kuile*. Historically, the river never really reached the sea, as the water would have emptied into the wetlands and pools and infiltrated into the sand dunes.

As the demand for formal housing in Cape Town escalated in the early 1980s, the area around the Kuils river was identified for development. The extensive townships of Mfuleni, Kleinvlei, Blue Downs and Delft were built, and in 1988, the land around the current-day Khayelitsha was identified for further development. In subsequent years, the wetlands were filled in, but the Kuils river kept on flowing, and over time, new wetlands formed in pockets around Khayelitsha.

Waterway name	Khayelitsha wetland
Catchment name	Kuils
Intervention type	Regional park with wetland rehabilitation
Key stakeholders	☑ City of Cape Town ☑ Kuils River Catchment Forum ☑ Khayelitsha Canoe Club
Key dates	Construction from 2008. Operations ongoing
Cost	Approximately R18 million for construction, and R2 million per annum for operations

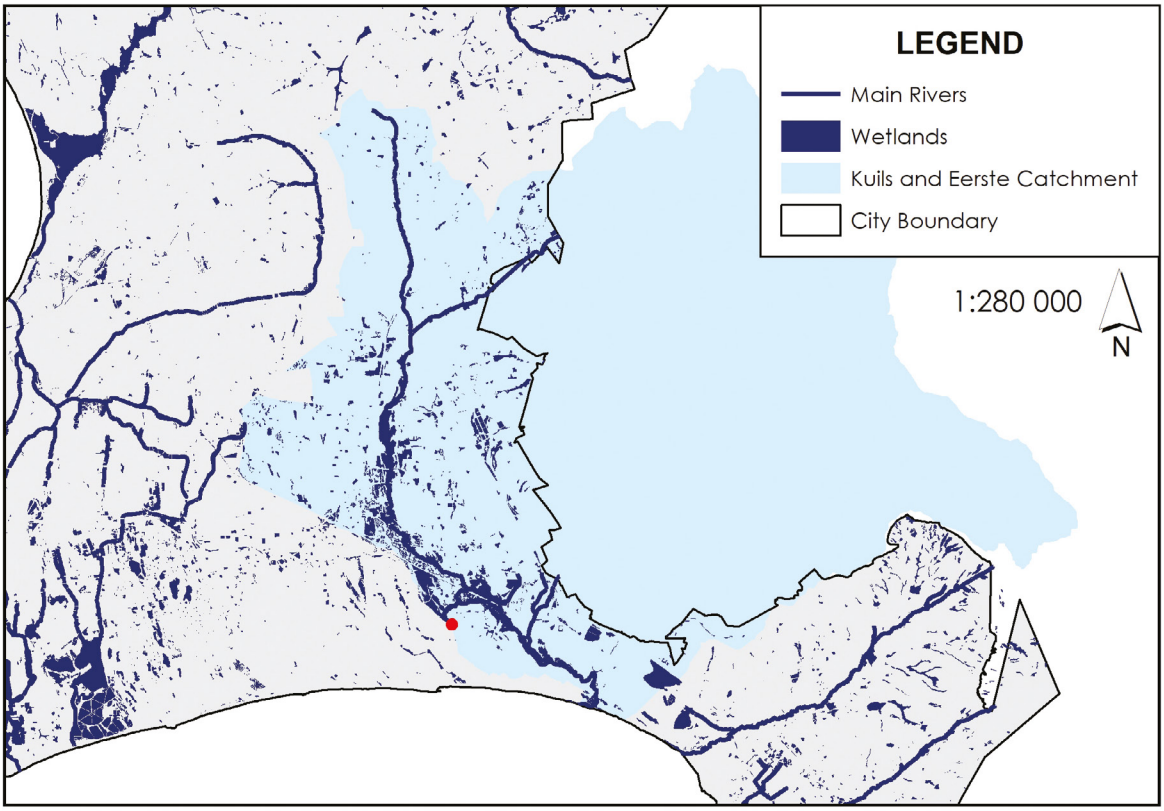


Figure 22: Map of the catchment and location of the Khayelitsha Wetland Park.

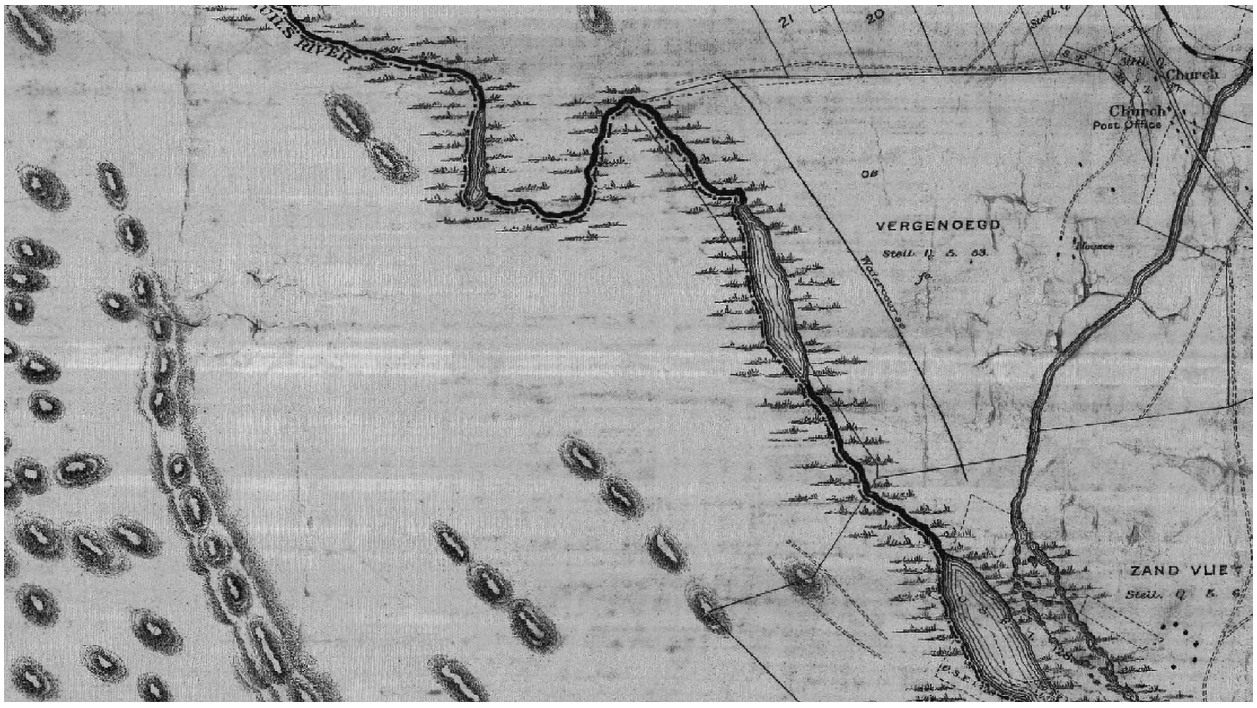


Figure 23: A map from 1901 shows the Kuils river as a series of interconnected seasonal wetlands as it passes the area where Khayelitsha is now.

6.2 INTERVENTION

In 1998, a management plan was developed for the greater wetland area. The plan recommended a number of land-use options, one of which was an urban park. The vision was to develop a community facility that would be inclusive and provide recreational and educational opportunities. The aim was to upgrade the local Makhaza Park by incorporating a portion of the Khayelitsha wetland to form a district park known as the Khayelitsha Wetland Park.

The project commenced with various specialist studies and engineering design work, including an environmental impact assessment (EIA), as the site was located adjacent to a sensitive wetland ecosystem. A multidisciplinary team was established that included a civil engineer, an aquatic ecologist, a botanist, hydrologist, quantity surveyor and landscape architect. After the necessary approvals and budget allocation, construction commenced, which saw the installation of an office, play areas and equipment, pathways, the planting of gardens and trees, and the rehabilitation of parts of the wetland, including cleaning and the removal of sediment and invasive alien vegetation. An amphitheatre was also built for the local communities to use, and a bird hide was installed next to the water edge for visitors to enjoy the views across the wetland.



The Khayelitsha Canoe Club in action on the water.



A bird's-eye-view across the wetlands showing just how extensive they are.

THE KHAYELITSHA CANOE CLUB

The Khayelitsha Canoe Club was started in 2013 by three local residents – brothers Siyanda and Akhona Sopangisa and a friend, Tsepho Ramuthokang. They wanted to keep the wetlands clear of rubbish and spent two years picking up litter in the area; starting the canoe club seemed like the logical next step. The club's 20 boats, paddles and lifejackets are used on a weekly basis by some 40 children between the ages of 10 and 15. Before anyone can paddle, they first have to pick up rubbish – an excellent way to get the community involved and raise awareness of the impact of litter. The youth are offered a new sport to participate in, litter no longer blocks the stormwater drains, the wetland plants and animals have a clean habitat, and the community has a new source of income in the form of township tours. The club relies entirely on donations and does not receive any funding or have any sponsorships. They are, however, looking for opportunities to partner with other clubs across Cape Town and recently participated in the Peninsula Paddle.

Siyanda says: "My vision for the future is for the Khayelitsha wetlands and the communities that surround it to find a common ground for both plants, animals and humans. And I think ecotourism would be a great fit for that common ground."

Courtesy of Siyanda Sopangisa, chair of the Khayelitsha Canoe Club



6.3 FUNDING, GOVERNANCE AND PARTNERSHIPS

Funding for the project came from various sources, including the capital budget of the City's Recreation and Parks Department, as well as both the municipal infrastructure and urban settlements development grants. In total, approximately R18 000 000 was spent on developing the park.

Management of the Khayelitsha Wetland Park falls to the City, in particular Recreation and Parks, who spends about R2 000 000 per annum on maintenance, security and general upkeep. This, however, is not nearly enough: keeping invasive alien plants in check alone costs over R1 500 000 per annum, and the need for more security and maintenance continues to grow.

The park is a CapeNature biodiversity agreement site, which means that the City has certain management obligations to fulfil. Most of the staff who assist with daily operations and maintenance activities are employed from the local communities through the Expanded Public Works Programme (EPWP). The Catchment, Stormwater and River Management Branch in the Water and Sanitation Directorate, as well as the Road Infrastructure Maintenance Department also assist with periodic clearing of sediment, litter and vegetation, using their annual repairs and maintenance budgets and various contractors.

A number of partnerships have also been established. These include a collaboration with the Kuils River Catchment Forum, which comprises various organisations, such as the Environmental Monitoring Group, the Western Cape Water Caucus, the national Department of Water and Sanitation and a number of community organisations. Over the years, the Kuils River Catchment Forum has carried out many high-impact projects, mostly on a voluntary basis. Projects include cleaning up litter in the park and wetland, hosting World Wetlands Day celebrations, and a number of activities aimed at educating the local community and schools about the neighbouring wetland environment.

6.4 CHALLENGES

Many of the challenges faced by the Khayelitsha Wetland Park are becoming progressively worse. Vandalism and safety are major concerns. Over the past few years, land invasions and destruction of infrastructure have greatly deteriorated the space. Sadly, some of the community assets that were installed are either no longer there or in a poor state, and the ongoing need to repair these assets puts additional strain on the Recreation and Parks budget.

Open spaces are increasingly being used for informal dwellings, and subsistence farming activities such as goat and cattle grazing has started to affect some parts of the wetland. The wetland also suffers from pollution, particularly sewage and greywater emanating from upstream. Littering and the illegal dumping of solid waste are common occurrences. The proliferation of reeds and silt in the wetland may have reduced the capacity of the wetland to absorb floodwaters, and the occupation of flood-prone areas by informal dwellings significantly increases the risk of these communities being affected during heavy winter rains.

6.5 OUTCOMES AND LESSONS

One of the main objectives of the Khayelitsha Wetland Park was to create a facility that would be inclusive and educate communities about the importance of wetlands and the value of the environment. Over the years, the park has been used by community groups, research institutions, schools and non-governmental organisations for various activities, events and training courses. A wide variety of recreation and entertainment facilities are available, including play areas, an outdoor gym, an amphitheatre, a braai area, a skate park, seating and benches, as well as walkways and cycling routes. The park is also popular for weddings and birthday parties, recreation and relaxation, exercise such as walking, cycling and canoeing, and as a non-motorised transport route through the area. It provides a much-needed green open space in an urban environment.

Another important benefit that the extensive wetland provides is that of cooling. A recent climate change, hazard and vulnerability study mapped the heat island effect across various parts of Cape Town. The map for the Khayelitsha area clearly shows that the wetland and Kuils river corridor have a lower heat risk compared to the adjacent built-up areas.

The wider Khayelitsha wetlands are an important ecosystem. The wetlands are characterised by bulrushes *(Typha capensis)* interspersed with patches of common reed *(Phragmites australis)* and other indigenous and alien plant species. The surrounding terrestrial vegetation is the endangered Cape Flats dune strandveld. Despite the altered state, these wetlands still have value as a habitat for aquatic animals and plants, for the provision of important ecosystem services such as water purification and storage, and for the recharge of the Cape Flats aquifer. The wetlands are also used to graze livestock, and for subsistence agriculture and hunting.

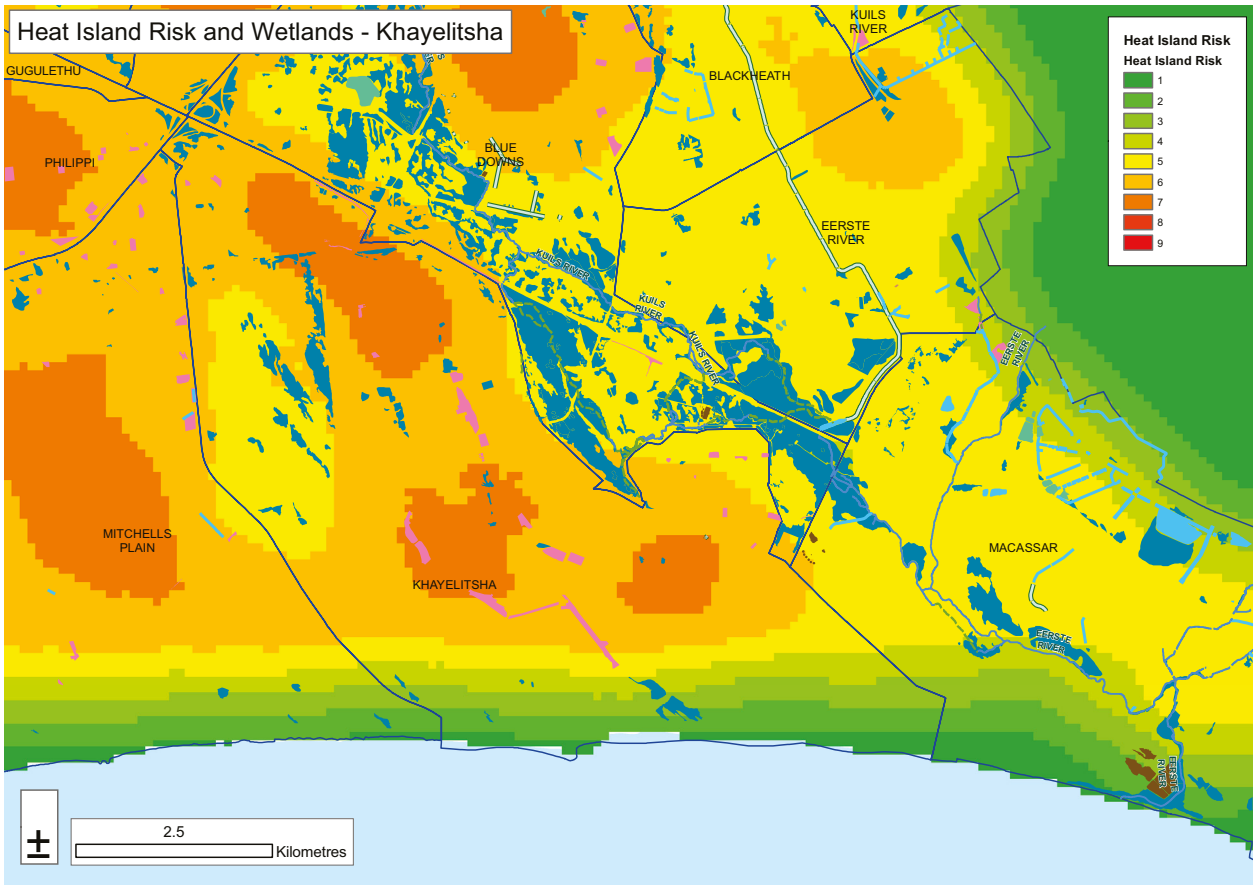


Figure 24: Map showing the heat island risk – red is hotter, and yellow and green are cooler.



A channel through the wetlands leads to the park and provides a great place to learn to paddle.



The wetland is immediately adjacent to the community and provides critical ecosystem services.



The wetlands are a wonderful outdoor classroom used by various community groups and NGOs for environmental education. Here school children are learning about the importance of wetlands during Mandela Day in 2019. Photo: Freshwater Research Centre.



The protea garden is a beautiful site when blooming.

Research undertaken by the University of Cape Town in 2017 confirmed the many benefits of the wetland. In community and park user surveys, all respondents agreed that the Khayelitsha Wetland Park was a positive feature of the township, and some even described it as "one of the best parks in Cape Town". Overall, the green infrastructure such as gardens and trees were seen as positive, as were the community facilities. Some respondents also perceived the wetland ecosystem as a positive feature, complementing the green infrastructure and facilities. Interestingly, 21% of respondents felt that the wetland was a negative feature, as it was associated with pollution, flooding, litter, solid waste and criminal activity.

Despite its challenges and the deterioration of some aspects of the Khayelitsha Wetland Park, the space is still well used by the community and remains an important ecosystem, providing critical ecosystem services for the benefit of the local community.

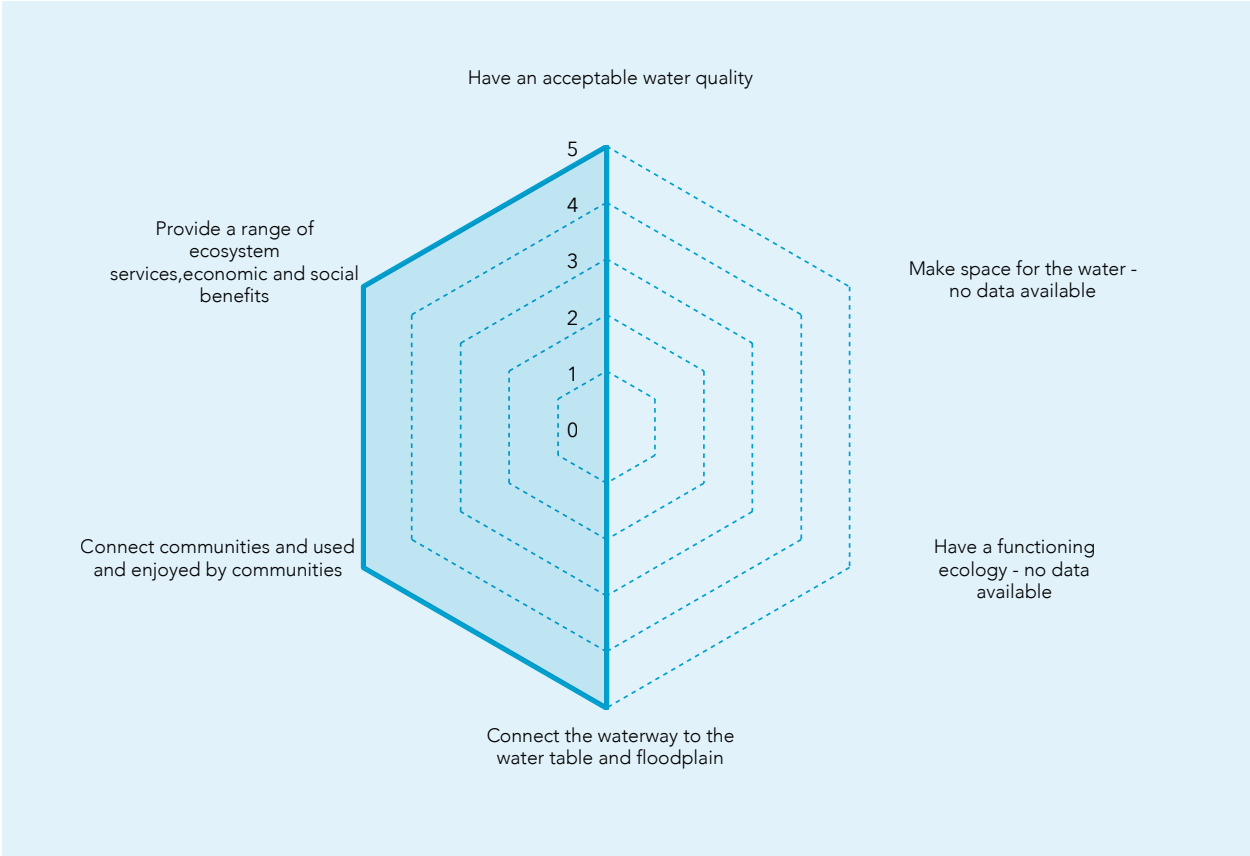
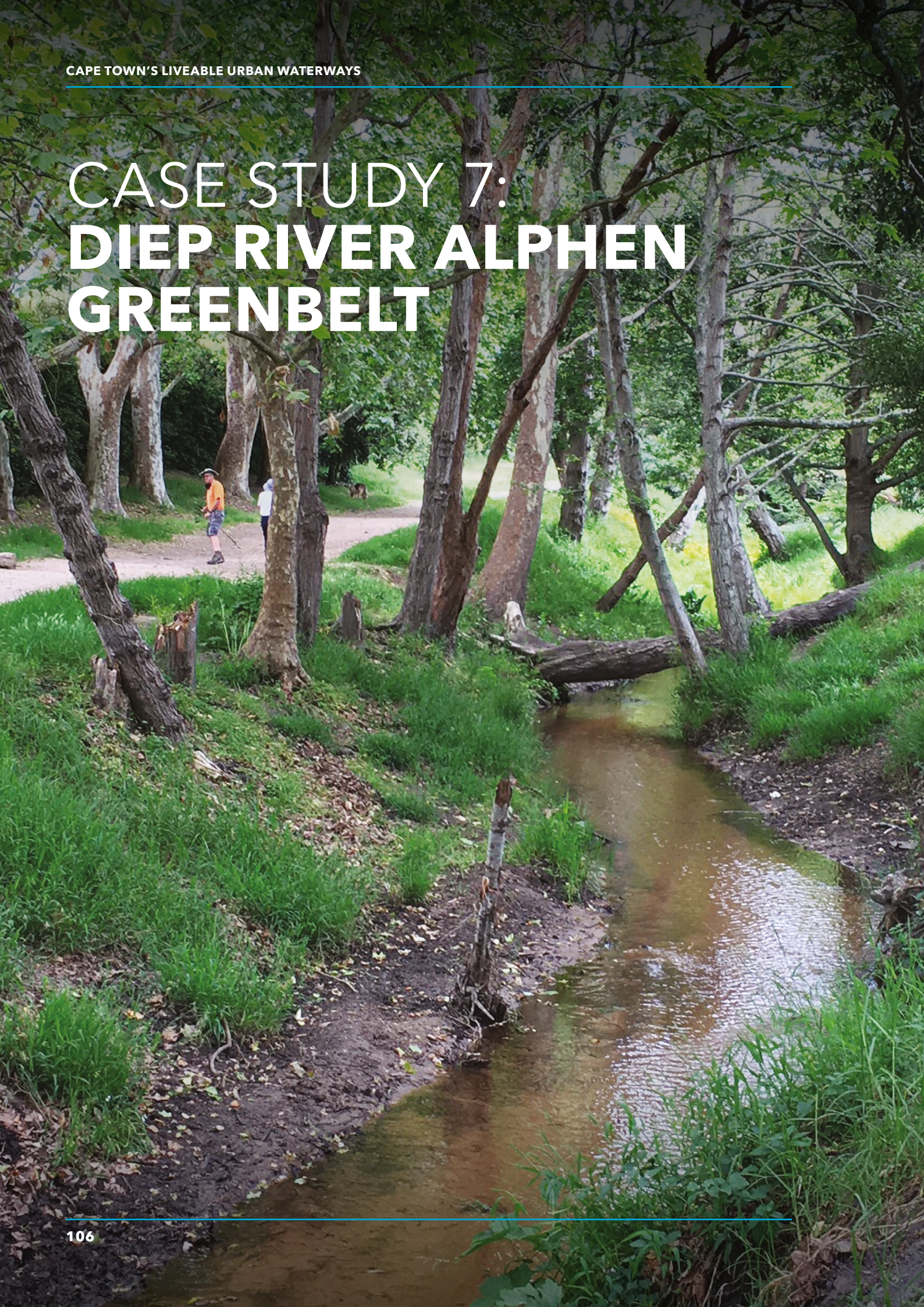


Figure 25: Elements of liveability for the Kayelitsha Wetland Park (2021).

KEY LESSONS

- Pollution and poor water quality are major threats to the liveability of our waterways. Everyone has a shared responsibility to improve water quality, including residents, businesses and the authorities.
- Safety is paramount for people to want to use a waterway. A well-maintained space – little or no litter, demarcated pathways, mown grass, trimmed trees and clear sight lines – is perceived to be safer. Visually permeable fencing and properties overlooking the waterway also enhance passive surveillance, leading to improved safety. And as the site attracts more people as a result, this assists with further safety.
- Post-project maintenance is critical for the sustained success of any waterway rehabilitation project. If projects are not properly maintained and become overgrown and unsightly, this affects people's connection with the space. Post-project maintenance must be considered at the project planning phase already and must look for opportunities to involve the community, such as using Friends groups to assist with some maintenance.

CASE STUDY 7: DIEP RIVER ALPHEN GREENBELT



7.1 INTRODUCTION

The Diep river (south) begins on the slopes above Constantia and flows in a broadly southeasterly direction, where it is joined by a number of smaller streams, namely Kirstenbosch, Hohenort, Rhodes Drive, Klaasenbosch, Brommersvlei, Alphen, Bel Ombre, Ferndale, Burgerskloof, Clover and Doordrift. Under natural conditions, the Diep river would have been a wetland-dominated system with poorly defined, sandy-bottomed braided channels in zones of wetland plant communities.

Today, the upper reaches flow through a well-defined sandy-bottomed channel as the river meanders its way through a number of well-established greenbelts, including the Diep river greenbelt and the Alphen greenbelt. From the M3 highway, it flows onwards through the Doordrift greenbelt down to Burnham Road, where it turns into a concrete canal as a result of urbanisation and development next to the river in the early 1900s. From Little Princessvlei onwards, the river is called the Sand river, which is perhaps a reflection of what the watercourse would once have looked like. The canal joins the Langevlei canal in Coniston Park before flowing into the northern end of the Zandvlei estuary.

Waterway name	Diep (south)
Catchment name	Sand
Intervention type	River and wetland rehabilitation
Key stakeholders	☑ City of Cape Town ☑ Friends of the Constantia Valley Greenbelts ☑ Alphen Estate
Key dates	Construction from 1996. Operations ongoing
Cost	Approximately R140 000 per annum for operations



The greenbelt is very well used, attracting many users most days of the week.

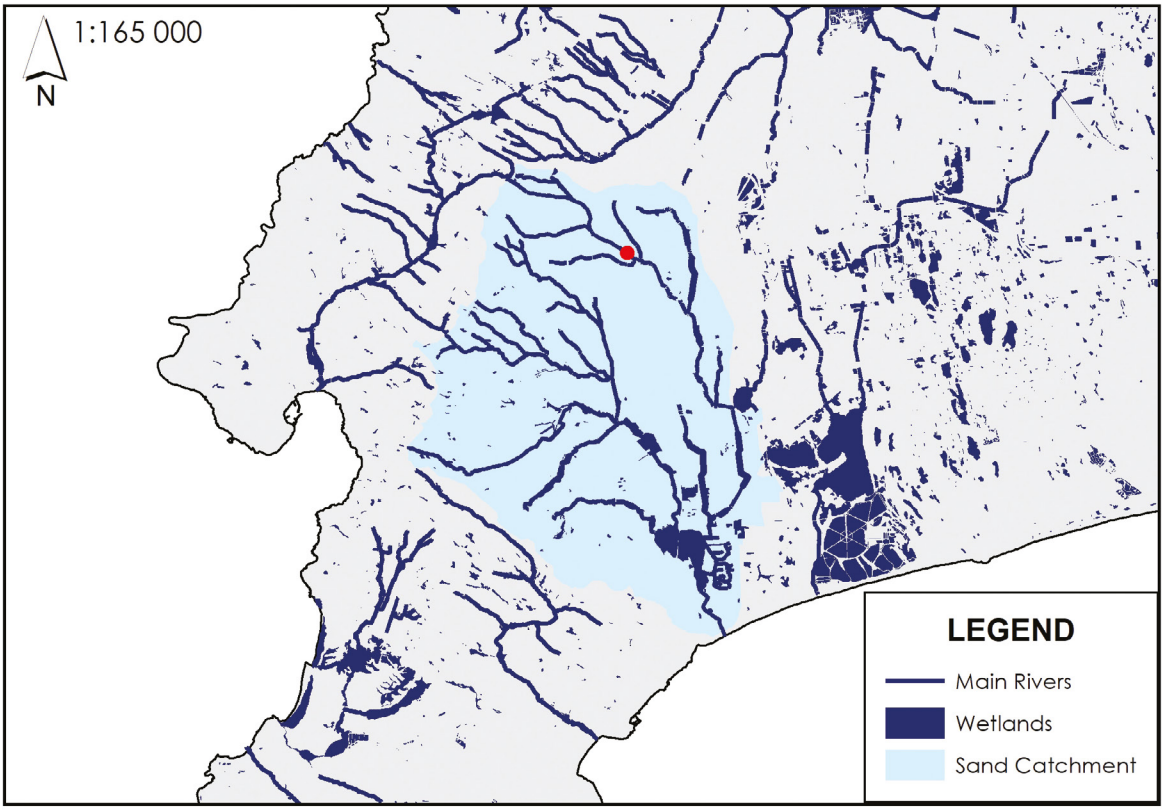


Figure 26: Map of the catchment and location of Diep river Alphen greenbelt.

7.2 INTERVENTION

The Constantia Valley and the area around the Diep river have a rich history. As far back as the late 1600s, the fertile soils were sought after for growing fruit and vegetables for passing ships, and the valley became a world-renowned grape and wine region. Alphen Estate was originally part of the much larger Groot Constantia Estate before it was portioned off in 1714. Much of the upper Diep river and some of its streams would have flowed through the property, and these would have been the main source of water for the farm. A leivoor directed water from the river to a small dam north of the cellars. From here, the water would have driven the wheel and powered the mill. This was one of the oldest mills in South Africa, dating back to 1772. The mill and dam have long gone, but in 1997, archaeologists discovered part of the mill next to the river, and plans are afoot to restore the dam and some of the leivore.

Over the years, the farm had various owners and was further subdivided in 1965. At the time, 10% of all land being subdivided had to be set aside as public open space, which, in hindsight, was a visionary and very forward-thinking requirement. Today, much of the greenbelts are located on what was Alphen Estate. The Diep river greenbelt runs from Southern Cross Drive (close to Rhodes Avenue) to Brommersvlei Road. The Alphen greenbelt then runs from Brommersvlei Road to Alphen Drive. The Alphen trail, the most popular of the trails in the valley, starts at the parking lot on Alphen Drive and continues northwards along the Diep river. Demarcated paths on either side of the river run through mature tree plantations and open meadows. In places, wooden bridges and boardwalks allow one to cross the river. The trail links with many of the other trails, making for a scenic network of walks. In total, there are 12 greenbelt walks in the valley that typically follow the various streams and rivers.

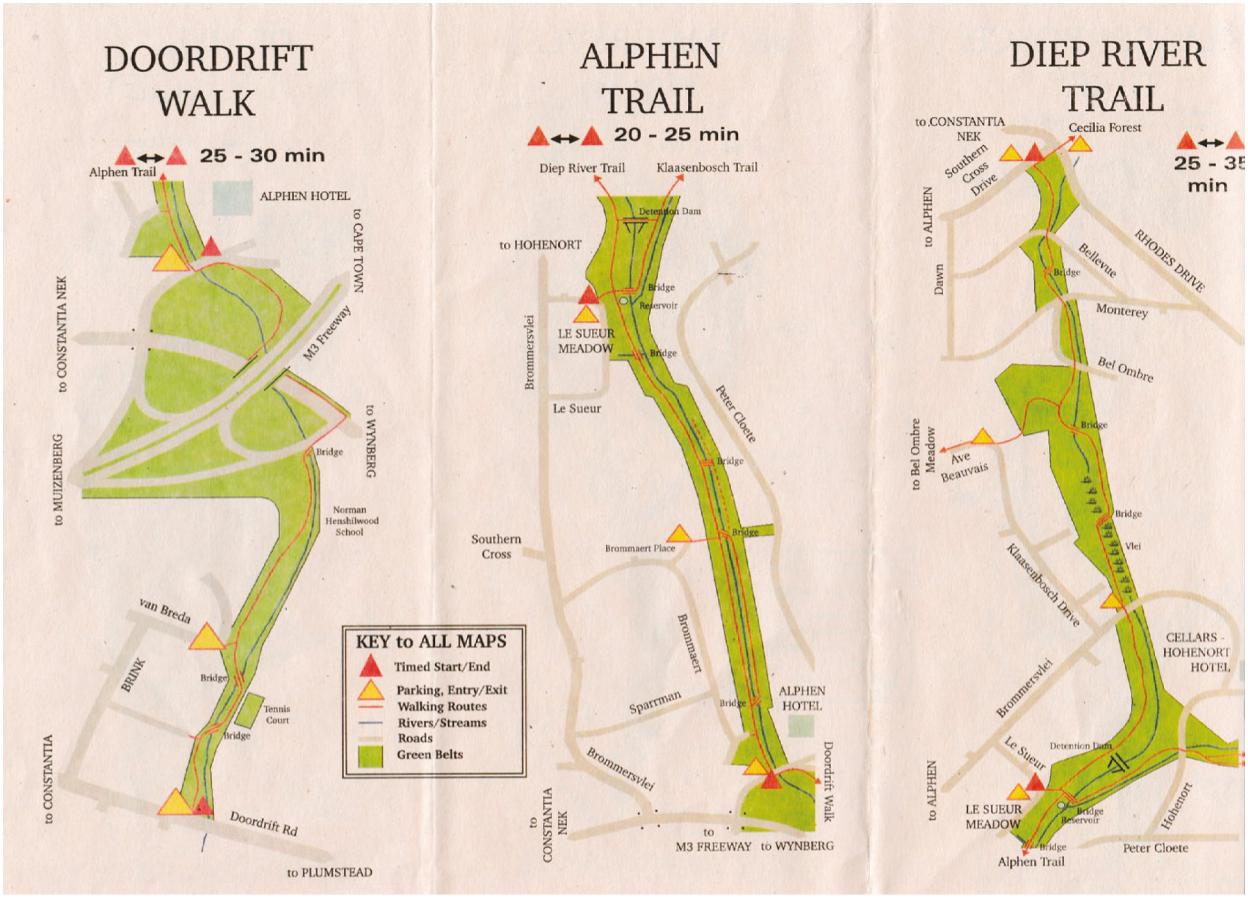


Figure 27: Some maps of the interconnected walks along the Constantia Valley greenbelts (courtesy of Friends of Constantia Valley Greenbelts).

Being an urban river, the Diep river has been altered over the years and no longer functions as it would have under natural conditions. In the 1980s, a number of flood detention ponds were constructed to reduce the impact of flooding downstream in Plumstead and beyond. Of particular concern in the early 1990s was the significant alien invasive plant invasion and large-scale erosion of the river banks. In response to these issues, the local authority commissioned Ninham Shand in 1993 to recommend options for better management and rehabilitation of the river. The study culminated in a project that ran from 1996 to 1999. The project removed invasive alien vegetation constructed a total of six gabion weirs at intervals down the length of the river, planted some indigenous riparian vegetation, graded and shaped the banks, and repositioned two pedestrian bridges. The weirs reduced upstream erosion and effectively raised the height of the stream bed in these reaches, facilitating the formation of a few seasonally inundated wetlands on the edge of the river.

Overall, the project resulted in a number of very positive changes in the waterway and helped achieve an ecosystem that functions more naturally, albeit in a limited area. However, as the project's primary objective was to manage erosion, it did not achieve the potential for habitat creation that might have been possible with more extensive river widening, re-establishment of wetlands and more adventurous landscaping. Moreover, sections of the river are again showing signs of deterioration, with erosion present in some places, some gabions are collapsing, and certain invasive alien plants have re-established.

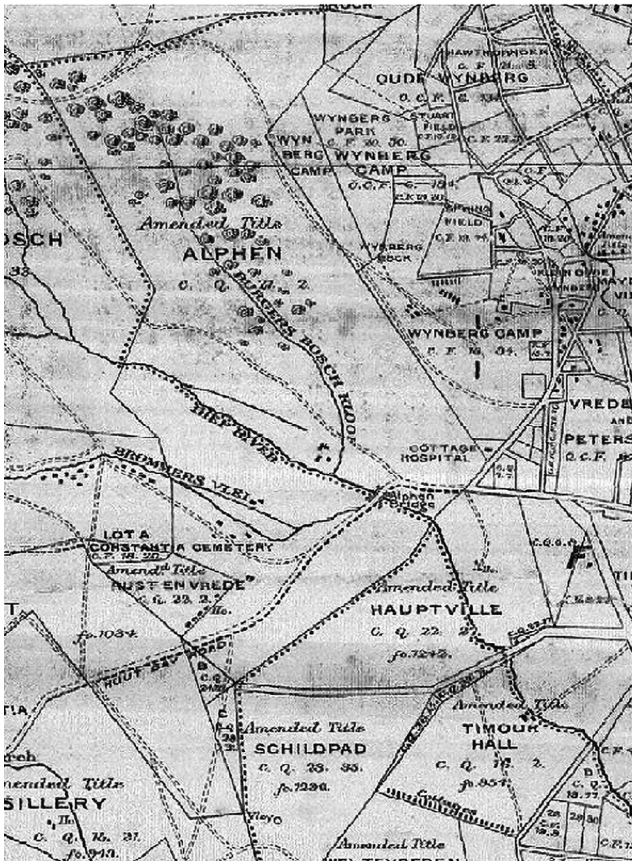


Figure 28: *The Diep river has long been associated with the Alphen Estate, and still today the Estate plays an important role in caring for the river.*

In 2009, to manage erosion just upstream of the Alphen Drive culverts, the City installed some gabions on the right bank of the river. Alphen Estate, which parts of the river flow through, has also done a considerable amount over the years to eradicate invasive alien species along the river flowing through the estate, and has planted indigenous species to control erosion. The estate also recently installed an additional low weir and Reno mattress structure to tie into the City-installed gabions.

The Friends of the Constantia Valley Greenbelts and its partners recently developed a wetland garden adjacent to the river near Brommersvlei Road. The garden has created a small pocket of biodiversity and represents what would have been typical of the area many years ago. Ponds were created, the wetland was shaped, and 50 indigenous species were planted after invasive kikuyu grass *(Pennisetum clandestinum)* was removed. In addition to the plants, the wetland garden provides a welcome habitat for aquatic and terrestrial animals that move up and down the river corridor. When funding becomes available, the Friends of the Constantia Valley Greenbelts intends to replicate this wetland garden concept in other places along the river.



Signage at the start of the trail. Photo: Andrew McDonald.



The mature trees create a wonderful setting with the mountain views beyond.



A series of gabion weirs were put in to halt erosion and to hold back the water to create some habitat diversity.

7.3 FUNDING, GOVERNANCE AND PARTNERSHIPS

The greenbelt is a public open space and is the responsibility of the City, in particular Recreation and Parks, to manage. The annual budget of approximately R140 000 is primarily used for invasive alien plant clearing, the employment of the two green wardens stationed on the greenbelts, repairs and maintenance of infrastructure, as well as a few special projects. Management of the river is the responsibility of the Catchment, Stormwater and River Management Branch in the Water and Sanitation Directorate, while their Repairs and Maintenance Division undertakes periodic clearing of sediment, litter and vegetation, using the annual repairs and maintenance budget.

Concerned residents established the Friends of the Constantia Valley Greenbelts around 1994 in response to the municipality's apparent lack of maintenance of the greenbelts. The organisation now plays an important part in conserving and managing the space. The non-profit raises funds through donations and community initiatives such as glass and paper recycling. These funds are then used to undertake a range of projects that improve the trails, including clearing of paths, removing invasive alien vegetation, trimming overgrown bushes, and planting indigenous species. Through a small committee, the organisation works closely with the City to coordinate activities. Each of the trails in the valley has its own river warden, who is responsible for monitoring their assigned section of greenbelt. Any issues detected or suggestions for improvement are communicated through the committee to the City officials. A conservation officer from Recreation and Parks meets regularly with the Friends of the Constantia Valley Greenbelts regarding management of the public open space. This has improved the relationship with the City, as the two organisations can work together to achieve common goals.

SOURCE TO SEA INITIATIVE

The Source to Sea pilot in the Zandvlei catchment focuses on the Diep and Prinskasteel-Keyser river corridors, which connect Table Mountain National Park (a nationally protected area) with the Greater Zandvlei Estuary Nature Reserve (an important estuary and City nature reserve).

Source to Sea aims to maximise urban natural recreational space by restoring degraded river corridors and waterways, and to promote and encourage use of these corridors. The rivers meander through varied socioeconomic areas and enable a wide range of stakeholders to be part of the transformative vision to restore healthy ecosystems, build climate resilience, offer recreational and mobility opportunities, create jobs and enhance social cohesion

The founding partners of the project were the City, South African National Parks (SANParks), ICLEI: Local Governments for Sustainability, and the Wildlife and Environment Society of South Africa (WESSA). In moving forward with implementation, the establishment of further partnerships with civil society, organisations and business will be critical for the project's success.

For more information, visit the website at http://sourcetosea.org.za/.

Courtesy of Joanne Jackson, City's head of Natural Space Systems

THE RIVER AMBASSADORS: BUILDING CAPACITY AND IMPROVING OUR RIVERS

NATURE CONNECT
Changing lives through nature

With a variety of land-uses along the river systems that connect the Table Mountain chain to the Zandvlei estuary, multiple human impacts affect river health. Over the past 30 years, a number of studies have explored how best to address these human impacts, and the Sand River Catchment Forum was established as a platform for stakeholders to discuss this.





The river ambassadors learning how to conduct a mini SASS river health assessment in the Liesbeek river. Photos: Hlomla Dali.

In 2017, discussions started between the City and the Cape Town Environmental Education Trust (now Nature Connect) on the possibility of creating a skills development programme for youth from the greater Source to Sea catchment. The aim was to address the skills shortages and job creation needs, while also improving the health and usability of the rivers in the Zandvlei catchment. The programme was to take the form of an accredited learnership for youth, who would become 'river ambassadors'. To this end, a model for the multiyear development of programme participants was developed, offering opportunities for the youth to tap into the capacity development initiatives of Catchment, Stormwater and River Management (CSRM) and creating opportunities for programme graduates to establish their own small, medium and micro-sized enterprises to tender for CSRM projects.

The first river ambassadors began in March 2020 and immediately started clearing alien invasive plants and removing litter from the river channel. However, the arrival of Covid-19 in South Africa and the subsequent lockdown meant that the programme lost some momentum. Yet this was again picked up in June 2020, and by December of that year, approximately 30 tons of biomass and 25,6 tons of non-recyclable waste had been removed from the river channel. The river ambassadors' practical work was interspersed with theory classes towards their National Certificate (National Qualifications Framework level 2) in Nature Conservation, which all participants passed. In addition to this qualification, the river ambassadors also received job-readiness training in chainsaw and brush-cutter usage, first aid, health and safety, and herbicide treatment.

The pilot programme is now complete and it is exciting to see that some participants have already secured jobs in the green economy, while others will advance to higher-level training. The aim is to expand the initiative across town to help achieve the vision of LUW and to upskill and improve the employability of Cape Town's urban youth.

For more information, visit the website at **https://natureconnect.earth/**.

Courtesy of Anthony Roberts, Nature Connect chief executive

7.4 CHALLENGES

Flowing through the greenbelts, the Diep river is an unlined channel, and while the space around it is attractive, the river here is far from natural. An ecological study in 2002 estimated the river's present ecological state to fall in category D, which is indicative of an ecosystem that is largely modified from its natural state. Much of the wetland habitat is no longer, and the indigenous fynbos and wetland vegetation has largely been replaced by exotic plants. In some instances, when they grow in the river channel, these can be problematic, as they alter river flow, destabilise the banks, and consume a lot of water. They do, however, provide a sense of place as well as shade and habitat, especially for birds. Although a significant amount of work has been done to remove invasive alien plants, this is an ongoing challenge due to the vast seed bank and the quick growth of saplings.

Another challenge is the continued impact of erosion and sedimentation on the river channel and banks. Without the wetland systems to hold back and slow down the flow, the fast-moving water causes the river to cut into the channel bottom and banks. Footpaths down to the water edge, as well as stormwater pipes from the surrounding roads, can be the start of erosion knickpoints. Some of the gabions put in place in 1996 have helped limit the erosion, but rivers are dynamic, and additional measures are now required in places. The deposition of eroded materials is an issue, particularly along the river after it flows past the Alphen Boutique Hotel. Here, vast amounts of sediment need to be periodically removed from the river with a mechanical excavator.

Fortunately, thanks to its location fairly high up the catchment, the quality of water in the river is usually fairly good, and it is only further downstream that the water quality shows signs of deterioration. Yet periodic sewer spillages do occur, and dog waste is also a problem at times, as is swimming pool backwash that enters the river from the stormwater pipes.

The allocated budget for greenbelt and river maintenance is not always sufficient to meet citywide needs. The Friends of the Constantia Valley Greenbelts also faces challenges raising sufficient budget, and the money they do raise is rarely enough to do all the work that is needed.



The newly rehabilitated space near Brommersvlei Road provides a welcome habitat for a myriad of indigenous flora and fauna.



Pathways wind their way through a grove of trees.



The river here is characterised by a defined channel and a sandy bottom with various exotic and indigenous plants growing on the banks. Photo: Andrew McDonald.

7.5 OUTCOMES AND LESSONS

Greenbelts in cities offer many benefits. They provide important natural spaces in otherwise densely urbanised areas, thereby limiting urban sprawl with all its negative impacts. The greenbelts of the Constantia valley, in particular, are important connectors that link the Table Mountain National Park to suburban communities and beyond, to Zandvlei and the sea. The river corridors provide both ecological and social benefits – offering opportunities for recreation and connecting with one another and nature. The trails are used by locals and visitors alike for activities such as jogging, dog walking, splashing in the water, horseback riding, birdwatching and a 5 km parkrun on weekends. Since the lifting of the Covid-19 restrictions, there has been a noticeable increase in the number of people using the greenbelts. With the new parking arrangement at the start of the Alphen trail, there are regularly over 180 cars at any given time over weekends. This underlines the importance of these spaces in bringing people together, and the immense value of having safe and pleasant urban green spaces.

Safety is paramount, and it is not uncommon to see people walking alone, suggesting that the space is indeed safe. This is because it is being well maintained, is regularly used, and has some private security patrols and surveillance cameras in place at access points.

The Alphen greenbelt has become one of the most popular greenbelt walks in the Constantia area. The dedication and passion of the various stakeholders such as the Friends of the Constantia Valley Greenbelts and the City help make the space so successful. Despite the challenges typical of urban rivers, and budget constraints, the Diep river Alphen greenbelt is a prime example of a liveable river corridor. Through the Source to Sea initiative and the LUW programme, there is considerable potential to extend the concept further downstream through the Doordrift greenbelt, and perhaps even beyond.

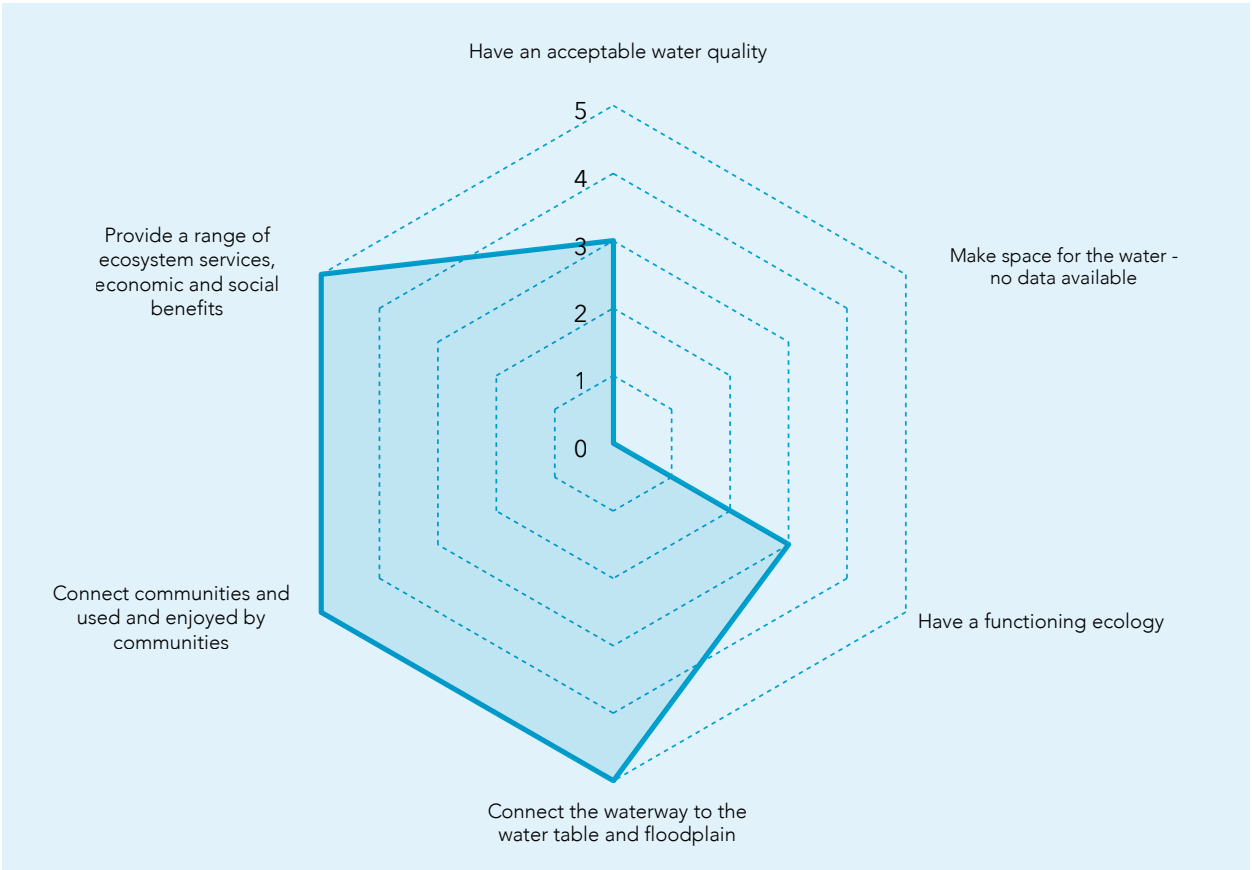


Figure 29: *Elements of liveability for the Diep river Alphen greenbelt (2021).*

KEY LESSONS

- Well-managed open spaces, and especially those with water, can add value to properties and make neighbourhoods more attractive and liveable. Poorly maintained open spaces have the opposite effect.
- The importance of community buy-in, support and ongoing involvement in management cannot be overstated.
- Successful waterway rehabilitation projects have a range of objectives and anticipated benefits. The multipurpose use of waterways provides better social, ecological and economic dividends, while projects with a single use or benefit are less likely to provide a good return on investment.
- Partnerships between civil society, non-governmental organisations and the public sector are important to get projects started and to ensure their sustainable management. Such partnerships can be informal and rely on good relationships, regular communication and teamwork. More formalised partnerships can be overly complex and are not always the answer to ensure collaboration. However, in some instances, formal partnerships are necessary and can also assist with funding allocation. Whether formal or informal, any partnership takes time and energy, and often relies on a few champions on all sides to sustain it.
- Safety is paramount for people to want to use a waterway. A well-maintained space – little or no litter, demarcated pathways, mown grass, trimmed trees and clear sight lines – is perceived to be safer. Visually permeable fencing and properties overlooking the waterway also enhance passive surveillance, leading to improved safety. And as the site attracts more people as a result, this assists with further safety.
- Post-project maintenance is critical for the sustained success of any waterway rehabilitation project. If projects are not properly maintained and become overgrown and unsightly, this affects how people connect with the space. Post-project maintenance must be considered at the project planning phase already and must look for opportunities to involve the community, for example using Friends groups to assist with some maintenance.



The remains of an old sluice gate that was historically used to control the water levels to allow for water to be abstracted for the Alphen Estate. Photo: Andrew McDonald.

CASE STUDY 8: KIRSTENHOF WETLAND



8.1 INTRODUCTION

Kirstenhof wetland is situated on the Westlake river in the suburb of Kirstenhof. The Westlake river is short – only 3 km in length – and the small sub-catchment is part of the much bigger Sand catchment, which drains about 90 km^2 of land from Wynberg Hill, through Constantia, Steenberg and Westlake, to Muizenberg. The river originates on the slopes of Steenberg peak, flowing past the Norval Art Gallery and Sculpture Garden, the American Embassy, Steenberg Village shopping centre, Westlake Village and Pollsmoor prison, and then under the M3 highway. The wetland begins at the outlet under the M3 and consists of an upper and lower section, bisected by Oranje Street. The upper section has a large reedbed, with the river flowing past the edge of the wetland, while the lower section consists of the river, pond, an extensive reedbed, open park space as well as a children's play area. The river continues its journey towards Zandvlei, passing under Raapkraal and Steenberg roads, before entering the northwestern side of the vlei through the Westlake wetlands. The Westlake river and its wetlands form part of an important natural system, creating a corridor that connects high-lying areas of the Table Mountain National Park to Zandvlei estuary and the sea.

Waterway name	Westlake river
Catchment name	Sand
Intervention type	River and wetland rehabilitation
Key stakeholders	☑ City of Cape Town ☑ Friends of Kirstenhof Wetlands ☑ Kirstenhof and Environs Residents' Association
Key dates	Construction from 2008. Operations ongoing
Cost	Approximately R50 000 in total from the Friends group to date. Approximately R150 000 per annum for maintenance operations



The Westlake river flows into Zandvlei and then out to sea at Muizenburg.

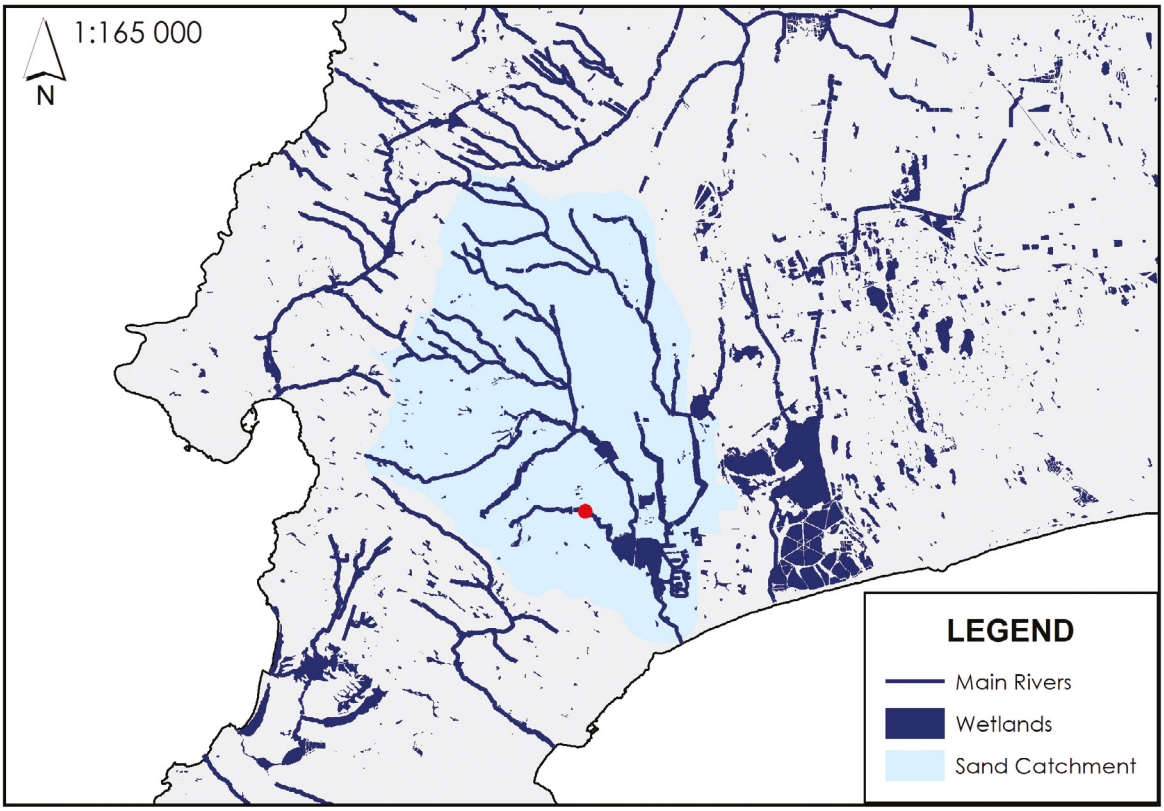


Figure 30: Map of the catchment and location of the Kirstenhof wetland.

8.2 INTERVENTION

Like most rivers and wetlands in built-up areas, the Westlake river and Kirstenhof wetlands faced various challenges, including poor water quality, siltation, and the proliferation of exotic plants. Around 1995, the municipality rehabilitated the Westlake river. The area was cleared of sediment and alien invasive plants, landscaping was improved, paths were laid out, and bridges and benches were installed. Despite this, however, the invasive plants returned over time, and local residents decided to intervene. Their vision was to have a better-functioning and healthier wetland ecosystem with fewer invasive plants, as well as better management of the open park space, with a pathway network and greater community involvement.

The residents rallied local support and called a public meeting, which culminated in the establishment of the Friends of Kirstenhof Wetland in 2008. The Friends group was formed with the assistance and guidance of the Wildlife and Environment Society of South Africa (WESSA), who were based in Kirstenhof at the time.

With the formation of the Friends group, things started to take a turn for the better. In 2009, a wetland management plan was developed that could be used to guide activities to improve the wetland. The first phase, undertaken by the Friends group, was to clear the invasive alien vegetation such as Port Jackson *(Acacia saligna)*, Brazilian pepper *(Schinus terebinthifolia)*, stinkbean *(Paraserianthes lophantha)*, syringa *(Melia azedarach)* and Indian shot *(Canna indica)*. The City's Environmental Management Department initially assisted with guidance and expertise, and Roads and Stormwater helped remove the cut and stacked trees. The next phase comprised follow-up clearing of invasive alien vegetation and the establishment of the indigenous gardens. Service provider Wetland Solutions was contracted to remove the smaller invasive alien trees and vegetation, and kindly donated approximately 500 indigenous shrubs and plants as their contribution to this community effort. The City team managed to source 20 milkwood trees from their nursery in Newlands, and new garden beds were established on the edge of the wetland.



The gardens taking shape. Photo: Louise Kinrade.

The third project phase was the ongoing development and maintenance of the indigenous gardens. The gardens require regular pruning, weeding and replacing of dead plants. The Friends group maintains these gardens with the help of a gardener who is hired every six weeks, and under the guidance of a local resident who is a botanist by profession.

8.3 FUNDING, GOVERNANCE AND PARTNERSHIPS

Funding for the project was kindly donated by the Rowland and Leta Hill Trust. In 2010, R15 000 was donated for the initial clearing of invasive alien vegetation and replanting of trees. The next year, another R15 000 was donated for further clearing of invasive alien vegetation and the creation of the garden. And finally, in 2020, R22 000 was donated for further invasive alien vegetation removal and garden maintenance. One local resident kindly donated R2 000 towards the replenishment of plants in the garden, while quarry stonework for bed edging was donated from excess in a nearby neighbour's garden project.

The Friends of Kirstenhof Wetlands works closely with the Kirstenhof and Environs Residents' Association (KERA), who has a Parks and Open Spaces subcommittee under the diligent and active stewardship of a local resident. The Friends group has been reincorporated into the Parks and Open Spaces portfolio, and the residents' association helps manage donations, ensuring greater due diligence and controls over the spending of the funds. The Friends group also recently rejoined WESSA Western Cape.

An intervention such as this requires multiple stakeholders working in a coordinated manner to ensure the project's success. Various City departments have a part to play, including the Recreation and Parks Department, who manages the public open space; the Water and Sanitation Department, who manages the river channel, and Environmental Management Department, who helps clear invasive plants from the river channel and duck pond. The wetland management plan is the key document that brings these stakeholders together and guides the collaborative management of the area. By and large, partnerships between the various City departments and the Friends of Kirstenhof Wetland have proven a success, achieved through constructive collaboration. The annual horticultural maintenance budget for the area is about R150 000, which is used for minor repairs, reed cutting and vegetation management.



The duck pond needs to be periodically cleared of parrot's feather (Myriophyllum aquaticum). Photo: Jean Fillis.

THE ONGOING CHALLENGE OF INVASIVE PLANTS

Invasive species hamper the natural functioning of ecosystems, and aquatic invasive plants are a major concern in terms of their potential impact on waterways. Many invasive plant species consume large quantities of water and can have a detrimental effect on water quantity, flow and quality, and also modify the soil. They tend to multiply exponentially to the detriment of indigenous vegetation, and when in watercourses, these species often also establish downstream. Many aquatic invasive plant species, such as water hyacinth with its striking purple flowers, were once ornamental horticultural plants that have 'escaped' from gardens

and become established in watercourses. Water hyacinth *(Eichhornia crassipes)* is now a major problem in many of Cape Town's waterways. With its rapid reproduction rate, it quickly forms thick, impenetrable mats. These not only affect the ecology of the watercourse, but can also cause blockages and consequent flooding, as well as entrap litter. In certain conditions, even indigenous plants such as the bulrush *(Typha capensis)* and common reed *(Phragmites australis)* can become invasive, and in those instances, also require control.

The control of invasive alien plants is regulated by both the National Environmental Management: Biodiversity Act, No. 10 of 2004, and the Conservation of Agricultural Resources Act, No. 43 of 1983. Different obligations for eradication or control apply to the various category lists of species. See **http://www.invasives.org.za/** for information on invasive species legislation and regulations, as well as information on species and how they can be controlled.

The following invasive aquatic plants require control and/or removal. With the exception of the fringed water lily, these are all found in Cape Town.

Category 1a

Cabomba *(Cabomba Caroliniana)*
Fringed water lily *(Nymphoides peltata)*
Hydrilla *(Hydrilla verticillata)*
Purple loosestrife *(Lythrum salicaria)*
Yellow flag *(Iris pseudacorus)*
Yellow water lily *(Nuphar lutea)*
Water primrose *(Ludwigia peruviana)*

Category 1b

Azolla *(Azolla filiculoides)*
Canadian water weed *(Elodea canadensis)*
Dense water weed *(Egeria densa)*
Giant reed *(Arundo donax)*
Indian shot *(Canna indica)*
Kariba weed *(Salvinia molesta)*
Morning-glory bush *(Ipomoea carnea)*
Parrot's feather *(Myriophyllum aquaticum)*
Purple morning-glory *(Ipomoea purpurea)*
Spiked water-milfoil *(Myriophyllum spicatum)*
Water hyacinth *(Eichhornia crassipes)*
Water lettuce *(Pistia stratiotes)*

Category 2

Watercress *(Nasturtium officinale)*

Adapted from *Green Infrastructure Programme Best Practice Guidelines: Urban Watercourses.* **https://resource.capetown.gov.za/documentcentre/Documents/Procedures,%20guidelines%20and%20regulations/CCT_Urban_Watercourses_Guide.pdf**



Kariba weed, parrot's feather, water hyacinth and water lettuce are unfortunately all too common in our waterways.



The wetland and river banks were infested with alien trees before the restoration work commenced in 2009. Photo: Jean Fillis.

8.4 CHALLENGES

Funding was initially a major challenge, as the project could not commence without it. However, once generous donations were received, the project was up and running, and over time, additional funds were secured to keep it going.

The quality of the water flowing into the wetland is poor at times, with elevated levels of nutrients and sewage pollution. The upper-section wetland and watercourse can dry up during the summer months, resulting in growth of Port Jackson. Parrot's feather, another problematic invasive plant, can proliferate in the pond. The continuous growth of invasive vegetation requires ongoing maintenance. In places, the river channel is eroding the bank, and some gabions and bridges are in need of repair.

Occasionally, trees and garden beds have been damaged by municipal contractors during mowing and river cleaning operations. Unfortunately, the garden has lost at least three trees as a result, and tree trunks are at risk of ring barking due to weed-eater activity during mowing. Vandalism also poses a challenge, with perpetrators damaging trees and plants as well as the dispensers that were installed to hold plastic bags for the collection of dog waste.

Public safety is always paramount, and vegetation is cut to provide clear sight lines and remove hiding and sleeping places. There are also more crime patrols and camera monitoring, especially at night when the cameras are activated, which helps deter crime, asocial behaviour and vandalism.

Sadly, community involvement has declined over the years, and so has community membership of the Friends group. Attempts are being made to rejuvenate the group, and its incorporation into the KERA Parks and Open Spaces subcommittee will hopefully assist in this regard.

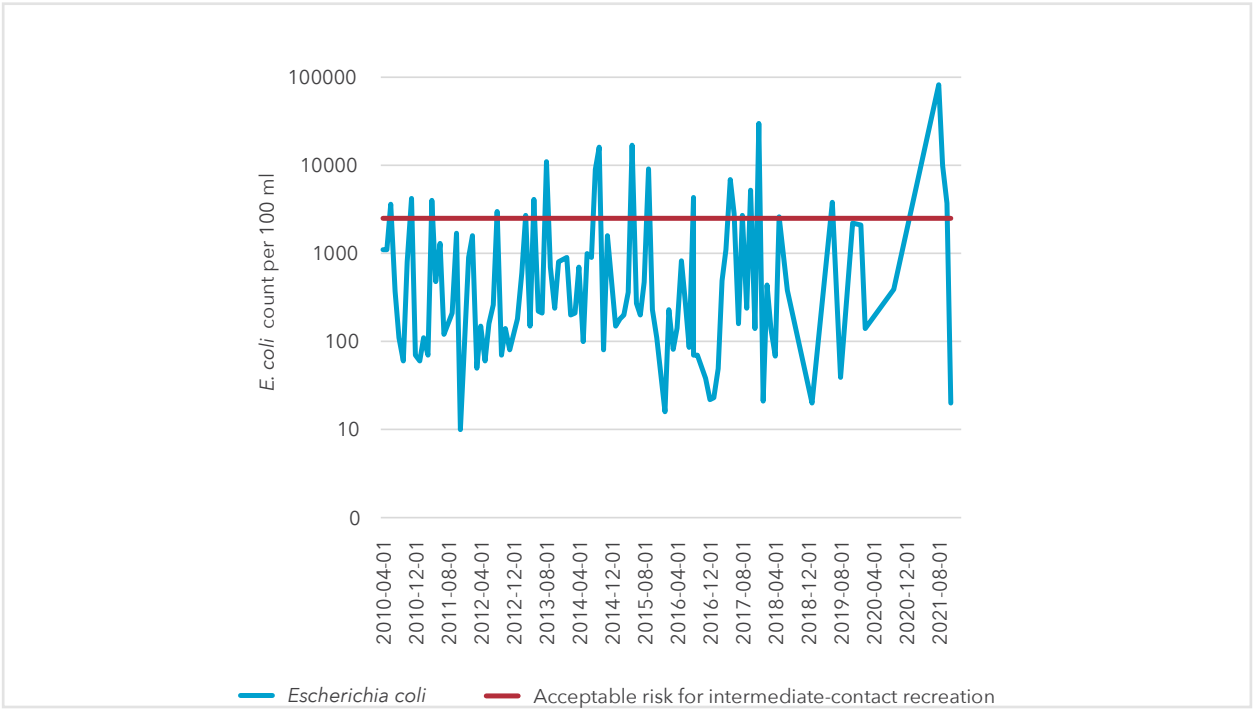


Figure 31: Water quality sample results at Oranje Street.

8.5 OUTCOMES AND LESSONS

The removal of invasive alien plants and the creation of indigenous gardens have attracted wildlife and restored the functioning of the system to a more natural state. The endangered western leopard toad *(Sclerophrys pantherina)* uses the river and wetland for breeding, and porcupine *(Hystrix africaeaustralis)* and Cape clawless otter *(Aonyx capensis)* have also been sighted.

The area is well used by both locals and residents from other areas, who drive there specifically to use the space. Activities include walking, jogging, cycling, dog walking, picnicking, birthday celebrations, and outdoor exercise such as summer bootcamps and family cricket games. The community has also expressed an interest in installing benches and trees in memory of departed family members who lived and raised their children in the suburb.

When they were still on-site, WESSA used the wetland as an outdoor classroom, and some teachers at Kirstenhof Primary have brought classes to visit the wetland as part of their Eco-school programme. More recently, universities have started using the space to learn about ecology and how to undertake a wetland assessment, and the masked-weaver *(Ploceus velatus)* nests along the river have also been the subject of a case study for a PhD student at the University of Cape Town.

The improved state of the public open space has increased property values for the entire suburb, as the wetland is in easy walking distance for Kirstenhof residents and is used as a selling point by estate agents. Residents walking the greenbelt have indicated that they experience an improved sense of personal safety and security. In 2004, a study on the costs and benefits of river rehabilitation projects concluded that the rehabilitation project provided a significant positive net present value (NPV) of R4,3 million and a benefit cost ratio of 2:1.

The project has shown how starting small is important, and how lots can be achieved with a limited budget. To do so, one must set realistic goals and achieve them, which, in turn, builds momentum and illustrates to others what can be done. Importantly, collaboration between various stakeholders has enabled the sharing of resources and resulted in a better collective impact.



The indigenous gardens are beautiful and make it such an attractive public space, and attract and provide habitat for wildlife. Photo: Louise Kinrade.



Masked weavers are one of the many bird species that flock to the wetland. Photo: Shutterstock.



The duck pond is thought to be fed by groundwater with the water quality usually good.

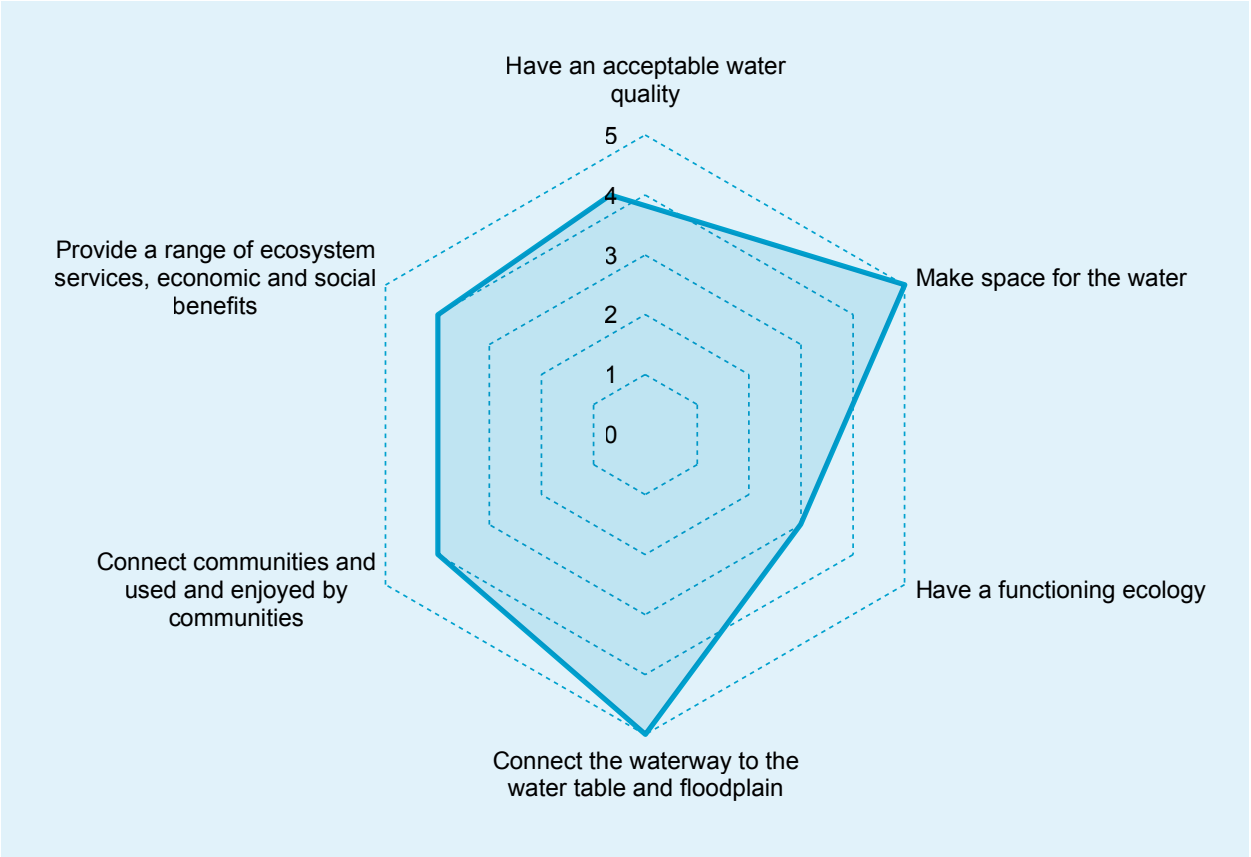


Figure 32: *Elements of liveability for the Kirstenhof wetland (2021).*

KEY LESSONS

- Well-managed open spaces, and especially those with water, can add value to properties and make neighbourhoods more attractive and liveable. Poorly maintained open spaces have the opposite effect.
- The importance of community buy-in, support and ongoing involvement in management cannot be overstated.
- Rehabilitation projects do not have to be large and complex. Many successful projects started small. Local champions, often from the community, are critical to get these projects off the ground. Learning-by-doing and gaining support through demonstration are further key elements.
- Partnerships between civil society, non-governmental organisations and the public sector are important to get projects started and to ensure their sustainable management. Such partnerships can be informal and rely on good relationships, regular communication and teamwork. More formalised partnerships can be overly complex and are not always the answer to ensure collaboration. However, in some instances, formal partnerships are necessary and can also assist with funding allocation. Whether formal or informal, any partnership takes time and energy, and often relies on a few champions on all sides to sustain it.
- Pollution and poor water quality are major threats to the liveability of our waterways. Everyone has a shared responsibility to improve water quality, including residents, businesses and the authorities.
- Safety is paramount for people to want to use a waterway. A well-maintained space – little or no litter, demarcated pathways, mown grass, trimmed trees and clear sight lines – is perceived to be safer. Visually permeable fencing and properties overlooking the waterway also enhance passive surveillance, leading to improved safety. And as the space attracts more people as a result, this assists with further safety.
- Post-project maintenance is critical for the sustained success of any waterway rehabilitation project. If projects are not properly maintained and become overgrown and unsightly, this affects how people connect with the space. Post-project maintenance must be considered at the project planning phase already and must look for opportunities to involve the community, for example using Friends groups to assist with some maintenance.



Wooden bridges allow one to cross the river.

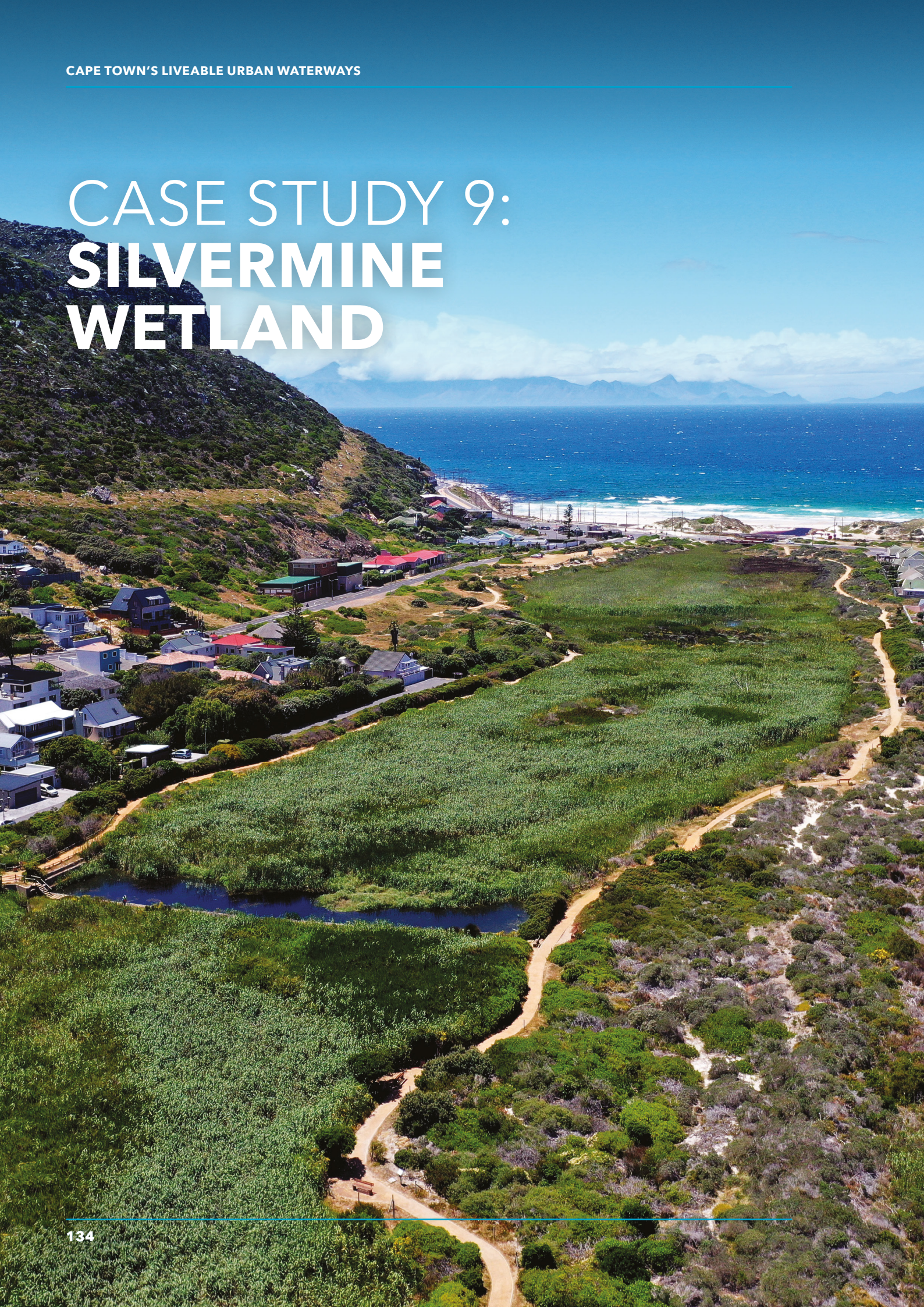


The footpaths that meander around the wetland are well used by visitors.



A shady spot to have a picnic or take in the view.

CASE STUDY 9: **SILVERMINE WETLAND**



9.1 INTRODUCTION

The Silvermine wetland is located on the lower reach of the Silvermine river as it flows between Fish Hoek and Clovelly. The Silvermine catchment is about 22 km^2, mostly in the Table Mountain National Park. The Silvermine river rises in the Steenberg mountains and flows for about 12 km across the Steenberg plateau, and then southward through the Silvermine valley to reach the coastal plain, before entering the sea at Clovelly. The wetlands and the river corridor constitute an important conservation area, featuring Hangklip sand fynbos, sand dunes and aquatic habitats.

The Silvermine river takes its name from attempts to mine silver in the mountains between Constantia and Fish Hoek – the "Zilvermijn" area – in the 1600s. Until at least 1741, however, it was known as the Esselstein rivier. The original course of the river was likely to be towards the centre of the valley, and it entered the sea somewhat further south than at present. The river was free to move without obstructions, and its position was determined primarily by the climate, the tides and the position of the protective coastal dunes. Historically, the Silvermine estuary would have covered an area of 50 to 60 ha, comprising of a series of shallow seasonal vleis that formed behind a low sand dune. Under these conditions, the estuary would have been a haven for estuarine fish and birds.

The first road and rail bridges were built at the Clovelly end of Fish Hoek beach in 1876 and 1890 respectively. These structures fundamentally altered the estuary, sand dunes and the flow of the river. The first major attempt to control the river was made in 1900, when a dyke was built. This was followed by an additional dyke in 1925, the remnants of which can be found near the walkway on the southern side of the wetlands. Today, the estuary is just a small seasonal lagoon that extends about 100 m upstream from the road bridge.

Waterway name	Silvermine river
Catchment name	Silvermine
Intervention type	River and wetland rehabilitation
Key stakeholders	☑ City of Cape Town ☑ Riverine Rovers ☑ Silvermine River Society ☑ Wildlife and Environment Society of South Africa ☑ Friends of Silvermine Nature Area ☑ SANParks ☑ CapeNature
Key dates	Construction from 1998 to 2001. Operations ongoing
Cost	Approximately R8 million for construction. Approximately R60 000 in total from the Friends group to date. Approximately R120 000 per annum for maintenance operations

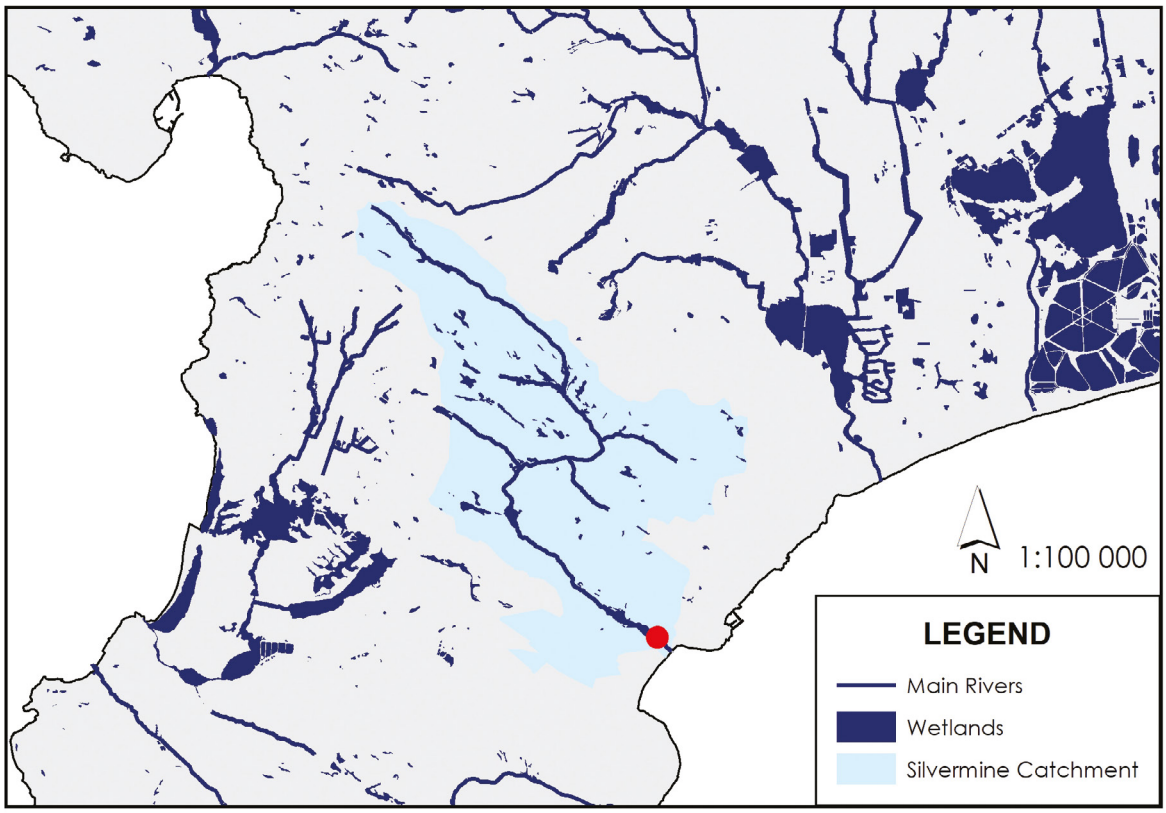


Figure 33: *Map of the catchment and location of the Silvermine wetland.*



The river in 1992 before the rehabilitation project. Photo: Silvermine River Society.

9.2 INTERVENTION

For years, the lower Silvermine river was in a degraded state, suffering from illegal dumping, encroachment by alien plants such as Port Jackson *(Acacia saligna)* and kikuyu grass *(Pennisetum clandestinum)*, and occupation by vagrants. The area also suffered periodic flooding when the river naturally flooded the adjacent lands of its old floodplain. Investigations showed that the Main Road bridge was unable to accommodate the 1:50-year flood and that floodwaters would run along Main Road into the centre of Fish Hoek. As a result, heavy machinery was used to dig a channel that would move floodwater to the sea as quickly as possible – an unfortunate yet all too common engineering solution used to manage rivers in the mid to late 20th century. Despite the flood mitigation measures, Fish Hoek experienced severe floods in 1992. This prompted the Fish Hoek municipality to look at additional measures to reduce the risk of flooding.

The technical investigations that led to the Silvermine river upgrade were initiated as part of a road planning exercise in the area. The Fish Hoek northern bypass was planned in 1969 as a freeway system linking Kommetjie and Fish Hoek, and included the canalisation of the lower Silvermine river. A large area of land was frozen from development to accommodate the proposed corridor. In 1988, engineering consultants Arcus Gibb were appointed to plan the Fish Hoek northern bypass, as well as to determine flood control measures for the affected reaches of the Silvermine river.

Meanwhile, the Silvermine River Society was formed in 1982 to help address some of the challenges facing the river. Ideas about rehabilitating the space into a wetland, which would also serve as a stormwater flood management facility, were investigated. The Silvermine River Society submitted a formal proposal to the then South Peninsula municipality for a wetland in the floodplain upstream from the Main Road bridge. The proposal was accepted in principle, but was not allocated any project status or funding.



The project was a big undertaking requiring the input of a multidisciplinary team. Photo: Steve Perrott.

Then, in 1998, the Fish Hoek Valley structure plan was developed, and the consultants Hill Kaplan Scott and Urban Dynamics produced the environmental baseline report, which included the proposal for a wetland as a stormwater detention facility. The municipality was still open to considering a wetland park, and not just a stormwater management facility, perhaps partly due to the growing appreciation of the Silvermine river as a unique example of an urban river.

Before the project commenced, extensive public meetings and consultations were held with local landowners and residents' associations, the Wildlife and Environment Society of South Africa, Friends of Silvermine Nature Area, the South Peninsula administration, SANParks and CapeNature. The primary aim of the project was to create sufficient capacity to accommodate the 1:50-year flood event. Other objectives were to create wetlands to enhance ecological functioning and provide recreational amenity for local users.

The project was undertaken in three consecutive phases. Preliminary work commenced in November 1998, starting downstream close to the sea, and moving progressively upstream. Construction on phase 1 started in 2000. The engineering works, which had been subject to extensive impact studies, included redefining the floodplain with gabion structures and earth berms, creating three ponds to attenuate floodwaters, and creating a new river alignment. Excavated material – some 90 000 m^3 – was used to fill and raise areas that were below the 1:50-year floodline, making some land available for development. There was extensive planting of indigenous wetland vegetation, such as reeds *(Phragmites australis)* in the free-water zone, and bulrush *(Typha capensis)* in the wet-bank zone. Walkways, boardwalks, a wooden bridge crossing, benches and information signs were installed, providing an accessible space for people to enjoy. To accommodate visitors, a 60-car gravel parking lot was provided. The 5,5 ha wetland recreational area is now a much-used and appreciated asset, and the area has been transformed into a major growth point in Fish Hoek.



It took a few years for the newly created habitat to establish. Photo: Unknown.

The success of the project was partly due to the multidisciplinary team involved throughout. An environmental management team consisting of a landscape architect, a freshwater ecologist, a hydrogeologist and a botanist were involved in design and construction. They appointed an environmental site officer, who oversaw the implementation of environmental measures. An environmental management committee, which included members of the local community, the Silvermine River Society, the local authority and CapeNature, was appointed to monitor the project.

After the rehabilitation, the Silvermine River Society reformed itself as the Riverine Rovers and took charge of community involvement in the lower Silvermine wetlands. Today, the Riverine Rovers have once again amalgamated with the Friends of the Silvermine Nature Area, and continue to play an important part in ensuring the continued conservation and sound management of the area.



Information signboard incorporating wetland design map.

9.3 FUNDING, GOVERNANCE AND PARTNERSHIPS

The Silvermine river upgrade project cost about R8 million. At the time, this was a significant amount of money. Interestingly, at the end of the project, 25% of the construction costs were allocated to landscaping, ensuring an aesthetically pleasing environment.

A number of stakeholders are involved in maintaining the river and wetlands, including Table Mountain National Park, the City, Clovelly Country Club and various non-governmental groups such as the Friends of the Silvermine Nature Area and Riverine Rovers. In recognition of its ecological value, the area is the subject of a biodiversity agreement between the City and CapeNature. (For more, see "Biodiversity agreement sites" below.)

The involvement of several City departments in the management of the area sometimes creates confusion as to the assignment of responsibilities. The appointment of a conservation officer from Recreation and Parks has helped in this regard. The conservation officer meets regularly with the Riverine Rovers regarding management of the wetland, which has improved the relationship with the City. Recreation and Parks is also responsible for updating and overseeing the environmental management plan, which is a requirement of the biodiversity agreement. The annual horticultural maintenance budget for the area is about R120 000, which is used for minor repairs, reed cutting and vegetation management.

A few years ago, the City appointed a gardener as a green warden to pick up litter, keep vegetation from overgrowing onto the paths, and remove alien vegetation. When the City's budget for the appointment was discontinued, the Riverine Rovers continued to employ the green warden. He works in the wetlands once a week, and his efforts contribute significantly to the appeal of the area.

The Riverine Rovers raise funds primarily through the annual Source to Sea walk, which has been going since 2011. To date, some R60 000 has been raised. SnapScan boards were also introduced in 2019. In addition, the Fish Hoek and Clovelly neighbourhood watch and the Rowland and Leta Hill Trust have kindly provided donations. Once a term, a community work party draws a group of 20 to 35 local volunteers to assist with clearing litter, and with maintenance tasks that require teamwork, such as replacing broken walkway planks, large-scale pruning to keep the walkways open, and removing invasive water weeds from the ponds. These community activities have generated a considerable amount of positive publicity, and the donations and hours spent by volunteers are a significant investment by ordinary members of the public.

BIODIVERSITY AGREEMENT SITES

Biodiversity stewardship involves entering into agreements with landowners to protect and manage land in biodiversity priority areas. The initiative, which is led by conservation authorities in South Africa, recognises landowners as the custodians of biodiversity on their land. Biodiversity stewardship is based on voluntary commitments from landowners, with four types of agreements available to support conservation and sustainable resource use.

The different types of biodiversity stewardship agreements range from non-binding to long-term commitments. Each successive level of agreement provides more protection for biodiversity and involves more land-use restrictions. Landowners at higher levels of commitment



A bird's-eye-view looking upstream with Clovelley on the right.

receive increased support. In addition, the relative importance of biodiversity is taken into consideration for eligibility at each level. To qualify for the higher levels of agreement, the property must have sufficient biodiversity importance.

The National Environmental Management: Protected Areas Act, No. 57 of 2003, provides the legal framework for the two highest levels of biodiversity stewardship, namely nature reserves and protected environments. These are established by formal declaration by the national minister or provincial member of the executive council. Nature reserves and protected environments that are declared through the biodiversity stewardship programme have the same legal standing as state-owned and managed protected areas, and contribute to South Africa's protected area estate.

Nature reserves are declared on properties of high biodiversity importance and have long-term title deed restrictions. This means that even if the land changes hands, its status as a protected area remains in place. Protected environments, in turn, are slightly more flexible and can be declared across multiple properties. Protected environments can allow for some production on the land, as long as this is integrated with an approved management plan.

Biodiversity agreements are contracts between landowners and the provincial conservation authority, which, in the Western Cape, is CapeNature, and include an agreed management plan. These agreement sites are not considered protected areas, but do contribute to the conservation area estate. Biodiversity partnerships, on the other hand, are informal agreements between the landowner and conservation authority, and do not legally bind either party to any obligations.

The City has 21 nature reserves declared (or in the process of being declared) under the Protected Areas Act, as well as 19 biodiversity agreement sites (16 signed and three in process). In addition, there are 24 biodiversity stewardship agreements on private land, including 12 that are in perpetuity.

Courtesy of Andre Rossouw, City Biodiversity Network coordinator

9.4 CHALLENGES

A project of the scale and complexity of the Silvermine river upgrade will always have unique challenges. In the course of the project, there were some conflicts between the engineering and ecological designs and objectives. The ecological needs of the wetland were that it was to be a seasonal wetland, inundated by stormwater runoff and, to some extent, by groundwater in winter only. The engineering needs, however, identified that excavation below the water table would be necessary to provide the required capacity to manage floodwater. In the end, the excavations exposed the water table, and the system is now permanently wet, fundamentally changing the type of habitat for plants and animals. Other design compromises were also required to allow for the engineering objectives to be met.

Today, one of the biggest challenges is pollution of the wetland and river from sewage spills upstream, usually emanating from the Valyland sewage pump station. Sewage spills have a negative impact on the ecology of the wetland. After a particularly long spill, the evening sound of frog calls stopped, promoting fears that

the sewage had killed off the amphibian population. Fortunately, a few days later, the frogs returned with their distinctive clicks and croaks. Despite the periodic inflow of sewage, the Silvermine river and catchment remains one of the least-affected catchments in Cape Town. Water quality samples regularly meet the intermediate-contact recreational guideline.

Over the past decade, sedimentation has built up in parts of the wetland. Together with nutrients from the sewage spills, this has encouraged the growth of reeds. Ongoing maintenance is required to remove the reeds and the silt, yet this does not happen often enough to keep up with the proliferation of vegetation and sedimentation build-up. Unfortunately, this lack of maintenance has perhaps reduced the biodiversity of the wetlands and negated some of the original rehabilitation project benefits.

Vandalism and theft have fortunately been minimal, thanks to the frequent use of the space and the presence of a neighbourhood watch. The abutting housing development has visually permeable fencing, which perhaps also contributes to the safety of the area. However, vagrants do sometimes sleep in the wetland and under the Main Road bridge, leaving behind litter and other waste. The resultant water pollution is a potential health hazard, especially in summer, when children play in the estuary water. Sadly, while vagrants are regularly relocated from the wetlands, the number living under the bridges has increased. It is suspected that the otter population that normally used the estuary as a safe movement corridor between day dens in the wetlands and hunting grounds in Fish Hoek Bay have been frightened away.

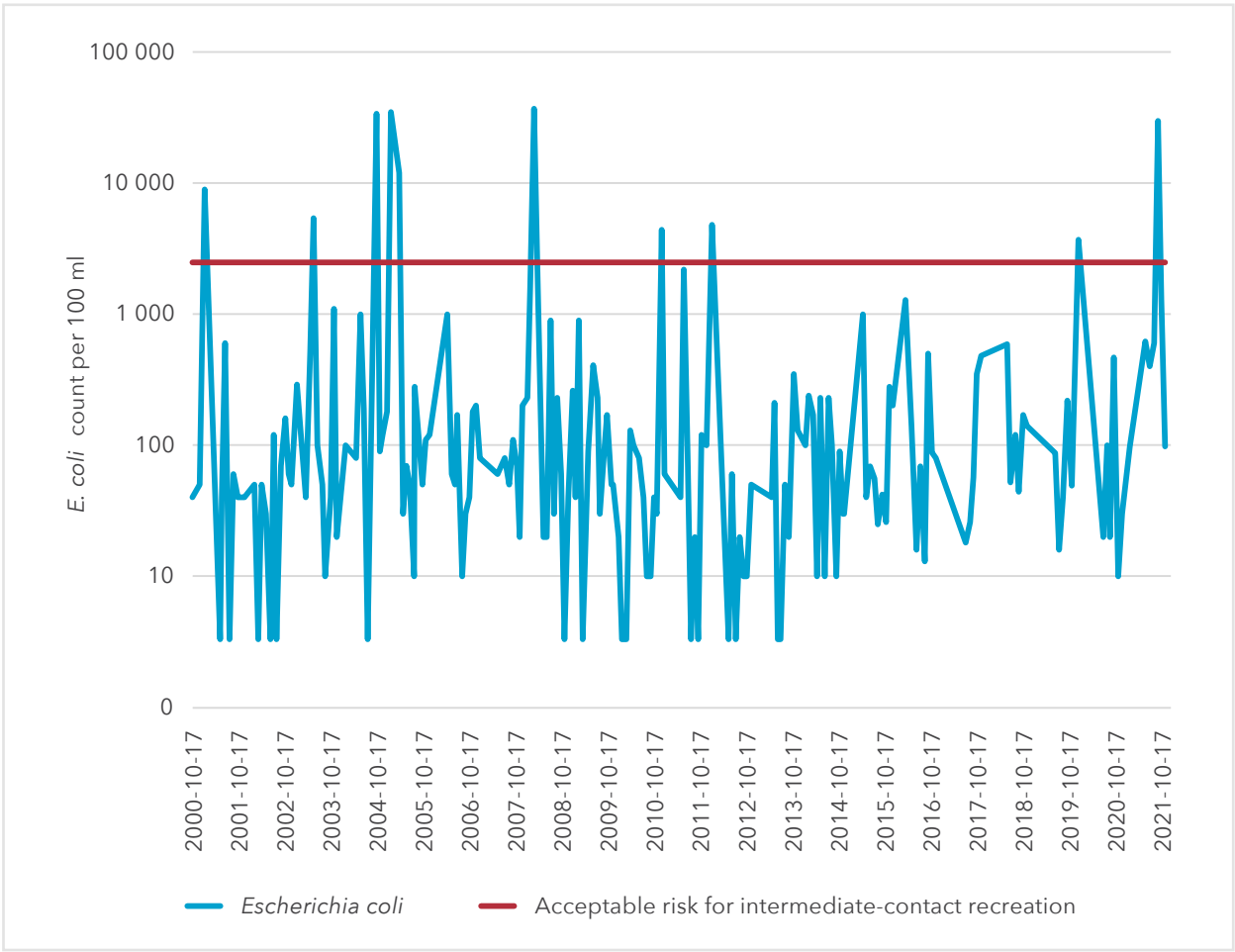


Figure 34: Water quality sample results at Winkle Road.



The tannin stained waters of the Silvermine river enter the sea at Fish Hoek beach.

9.5 OUTCOMES AND LESSONS

The primary objective of the project was to develop a stormwater management facility that would also contribute to the ecological, aesthetic and recreational value of the area. The wetlands certainly perform a flood management function and, therefore, have achieved the primary project objective. Moreover, even with some of the ecological trade-offs in favour of engineering requirements, the wetlands do provide a significantly improved habitat. A few years after the project, a habitat integrity assessment showed that the habitat had improved by 8%. The wetland is now home to a broad amphibian population, including the arum lily frog *(Hyperolius horstockii)*, the Cape river frog *(Amietia fuscigula)*, the clicking stream frog (Strongylopus grayii) and the endangered western leopard toad *(Sclerophrys pantherina)*. There are also around 50 bird species and various small mammal species, including the Cape clawless otter (see "Cape (African) clawless otter" on page 150), porcupine *(Hystrix africaeaustralis)*, Cape grysbok *(Raphicerus melanotis)* and water mongoose *(Atilax paludinosus)*. Understandably, the wetlands have been designated as a CapeNature–City biodiversity management agreement area, reinforcing the conservation status of the wetlands.

In addition, the wetlands provide a water filtration system, a connection to the floodplain and groundwater, and an attractive place for residents and visitors to enjoy. The area is used for activities such as jogging, walking and birdwatching by people from across Cape Town. The Cape Bird Club hosts visits and does weekly recordings of bird sightings, schools use the wetlands as an outdoor classroom, and the Girl Guides have regular clean-up projects. An increasing interest in and appreciation for the wetlands have also seen the area develop into an eco-art route, with a local art studio creating mosaics of local wildlife, which are placed along the walkways. The multifunctionality of the space makes for a very liveable urban waterway.



The gabion weirs create a large pool of water which attracts many amphibians, fish and birds.



A stepping stone pathway through the reeds allows one to cross the wetland.

The diverse needs that arose during the design phase highlight the need for having a common vision, setting clear objectives, managing expectations, and making trade-off decisions at the design stage. Greater emphasis on integrating the ecological possibilities with the engineering design could have addressed some of the less successful ecological aspects of the wetland. Although this might have had cost implications, such options should be identified and quantified rather than rejected upfront.

The improvements associated with rehabilitation paved the way for the establishment of new housing complexes on vacant land on the southern side of the river, which formerly would not have been approved due to flood risk. A number of complexes have since been built, and all were designed to take advantage of the views of the wetland. Unsurprisingly also, local estate agents use the wetlands as a selling point when marketing property, and the wetlands have likely increased the desirability of property nearby too. In fact, a 2004 study concluded that the rehabilitation project provided 4,5 times more benefit than cost when taking into account the property premiums. The study also found that if 'hard', engineered flood attenuation measures such as canalisation were implemented without landscaping and ecological restoration, the benefits would have been less. This highlights the importance of designing rehabilitation projects to achieve as much benefit as possible, rather than focusing on a single objective only. Even if it means spending a bit more upfront, this initial investment could unlock significant future dividends.

The lower Silvermine river flood alleviation scheme won the 2003 South African Institute of Civil Engineers annual excellence award for the Western Cape, and was a finalist in the natural resource category of the 2003 Green Trust awards. The fact that the project received attention from two such diverse organisations illustrates the change in focus and method of river engineering interventions over time, with 'soft', ecologically friendly treatments becoming far more prevalent.



A bird's-eye-view looking downstream over the Silvermine wetlands, with the boardwalk in the foreground and False Bay in the distance.



The area has a rich history which is depicted in various sign boards.



A local artist created colourful mosaics of the commonly found creatures. Photos: Andrew McDonald.

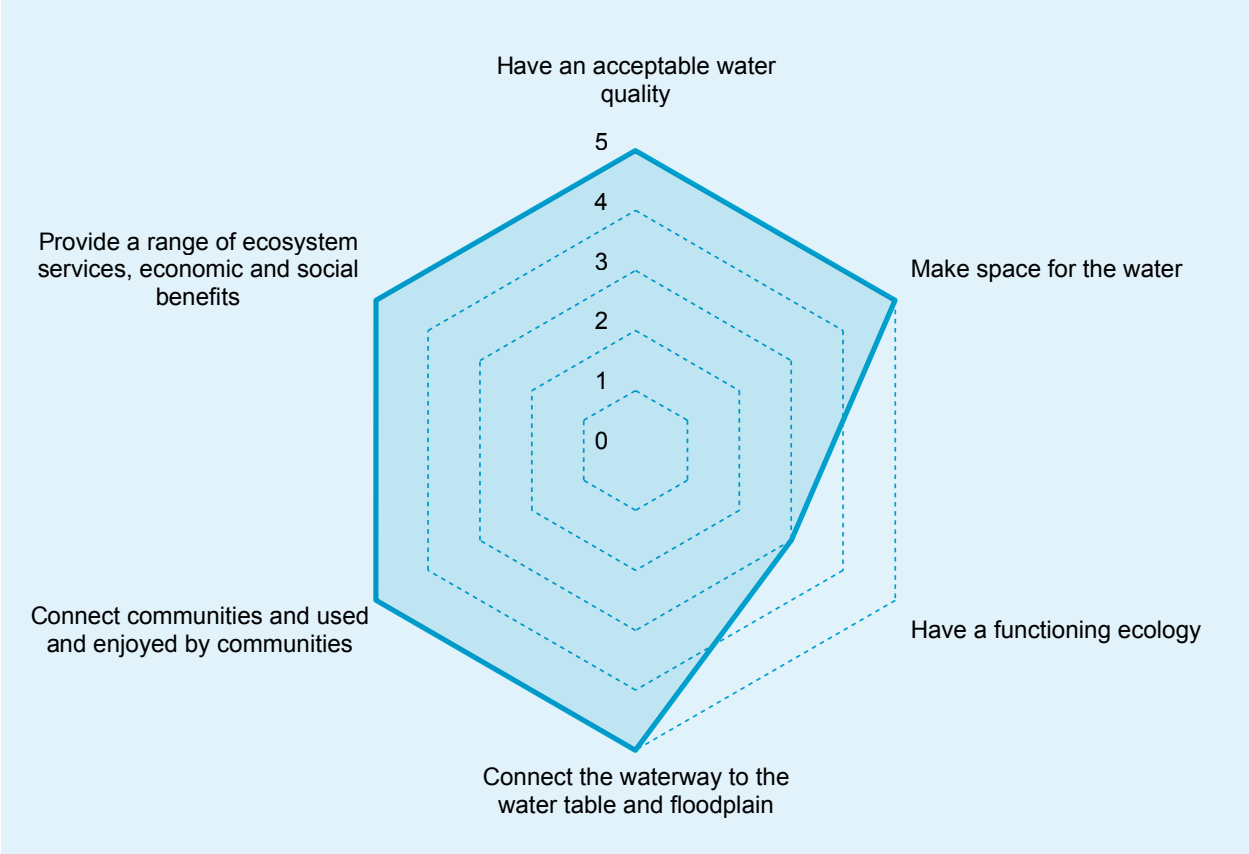


Figure 35: *Elements of liveability for the Silvermine wetland (2021).*



The community of Clovelly, adjacent to the wetland, use the space regularly.

KEY LESSONS

- Well-managed open spaces, and especially those with water, can add value to properties and make neighbourhoods more attractive and liveable. Poorly maintained open spaces have the opposite effect.
- Strategic projects, initiated for whatever reason, need to ensure that water is a central design feature and must embrace the principles of water-sensitive design, collaborative planning, sustainable drainage and green infrastructure.
- Successful waterway rehabilitation projects have a range of objectives and anticipated benefits. The multipurpose use of waterways provides better social, ecological and economic dividends, while projects with a single use or benefit are less likely to provide a good return on investment.
- Partnerships between civil society, non-governmental organisations and the public sector are important to get projects started and to ensure their sustainable management. Such partnerships can be informal and rely on good relationships, regular communication and teamwork. More formalised partnerships can be overly complex and are not always the answer to ensure collaboration. However, in some instances, formal partnerships are necessary and can also assist with funding allocation. Whether formal or informal, any partnership takes time and energy, and often relies on a few champions on all sides to sustain it.
- All waterway rehabilitation projects cost money both to implement and maintain. Common funding sources include donations from local residents, businesses and other donors. Some projects also raise funds through SnapScan, partnering with the municipality, or generating revenue from recycling.
- Safety is paramount for people to want to use a waterway. A well-maintained space – little or no litter, demarcated pathways, mown grass, trimmed trees and clear sight lines – is perceived to be safer. Visually permeable fencing and properties overlooking the waterway also enhance passive surveillance, leading to improved safety. And as the space attracts more people as a result, this assists with further safety.
- Post-project maintenance is critical for the sustained success of any waterway rehabilitation project. If projects are not properly maintained and become overgrown and unsightly, this affects how people connect with the space. Post-project maintenance must be considered at the project planning phase already and must look for opportunities to involve the community, for example using Friends groups to assist with some maintenance.

CAPE (AFRICAN) CLAWLESS OTTER

The shy Cape (African) clawless otter (*Aonyx capensis)* is Africa's largest otter and keeps to areas of permanent fresh water and coastal shorelines that offer them adequate cover and sufficient food. Their diet includes crabs, fish, frogs, molluscs, insects and even small mammals and birds. Their defecation sites normally contain crab-shell fragments, which can be a good indication of their presence in an area. The Cape clawless otter is considered near-threatened because of their close association with aquatic environments, which are unfortunately subject to significant degradation and pollution. This habitat degradation is caused by industrial effluent pollution, insecticides, herbicides, sewage spills, alien and invasive plant invasion of waterways and associated riparian areas, as well as the development and transformation of riverine and coastal areas. The Cape clawless otter shares a need for resources such as water, land and fish with the residents of Cape Town, which makes it critical for us to protect our rivers, wetlands and their surrounding vegetated buffers from further degradation to keep these endearing creatures as neighbours.

Courtesy of Suretha Dorse, City aquatic ecologist

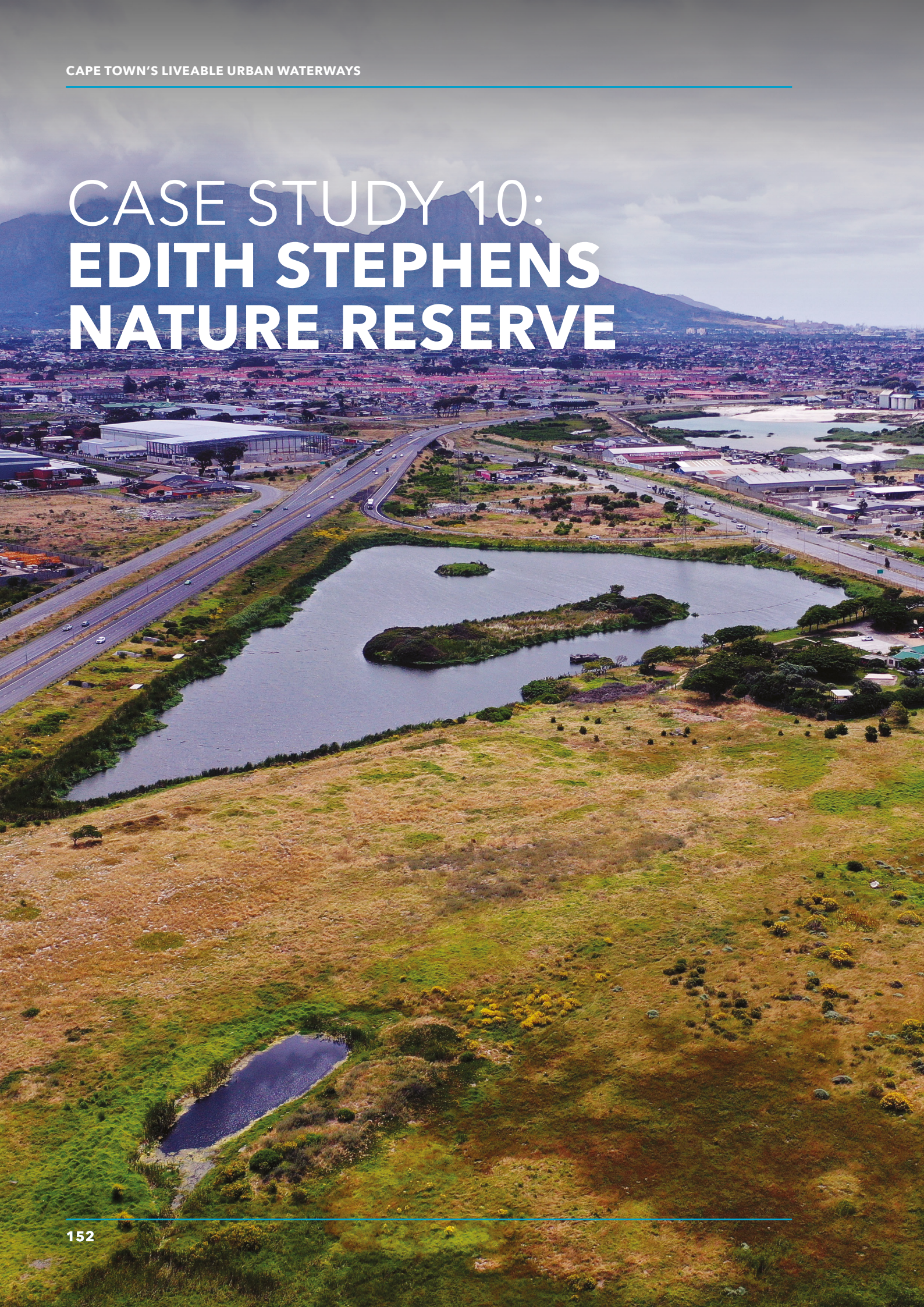


Photo: Shutterstock.



A network of paths, boardwalks and bridges crossing the space are well used by visitors. Photo: Andrew McDonald.

CASE STUDY 10: **EDITH STEPHENS NATURE RESERVE**



10.1 INTRODUCTION

The Edith Stephens Nature Reserve is situated in the suburb of Philippi, north of Jakes Gerwel Drive. The site is located in the Zeekoe catchment, which is drained by the Big and Little Lotus rivers. The Big Lotus river is, in fact, an artificially constructed canal system. In its original form, it would have been a string of seasonal wetlands. The canal was constructed in the late 1940s to receive stormwater runoff from the airport, Nyanga and Gugulethu. Unusually, the route of the canal runs along the catchment watershed (the high-lying land), rather than the valley, as this was where the available land was.

The nature reserve consists of a large seasonal wetland surrounded by endangered Cape Flats sand fynbos and Cape Flats dune strandveld. This type of ecosystem is locally endemic. At one time, it would have been extensive on the Cape Flats, but today, it has mostly been destroyed by development. There is also a stormwater detention pond, which was built in 1987 to mitigate flooding. The pond is fed by water from the Big Lotus river.

The large seasonal wetland provides an important habitat for breeding waterfowl such as the Cape shoveler *(Spatula smithii)*, yellow-billed duck *(Anas undulata)* and African snipe *(Gallinago nigripennis)*. Some 95 bird species have been recorded, five of which breed on the islands in the detention pond. In addition to the birdlife, five amphibians have been recorded, including the easternmost population of the endangered western leopard toad *(Sclerophrys pantherina)*, 12 reptiles and 10 mammals, including the Cape clawless otter *(Aonyx capensis)*. The area is also home to seven Red Data plant species, including the rare Cape quillwort *(Isoetes capensis)*.

Waterway name	Edith Stephens wetland
Catchment name	Lotus
Intervention type	Nature reserve with wetland rehabilitation
Key stakeholders	☑ City of Cape Town ☑ Working for Wetlands ☑ Botanical Society of South Africa ☑ The Table Mountain Fund ☑ Primary Science Programme
Key dates	Construction from 2000. Operations ongoing
Cost	Approximately R5,25 million for construction, and R2 million per annum for operations

10.2 INTERVENTION

In 1955, botanist Edith Stephens donated 3,7 ha of land to the Kirstenbosch Botanical Garden to protect the rare Cape quillwort, which is found nowhere else in the world. Although spared from housing development, the area became infested with invasive alien plants over the years, providing cover for criminals and their unlawful activities.

Then, in 1989, the municipality commissioned Hill Kaplan Scott to undertake an engineering study to investigate linking the detention pond with the adjacent wetlands to create a larger wetland park. Things gained momentum in 1997 with the development of the Wetton-Lansdowne-Philippi corridor spatial plan, which included the idea of a wetland park. The project commenced in 2000, when the municipality allocated

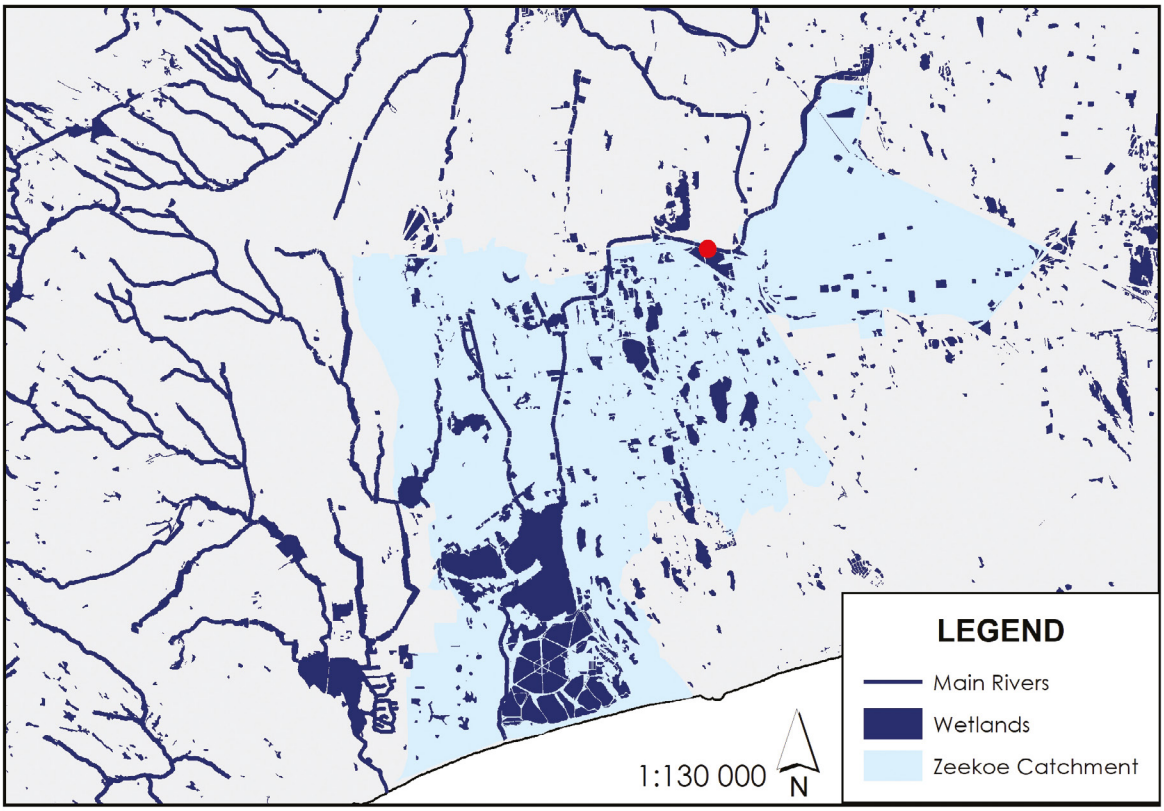


Figure 36: Map of the catchment and location of the Edith Stephens Nature Reserve.



Pollution and litter in the Lotus river has for a long time been an issue.

funds to develop the park with inputs from the community, consultants and local contractors. The City worked in partnership with the Botanical Society of South Africa (BotSoc) and the Table Mountain Fund (TMF), and established a project management team that included representatives of the surrounding communities of Manenberg, The Vlei, Sweet Home, Nyanga, Gugulethu and Philippi. The TMF facilitated the public participation process and visioning exercise, and a landscape architect was appointed to draft the landscape master plan that expressed the community's vision.

Construction started, which included the restoration of parts of the Cape Revival-style homestead to convert it into an environmental education centre, and the removal of tons of rubble. Some of the rubble was reused to construct the earth berm and amphitheatre, creating a landscape feature that provides shelter from the winds, and an elevated platform to enjoy the vistas over the wetlands and beyond. Softer landscaping elements included a bird hide, benches around the pond, and boardwalks through the wetland. Over 400 indigenous trees such as silver oaks *(Brachylaena discolor)*, wild camphor *(Tarchonanthus camphoratus)*, wild olive *(Olea africana)* and bitou bush *(Osteospermum moniliferum)* were planted, as well as a biodiversity garden that showcased some of the sand plain fynbos species found in the area. Over the years, an urban agriculture garden was also added, which the communities and the Council for Scientific and Industrial Research (CSIR) used as part of a study into the benefits of orange sweet potatoes for children's eye health.

The wetland park was named after Edith Stephens in recognition of her generous donation. In 2015, it was proclaimed a nature reserve. Today, the reserve has an environmental education centre, which is well used by school learners and the local community. There is also an amphitheatre, pathways that meander through the site, benches to sit and relax, a picnic area, a medicinal garden, a play area for children, and informative environmental signage.

10.3 FUNDING, GOVERNANCE AND PARTNERSHIPS

The Edith Stephens Nature Reserve is managed by the City's Biodiversity Management Branch. An area manager is supported by six on-site staff, namely a team leader, an environmental education officer and four field rangers. Veld restoration work is undertaken by Biodiversity Management's Invasive Species Unit, who employs people from the local community through the Expanded Public Works Programme (EPWP). Other departments also contribute, including the Catchment, Stormwater and River Management Branch, who helps maintain the river and pond.

When the park was first expanded, the municipality set aside some R750 000 to purchase land, and a further R4,5 million over five years to implement the landscape master plan. Today, the operational costs amount to some R2 million per annum. This budget pays for maintenance, equipment, tools, staff salaries, and various outreach and education activities. Security and restoration costs are covered from a separate budget held centrally.

The success of the reserve is largely thanks to the many partnerships that have been formed over the years. One particularly significant partnership is with the Western Cape Primary Science Programme, which trains teachers to use environmental information in teaching science and maths to learners. The programme has been based at Edith Stephens Nature Reserve for many years, using the space in their teaching. Drawing on the teachers' and learners' interaction with the indigenous plants, birds, animals and water in the park, the programme has even published an educational book aimed at grades 4 to 9. The activities in the book include innovative engagement with concepts such as the water cycle, pollution, conservation, water issues and social issues of the Cape Flats.



The large stormwater pond provides a permanent waterbody for aquatic birds.





A bench under a shady tree provides a spot to relax. Photo: Andrew McDonald.



Informative signage around the site describe some of the plants and animals.

10.4 CHALLENGES

The area surrounding the Edith Stephens Nature Reserve is plagued by a number of socioeconomic challenges. In the face of service delivery issues, high crime and unemployment, community members do not consider natural areas a priority, and these competing environmental and social objectives tend to create tension between authorities and local residents. Vandalism, theft and illegal land occupation are fairly common, and the nature reserve staff deal with these challenges through outreach programmes and by building relationships with the communities.

The poor water quality in the Big Lotus river is another ongoing challenge. Between 2005 and 2010, the elevated nutrients in the water spurred the rapid growth of water hyacinth *(Eichhornia crassipes)* in the pond, which caused a decline in waterbird species diversity. In December 2010, the initial clearing of the water hyacinth was completed, and regular clearing is now required to prevent it from accumulating again.

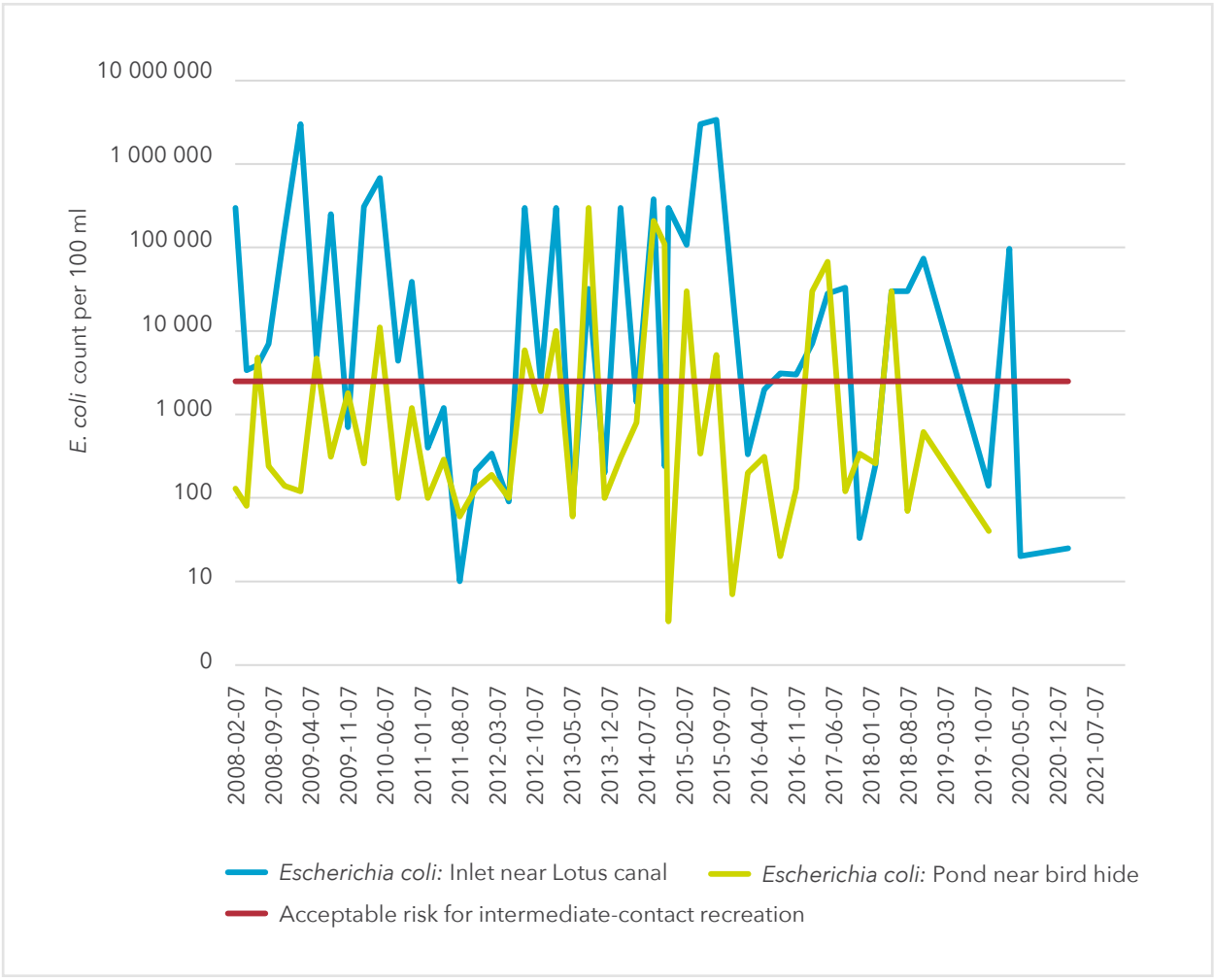


Figure 37: *Water quality samples showing comparison between Lotus river and pond.*

THE ONGOING CHALLENGE OF POLLUTION

One of the biggest challenges facing Cape Town's waterways is pollution from waste. Untreated or partially treated sewage, litter and dumping can have a profound effect on watercourses. Ideally, all liquid sewage waste should be safely treated at a wastewater treatment plant, and the treated effluent be reused for irrigation or discharged back into the environment, while all solid waste should be safely collected, recycled or managed at landfill sites. In practice, however, particularly in developing countries, the management and treatment of human waste is often fraught with problems such as the following:

- The establishment of informal settlements on land considered unsuitable for housing (such as in low-lying flood-prone areas, or in or near seasonally inundated wetlands). This impedes service delivery, which means that residents tend to dispose of their household waste, greywater and sewage directly into the environment.
- Repeated sewer leaks and overflows from sewage infrastructure, largely due to by-law contraventions and, to a lesser extent, factors affecting the condition of sewers.
- Overflows from sewage pump stations, typically as a result of mechanical, electrical or instrumentation failures, foreign objects and load-shedding. Unfortunately, an increasingly common cause of sewage pump station failure is theft and vandalism.
- Inadequately treated wastewater discharged from wastewater treatment plants, which may be caused by equipment failures and capacity constraints.
- Illegal connections in industrial or residential areas, which allow waste that should be discharged into sewers, to pass into stormwater systems instead.
- Swimming pool backwash discharged into streets or the stormwater system.
- Littering, illegal waste dumping and poor use of the City's refuse management services. As a result, waste accumulates along roads and open spaces, from where plastics and organic waste can wash into the stormwater system.

Extracted from the City's 2019 Inland Water Quality Report

https://resource.capetown.gov.za/documentcentre/Documents/City%20research%20reports%20and%20review/CT_inland_water_quality_report_summary.pdf



Water birds regularly use the platforms to roost and nest. Photo: Andrew McDonald.

10.5 OUTCOMES AND LESSONS

The Edith Stephens Nature Reserve provides the local communities with much-needed green space in an intensely built-up and urbanised area. The reserve is considered a safe space for people to meet and is used by the broader public for walking, birdwatching, picnicking and even weddings. Reserve users are diverse, including non-governmental organisations, churches and educational groups. The reserve has even been a venue for gang peace talks.

Reserve staff undertake many community outreach and environmental programmes, such as teaching horticultural skills and environmental awareness. Several schools work closely with the reserve and have established gardens on their own school grounds as a result.

The pond in the reserve serves an important flood alleviation function, and the seasonal wetland provides a key habitat and breeding ground for a number of species, including the endangered western leopard toad. The reserve is a considerable asset to Cape Town and constitutes an important link in the City's Biodiversity Network, which aims to ensure that all conservation-worthy land parcels are protected.

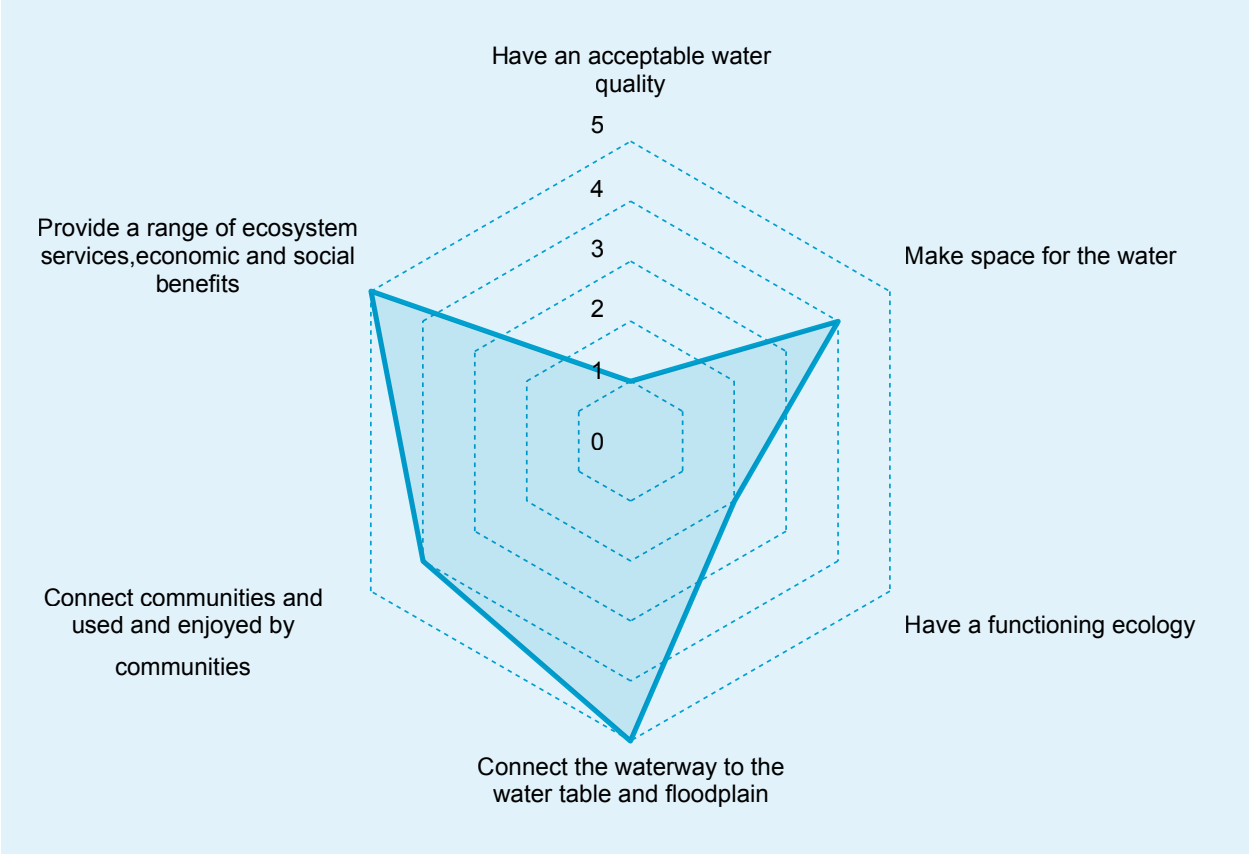


Figure 38: *Elements of liveability for the Edith Stephens Nature Reserve (2021).*



Benches provide a place to take in the view across the pond.



A children's play area is well used by the younger visitors.

KEY LESSONS

- ☑ The importance of community buy-in, support and involvement in management cannot be overstated.
- ☑ Partnerships between civil society, non-governmental organisations and the public sector are important to get projects started and to ensure their sustainable management. Such partnerships can be informal and rely on good relationships, regular communication and teamwork. More formalised partnerships can be overly complex and are not always the answer to ensure collaboration. However, in some instances, formal partnerships are necessary and can also assist with funding allocation. Whether formal or informal, any partnership takes time and energy, and often relies on a few champions on all sides to sustain it.
- ☑ Pollution and poor water quality are major threats to the liveability of our waterways. Everyone has a shared responsibility to improve water quality, including residents, businesses and the authorities.



The original swimming pool has been left to rewild into a pond.

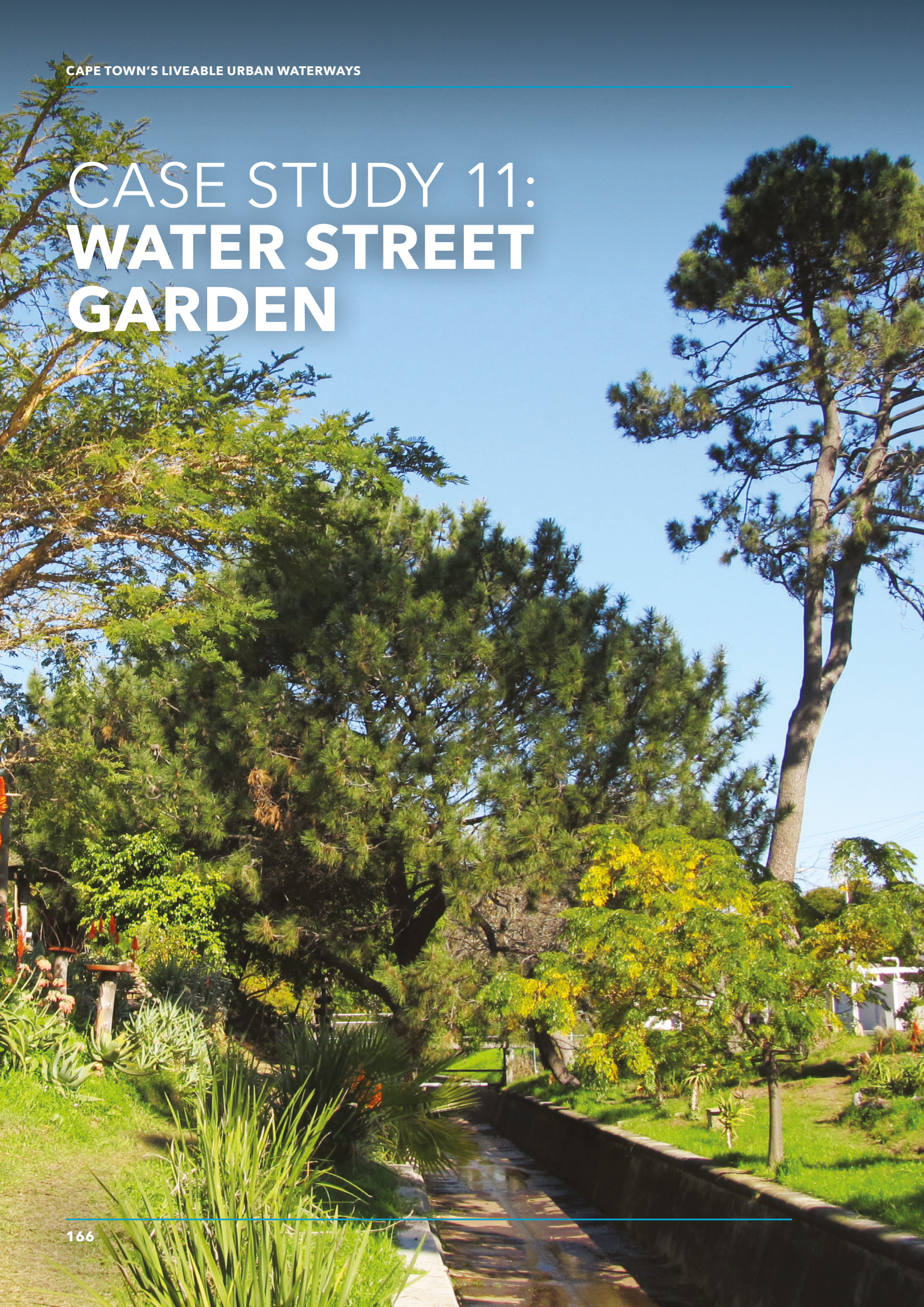


Colourful murals add a nice touch to the buildings.



Indigenous plants add a touch of colour when in bloom.

CASE STUDY 11: **WATER STREET GARDEN**



11.1 INTRODUCTION

The Water Street garden is situated on the banks of the Black river canal as it flows through the neighbourhood of Lynfrae in Claremont. The Black river has two sources, namely the headwaters rising in the Arderne Gardens, and the Stellenberg stream, most of which is now buried in pipes. The waterway daylights near the Villagers Rugby Club and continues along Water Street in Lynfrae, through Keurboom Park and past Rondebosch Boys' High School. It then joins the Kromboom canal, where it flows past Rondebosch golf course and later links up with the Vygekraal and Elsieskraal rivers. From here, the river is a wide, meandering channel making its way to the sea at Paarden Eiland. The Black river was first canalised between 1949 and 1951, and was widened again in 1970 during a period that also saw the covering over of a considerable portion of the river and its wetlands. The Black river canal is typical of the many canals that form part of the larger Salt catchment.

Interestingly, the river was not always called the Black river. The early Dutch settlers referred to it as the Kromboom river. In more recent years, however, it has been called the Zwart (later Black) river, while the Kromboom river is now the small tributary of the Black river found further to the east, rising at Kenilworth racecourse.

Waterway name	Black river
Catchment name	Salt
Intervention type	Waterway garden
Key stakeholders	☑ Local residents
Key dates	Commenced in 2015. Ongoing
Cost	Time and donations by public

11.2 INTERVENTION

The Water Street garden project started in 2015. Prior to this, the space next to the canal was underused, overgrown and not somewhere people would want to spend their time. Then, a local resident decided to clean up the space, and a small garden was planted. His vision was to create an area of landscaped garden to be enjoyed by the surrounding community. The garden began on the east side of the canal and extends for about 180 m from the pedestrian bridge in a northerly direction towards Keurboom Park. At first, the westerly side of the canal was left untouched for a few years, although rubble was removed and the grass cut by the City's maintenance teams. Several residents remarked on the progress of the eastern part of the garden, and as a result, it was decided to extend the garden to the western side as well.

The walkways alongside the canal were extended as the garden grew. The garden now has two walkways – one through the garden itself, and another along the entire length of the canal. Two ponds provide an attractive water feature and a habitat for plants and animals. Soft landscaping has included a variety of trees, bushes, grasses and shrubs such as lilies, aloes and proteas. There is also a small herb garden, a succulent garden, and a hedge of *Plectranthus,* and plans are afoot to plant some reeds. Visitors to the garden can sit in the shade on one of the benches and enjoy the view across to the mountain.

In the future, residents intend putting a small weir into the canal to create a much-needed pool for use by waterbirds. Every year, a new batch of Egyptian geese (*Alopochen aegyptiaca*) hatch, yet very few of the goslings survive. A second future project will be to upgrade the pedestrian bridge, creating an art piece to further enhance the area and add quality to the canal.

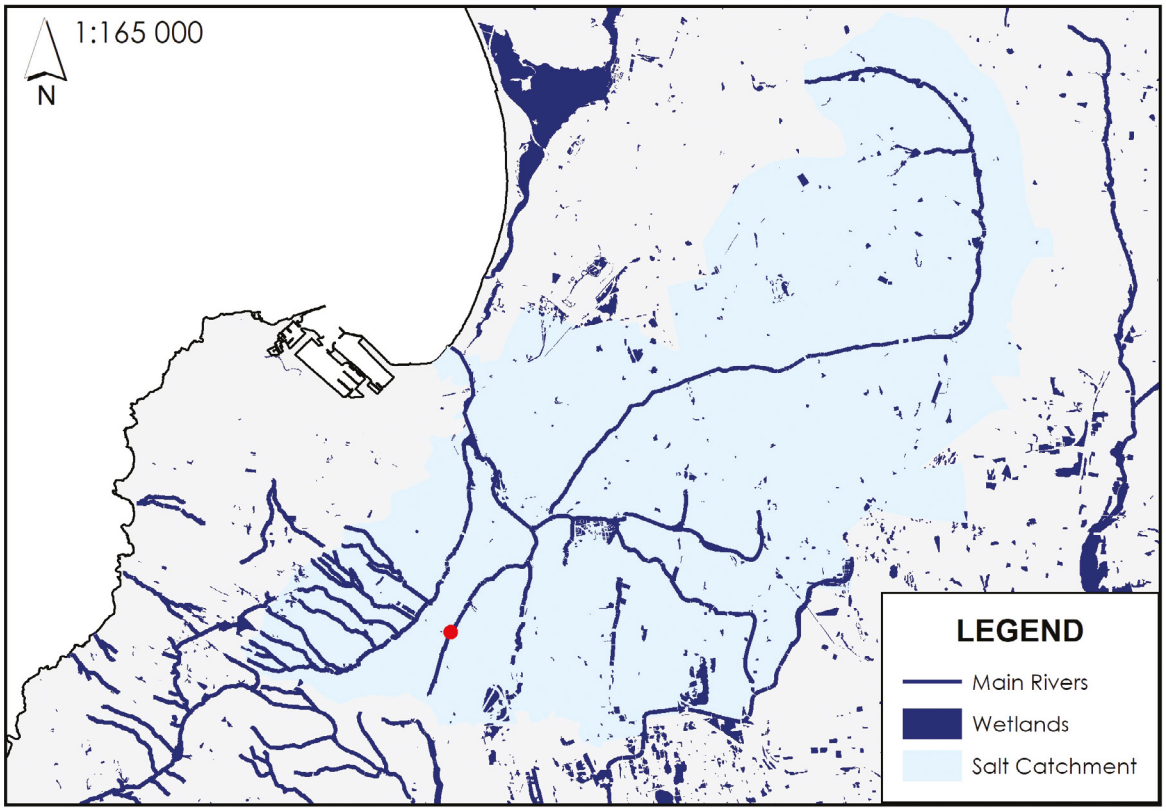


Figure 39: *Map of the catchment and location of the Water Street garden.*



The garden looks wonderful with its colourful flowers.

11.3 FUNDING, GOVERNANCE AND PARTNERSHIPS

The garden is maintained by the local residents. Although the space is designated as a public open space, the City only maintains up to the edge of the garden, keeping the grass mown. Funding for the garden is obtained entirely through volunteering as well as financial and plant donations.



Figure 40: *A 1905 map of Claremont shows the waterway as the Kromboom river.*

WATERWAY ECOSTATUS

The determination of the ecological condition or 'health' of a watercourse involves assessment of a number of biophysical metrics that drive and characterise these ecosystems. Underpinning this is the driver–response principle, which assumes that there is a physical 'template' that will ultimately determine the fauna and flora communities that may be found in a given aquatic ecosystem. Therefore, the measurement of the ecostatus, or present ecological state (PES), of a river will involve an assessment of the hydrology, geomorphology and water quality of the river reach. These factors influence the quality and condition of the instream and riparian habitat, and determine whether the aquatic environment is suitable for inhabitation by freshwater fauna and flora.

Freshwater ecologists throughout South Africa use these assessments to undertake long-term monitoring, make reserve determinations, apply for water-use licences, and plan for river rehabilitation. The three driver components (hydrology, geomorphology and water quality) are assessed along with the four response components (instream habitat, riparian habitat, aquatic invertebrates, fish), and each is scored. After assessment of each component, a river reach can then be assigned an overall ecostatus based on integration of the individual driver and response metrics. The A-to-F scale is a continuum with notional boundaries, so assessment results close to the boundaries may be denoted as B/C, C/D, etc.

Ecostatus category	Ecostatus description	Targets used for water quality assessments
A	Natural/no change	Ideal
B	Largely natural, with few modifications/small change in natural habitats and biota, but the ecosystem functions are essentially unchanged	Ideal
C	Moderately modified/moderate change	Acceptable
D	Largely modified/large change	Tolerable
E	Seriously modified/serious change	Unacceptable
F	Critically modified/extreme change. Ecosystem has been modified completely, with an almost complete loss of natural habitat and biota. Changes may be irreversible.	Unacceptable

Since many urban waterways have been significantly altered from their natural state due to catchment hardening, habitat degradation (e.g. wetland infilling, river canalisation, loss of connectivity), urban runoff, and discharges of various types of effluent, the biota inhabiting aquatic ecosystems will likely reflect these changes. Consequently, the biotic community in many urban waterways tend to be dominated by a few hardy, pollution-tolerant, generalist species, while sensitive and endemic species have long become locally or regionally extinct. Such systems would likely fall into categories D, E and F. The Black river canal as it flows through Claremont and Rondebosch is typical of many of the canals in the Salt catchment, most of which have an ecostatus of D to F. Unsurprisingly, the Upper Liesbeek, which in some places resembles a near-natural river, has a significantly better ecostatus compared to its lower, canalised sections.

Waterway name	Waterway type	Ecostatus category
Black	Canal	F
Elsieskraal	Canal	F
Kromboom	Canal	D
Vygekraal	Canal	F
Lower Liesbeek	Canal	D
Middle Liesbeek	Canal	C
Upper Liesbeek	Foothill river	A

Importantly, the National Water Act regards categories E and F, which indicate serious to extreme modification, as undesirable (unacceptable). Therefore, river systems falling into these two categories should, where feasible, be managed and rehabilitated towards a D or higher.

Courtesy of Candice Bouland, City aquatic ecologist



The Black river canal as it flows through Rondebosch, typical of many canals with public open space on both sides. Photo: Andrew McDonald.

11.4 CHALLENGES

As with most community-led initiatives, funding for the Water Street garden is a challenge. The garden relies entirely on donations and volunteers. Most of the plants and equipment used in the garden have been donated, and all other expenses are covered by residents. This means that the long-term viability of the garden is not guaranteed. The area has had some issues with vandalism and theft: material such as iron and steel used in the garden has been stolen numerous times. Unfortunately also, some locals were opposed to the idea of expanding the garden further downstream, but for the most part, residents have been very supportive.

Certain issues are beyond residents' capacity, such as maintaining the canal edge further downstream, managing the large pine trees, attending to pollution, and clearing blocked stormwater outlets. In addition, while the garden has enhanced the side of the canal, it has done nothing to improve the canal itself, which is concrete with steep sides and has little aquatic life. The quality of its water is poor at times. It is hoped that there would be opportunities to restore sections of the canal to a more natural state in the future to complement the space next to the canal.



Despite the wonderful garden on the side, the canal is still a concrete drain, although it is trying hard to rewild itself. Photo: Andrew McDonald.

11.5 OUTCOMES AND LESSONS

The purpose of the project was to create a garden that could be enjoyed by the surrounding community. By all accounts, this has been achieved. The garden is a well-used space, visited by local residents most days and weekends. During the hard Covid-19 lockdown in early 2020, when outdoor activity was limited to a few hours in the morning, the garden proved hugely popular and was discovered by many more of the local residents. It has not only brought the community together, but also created a place of interest and a talking point, and has inspired some residents to improve their own pavement gardens as well. Since the beginning of the Water Street garden, the general Lynfrae pavement area has improved, one example being the newly planted sour-fig garden opposite the Claremont Primary School sports field.

The success of the Water Street garden demonstrates that positive change in a community often requires a passionate and dedicated champion. Another key lesson is the importance of an appropriate funding and operating model, without which the long-term sustainability of the project may be in jeopardy.

The Water Street garden is an excellent example of a community-led approach to waterway improvement. A vision, a significant amount of hard work and some support from local residents have turned a previously underused waterway into a community asset that enhances the neighbourhood and makes a short reach of the Black river canal more liveable.



An apt name for the street alongside the canal.

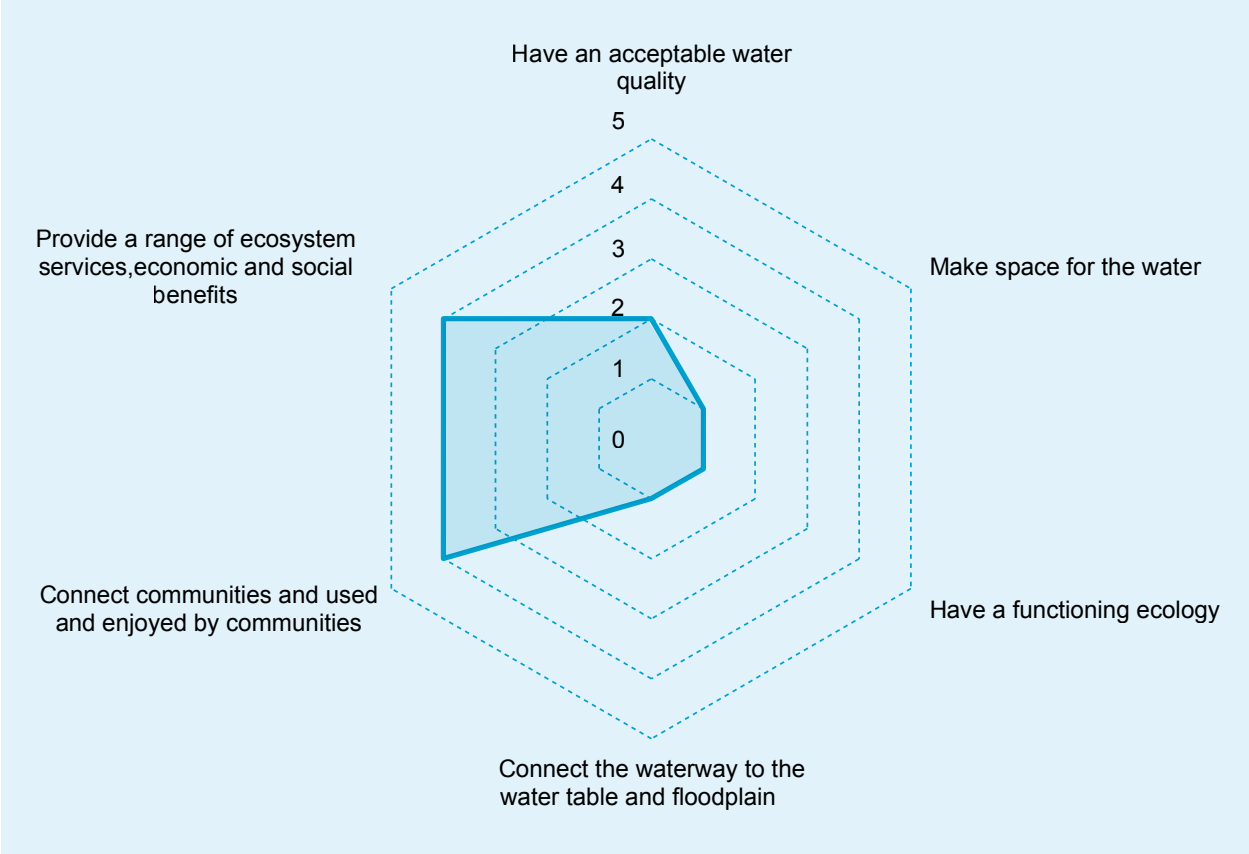


Figure 41: *Elements of liveability for the Water Street garden (2021).*



Even some fairies have moved into the canal-side garden. Photo: Andrew McDonald.



A footpath alongside the canal provides a space for people to walk and run, with potential to continue even further up and down the canal length. Photo: Andrew McDonald.

KEY LESSONS

- ☑ Well-managed open spaces, and especially those with water, can add value to properties and make neighbourhoods more attractive and liveable.
- ☑ The importance of community buy-in, support and ongoing involvement in management cannot be overstated.
- ☑ Rehabilitation projects do not have to be large and complex. Many successful projects started small. Local champions, often from the community, are critical to get these projects off the ground. Learning-by-doing and gaining support through demonstration are further important elements.
- ☑ Post-project maintenance is critical for the sustained success of any waterway rehabilitation project. If projects are not properly maintained and become overgrown and unsightly, it affects how people connect with the space. Post-project maintenance must be considered at the project planning phase already and must also look for opportunities to involve the community, for example using Friends groups to assist with some maintenance.

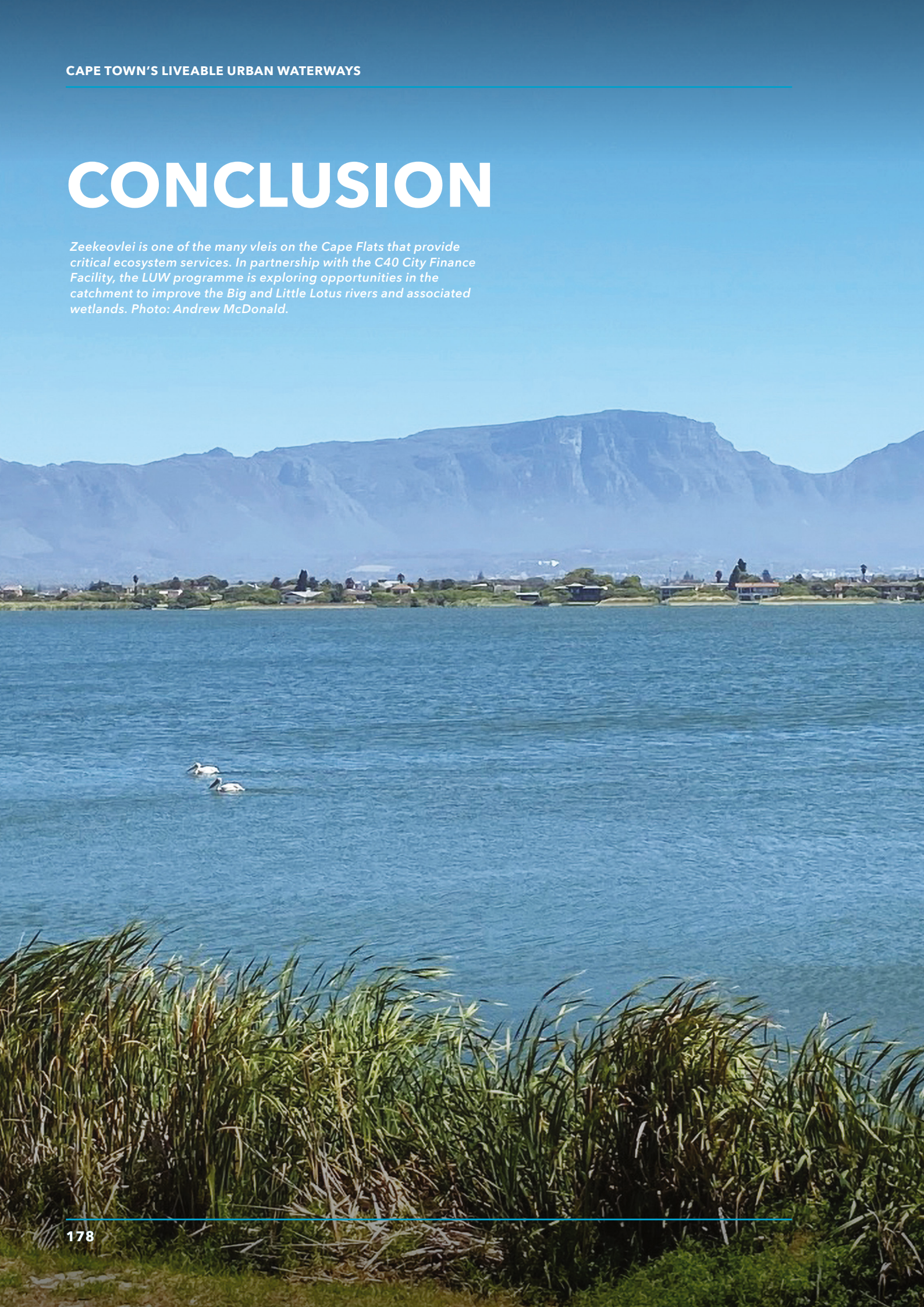


A small pond and well-placed rocks add much-needed habitat.



A fallen tree provides a unique planting space and an eye-catching feature, and a great place for kids to climb. Photo: Andrew McDonald.

CONCLUSION



Zeekeovlei is one of the many vleis on the Cape Flats that provide critical ecosystem services. In partnership with the C40 City Finance Facility, the LUW programme is exploring opportunities in the catchment to improve the Big and Little Lotus rivers and associated wetlands. Photo: Andrew McDonald.

COMMON THEMES AND KEY LESSONS

The 11 case studies in this compendium have showcased a variety of waterways and the excellent work done by many people to rehabilitate and maintain them over the years. Although each case study has unique rehabilitation approaches, interventions and key stakeholders, some common themes and key lessons can still be identified.

The following two lessons are particularly important:

- ☑ Rivers and wetlands are dynamic socioecological systems that operate in complex catchments. Therefore, achieving real, sustained positive change in the waterways requires a systems approach that addresses systemic catchment issues. A rehabilitation project on a single reach of river may provide some localised benefits, but probably will not yield benefits for the whole system. Ideally, projects must be developed in the context of a river corridor plan and a wider catchment plan.
- ☑ In addition to the usual engineering, ecological and recreational objectives, rehabilitation projects should centre on building human, social and institutional capital, securing sustainable funding, and establishing effective collaboration and partnerships between municipal departments and with citizens, businesses and non-profit organisations.



A number of waterway rehabilitation projects are planned, for example the naturalisation of the canal at the Roscommon Road wetlands.

At a more site-specific level, the following lessons are worth remembering:

- ☑ Well-managed open spaces, and especially those with water, can add value to properties and make neighbourhoods more attractive and liveable. Poorly maintained open spaces have the opposite effect.
- ☑ The importance of community buy-in, support and ongoing involvement in management cannot be overstated.
- ☑ Rehabilitation projects do not have to be large and complex. Many successful projects started small. Local champions, often from the community, are critical to get these projects off the ground. Learning-by-doing and gaining support through demonstration are further important elements.
- ☑ Strategic projects, initiated for whatever reason, need to ensure that water is a central design feature and must embrace the principles of water-sensitive design, collaborative planning, sustainable drainage and green infrastructure.
- ☑ Successful waterway rehabilitation projects have a range of objectives and anticipated benefits. The multipurpose use of waterways provides better social, ecological and economic dividends, while projects with a single use or benefit are less likely to provide a good return on investment.
- ☑ Well-considered plans must set out the vision, define management objectives and outline the actions necessary to achieve the vision. This is particularly important when various parties have a role to play or an interest in the waterway. To this end, catchment, river corridor, wetland management and environmental management plans are useful to bring stakeholders together and guide the collaborative management of the area.
- ☑ Partnerships between civil society, non-governmental organisations and the public sector are important to get projects started and to ensure their sustainable management. Such partnerships can be informal and rely on good relationships, regular communication and teamwork. More formalised partnerships can be overly complex and are not always the answer to ensure collaboration. However, in some instances, formal partnerships are necessary and can also assist with funding allocation. Whether formal or informal, any partnership takes time and energy, and often relies on a few champions on all sides to sustain it.
- ☑ All waterway rehabilitation projects cost money both to implement and maintain. Common funding sources include donations from local residents, businesses and other donors. Some projects also raise funds through the use of SnapScan, partnering with the municipality, or generating revenue from recycling.
- ☑ Pollution and poor water quality are major threats to the liveability of our waterways. Everyone has a shared responsibility to improve water quality, including residents, businesses and the authorities.
- ☑ Safety is paramount for people to want to use a waterway. A well-maintained space – little or no litter, demarcated pathways, mown grass, trimmed trees and clear sight lines – is perceived to be safer. Visually permeable fencing and properties overlooking the waterway also enhance passive surveillance, leading to improved safety. And as the space attracts more people as a result, this assists with further safety.
- ☑ Poorly maintained public open spaces often contribute to further crime, grime and decline. An already litter-strewn space attracts larger-scale dumping; overgrown bushes can be a hideout for criminals; eroded and steep river banks are unsafe; broken benches will not be used; dark and deserted paths will not entice people to walk there. And since no one wants to use these spaces, the deterioration continues.
- ☑ Post-project maintenance is critical for the sustained success of any waterway rehabilitation project. If projects are not properly maintained and become overgrown and unsightly, it affects how people connect with the space. Post-project maintenance must be considered at the project planning phase already and must also look for opportunities to involve the community, for example using Friends groups to assist with some maintenance.



A well-maintained pathway and colourful flowers alongside a canalised section of the Liesbeek river in Mowbray – a simple solution to make the space attractive and accessible. Photo: Andrew McDonald.

THE FUTURE

It is well documented that the risks associated with a changing climate as well as impacts on human health, safety and well-being are increasingly linked to poor waterway management. Yet the same waterways, if properly managed, protected and enhanced, can play a pivotal role in mitigating these risks and can catalyse transformative climate adaptation, help connect communities, reduce vulnerability, and improve livelihoods.

Despite the challenges and the apparent lack of sustained investment in Cape Town's waterways over the past few decades, the future is positive. This compendium of case studies has shown what is possible when visionary, committed and passionate people come together to improve their local waterways. Furthermore, the City's Water Strategy clearly sets out the commitment to become a water-sensitive city and manage Cape Town's waterways differently. This is an ambitious yet exciting commitment, and one that will transform the water cycle in Cape Town.

Rehabilitating and better managing all the waterways of Cape Town will require substantial effort and investment. Importantly, it must be a whole-of-society approach: the City cannot do it alone, and there is a considerable amount of community knowledge and energy that must be tapped into. The City has recognised the challenge and is responding to this urgent need with various initiatives, including the LUW programme. Without this effort and investment, the value of our waterways will erode further, generating more and more negative effects and costs for both current and future generations of Capetonians to bear. Can we afford not to act?



The Vygekraal river is to be upgraded under the Liveable Urban Waterway progamme. Photo: ARLA Consulting Landscape Architects



The canalised Sand and Langevlei rivers as they converge in Coniston Park provide a unique opportunity to implement a nature-based solution such as a wetland, that will provide better habitat and improve the water quality. This project is proceeding under the Liveable Urban Waterway programme.

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CONCLUSION

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