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Rooiels River Estuary

Draft Estuarine Management Plan

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Disclaimer

The Estuarine Functional Zone depicted in this estuarine management plan will be subject to change based on new data published from time to time.

EXECUTIVE SUMMARY

The National Environmental Management: Integrated Coastal Management Act (Act 24 of 2008) (ICMA) was developed to facilitate the sustainable use and management of South Africa's coastline and coastal and estuarine resources. The ICMA requires that estuaries within South Africa are managed in a co-ordinated and efficient manner, and in accordance with the 2013 National Estuarine Management Protocol (NEMP), the National Coastal Management Programme (CMP) and the Western Cape CMP, which lay out specific objectives for management of the South African coastline, including estuaries. This document represents the first-generation Estuarine Management Plan (EMP) for the Rooiels River estuary developed under the auspices of the Western Cape Estuarine Management Framework and Implementation Strategy (EMFIS), a strategic project emanating from the provincial CMP, specifically priority area 7.

The purpose of this EMP is to provide the Vision of the future desired state of the Rooiels River estuary and guide the management of human activities in and around the system by setting out strategic objectives, management priorities and detailed management strategies with actions/activities. The co-ordination of the implementation of the EMP vests with the responsible management authority (RMA) as per the 2013 NEMP.

Geographical boundaries

The Rooiels River is a small temporarily closed estuarine system situated approximately 70 km east of Cape Town on the Cape south-west coast within the cool temperate biogeographic region of South Africa. It is located on the eastern side of False Bay, adjacent to the small settlement of Rooiels, in the Overstrand Local Municipality (LM), Overberg District.

Vision and Objectives

The following Vision for the Rooiels River estuary was proposed at a public meeting held in October 2017 in Pringle Bay, and supported at a second meeting held in April 2018:

Tucked between mountain and sea, the Rooiels River estuary is well managed and protected to add value, diversity and beauty to our local and wider community

Strategic objectives, performance indicators and priorities for the Rooiels River estuary are as follows:

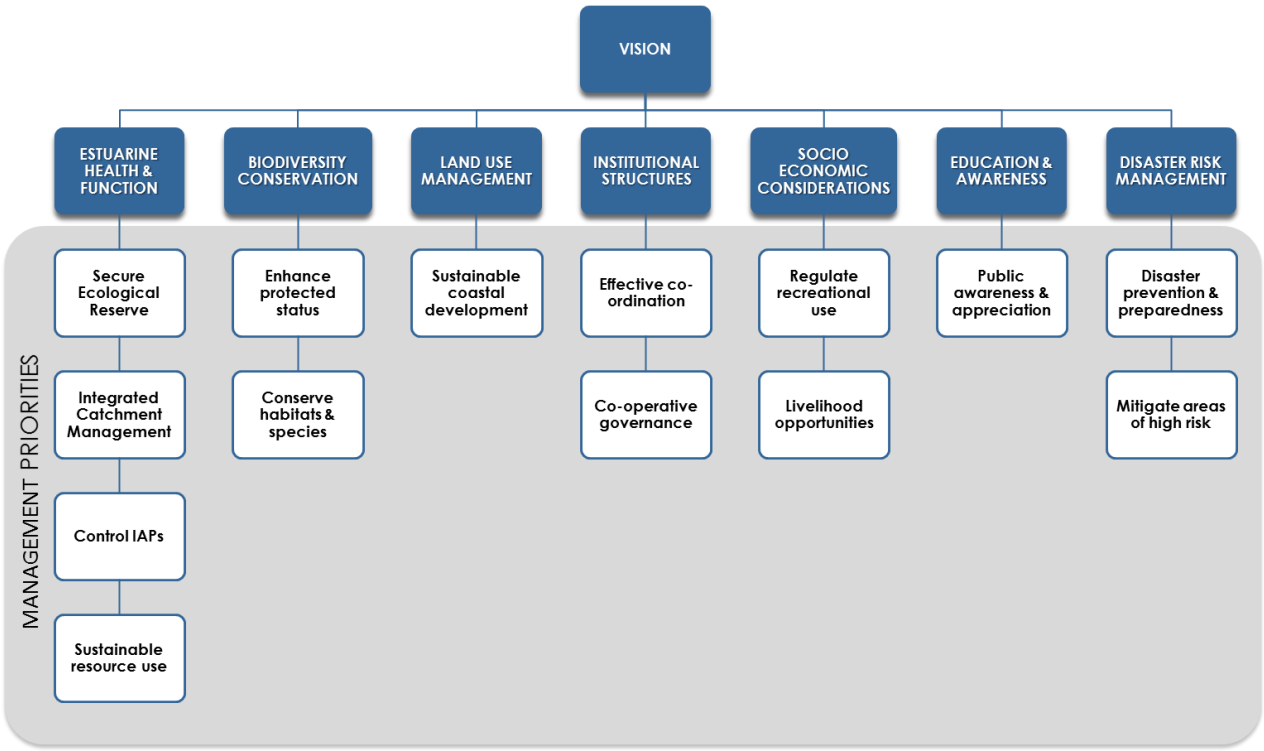
	Sector / Category	Strategic Objective	Performance Indicator(s)	Priority
1	Estuarine Health and Function	The ecological health and natural functioning of the Rooiels is maintained and safeguarded, its living resources are sustainably managed and estuary	• Maintain an A/B ecological health status • Ecological Reserve secured and implemented • Ecological health of the estuary is improved	**HIGH**

	Sector / Category	Strategic Objective	Performance Indicator(s)	Priority
		nursery function protected in a hotter, drier future	• Effective catchment management and maintenance of good water quality • Pollution reduced • Water quality monitoring programme in place • Invasive alien plant infestations managed • Resources utilised within legal and sustainable limits • Illegal activities controlled • Ecological monitoring programme in place	
2	Biodiversity Conservation	The biodiversity of the Rooiels River estuary is conserved	• Protected area expanded • EMP incorporated into the Boland Mountain Complex (BMC) Protected Area Management Plan • Estuarine bylaws or regulations are gazetted • Spatial zonation plan is adopted and enforced • Healthy biological communities	**HIGH**
3	Land-use and Infrastructure Planning and Development	Impacts associated with developments and proposed changes in land-use, including infrastructure and agriculture, are minimised	• EMP included in all relevant planning documents • All development and land use changes surrounding and within the Estuarine Functional Zone (EFZ) comply with environmental legislation and environmental best practice / risk aversion approach • Any additional transformation of estuary margins prevented	**MEDIUM**
4	Institutional and Management Structures	The Rooiels River estuary is managed well through effective co-operative governance	• EMP is seamlessly incorporated into the BMC Protected Area Management Plan • Estuary advisory forum is established and meets regularly • Estuarine bylaws or regulations are gazetted	**HIGH**
5	Socio-Economic Considerations	Socio-economic benefits are enhanced and regulated to ensure sustainable use of the Rooiels River estuary and its resources	• Standard operating procedures in place to manage visitor numbers • Viable alternative livelihood opportunities identified and implemented	**MEDIUM**

	Sector / Category	Strategic Objective	Performance Indicator(s)	Priority
6	Education and Awareness	Members of society are sensitive to and aware of the value and importance of the Rooiels River estuary.	• Increase in number of research projects • Signage erected • Information disseminated • Awareness programme developed and successfully implemented on an on-going basis	**LOW**
7	Disaster Risk Management	Potential risks that could impact the Rooiels River estuary are reduced (inclusive of climate change impacts)	• Rehabilitation of degraded areas • Contingency plans in place • Key infrastructure is well defended	**MEDIUM**

Priority management objectives and associated activities

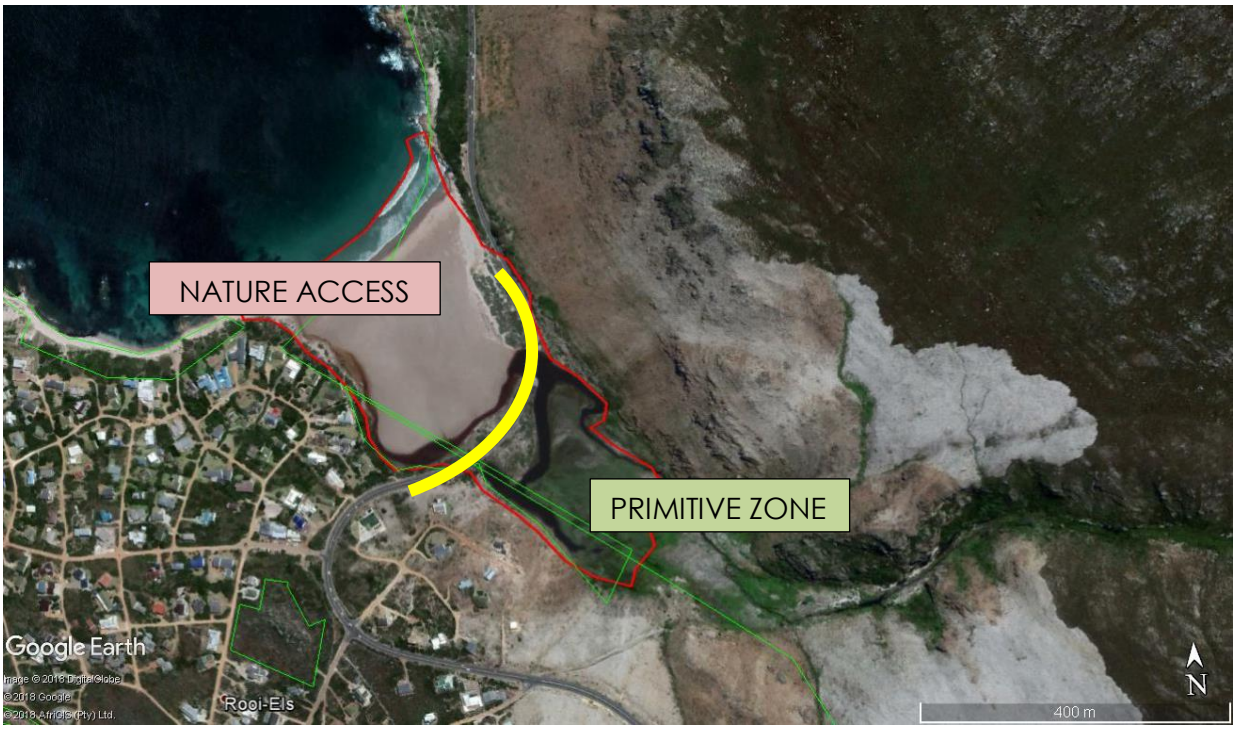
An overview of the management objectives and management priorities is provided diagrammatically.



Proposed zonation of activities

Spatial zonation of activities on an estuary is necessary to avoid user conflict and to guide sustainable utilization of resources without degradation of the estuarine environment. Zonation of the Rooiels River estuary is informed by the zonation of the BMC Protected Area and CapeNature prescriptions apply. Two specific zones proposed, namely the Nature Access Zone and the Primitive Zone. Formal development or construction activities in either zone are to be regulated according to the EIA Regulations and any future controls emanating from the Provincial determination of coastal management lines.

- **Nature Access Zone** – the area below the R44 bridge which is a popular recreational area for residents and visitors. The area will minimise impacts on sensitive environments by actively managing user and visitor impacts and allowing for minimal or more intense biodiversity management
- **Primitive Zone** - the area above the R44 bridge. The area will limit visitor use, numbers and infrastructure to minimise impact in sensitive environments and allowing for minimal or more intense biodiversity management



Proposed spatial zonation of the Rooiels River estuary

Integrated monitoring plan

Monitoring is a crucial aspect of the adaptive estuarine management planning process as the generated data will be used to inform and update management decisions. Three broad categories of monitoring are incorporated into an integrated monitoring plan, namely resource monitoring, compliance monitoring and performance monitoring.

The recommended minimum monitoring requirements to ascertain impacts of current and future pressures on the estuary detailing ecological component, monitoring action, temporal scale as well as spatial scale of monitoring proposed.

By and large, compliance monitoring will be the responsibility of CapeNature, and will be undertaken according to legislation and policies applicable to protected areas and by means of law enforcement and compliance monitoring protocols internal to CapeNature.

The performance monitoring plan is proposed to be used by the RMA, and/or identified implementing agents, to assess the effectiveness with which planned management activities contained in the EMP are being performed and ultimately to gauge progress in achieving the vision and objectives. A monitoring plan relative to the proposed management priorities is included.

Institutional Capacity and Arrangements

This EMP should be regarded as a strategic plan that can guide the detailing of management actions and identification of implementing agents/authorities that are mandated to implement certain actions. While it does not specify the required resources (human and financial) required for effective management of the estuary, it does provide for their prioritisation. Co-management and effective governance have been identified as vital aspects to the efficient and effective management of the Rooiels estuarine system and key role players are identified.

The NEMP identifies CapeNature as the RMA, responsible for the co-ordination of the implementation of the Rooiels River EMP by virtue of the estuary's location within the Kogelberg Nature Reserve and larger BMC, where CapeNature is legally responsible for the management thereof. **It is noted that in the amendments to the NEMP, such responsibilities remain allocated to the applicable conservation authority, in this case CapeNature, in respect to estuaries in protected areas or part of a protected area expansion strategy**. Ultimately the role of the RMA must be designated through formal signed agreement.

Effective implementation of this EMP requires the augmentation of capacity within CapeNature, with the recommended appointment of a regional estuarine management co-ordinator (EMC) within DEA&DP. This individual will play a pivotal co-ordinating role for all other implementing agencies as well as CapeNature departments (e.g. Biodiversity Capabilities). Specific implementation actions identified in this EMP remain the responsibility of mandated government agencies as well as respective departments within the RMA. It is crucial that champions/project leaders/teams are identified who will be responsible for the formulation of detailed project plans and the implementation thereof.

While the establishment of an Estuary Advisory Forum (EAF) for each estuary is no longer a requirement in the 2013 NEMP, the Western Cape Government still support their establishment and recommend that private entities and non-government organisations continue to play a supporting role in the implementation of this EMP. While an individual EAF is not recommended for each estuary, the establishment of a collective platform is proposed. The incorporation the Rooiels, Buffels and Palmiet estuaries into the communication structures of the Kogelberg Biosphere Marine Working Group is an appropriate option. This is lead by CapeNature.

Finally, key government departments and organs of state are identified and a template provided for the conversion of the priority actions into detailed project plans, which must be prepared and adopted into the respective departmental implementation strategies.

In conclusion, the following items/issues are considered critical towards the ultimate achievement of the vision and should be immediately addressed and/or receive greatest effort in respect to human/financial resources:

- Protected area expanded and proposed zoning reflected in the Overberg Municipal Town Planning Scheme;
- The vegetated areas to the west of the road bridge cleared and kept clear of alien invasive vegetation;

- Informal illegal access routes to be closed and rehabilitated; and
- The DEA&DP to consider the appointment of a Regional estuarine management co-ordinator/champion within either DEA&DP or CapeNature.

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ACRONYMS AND ABBREVIATIONS

amsl	Above mean sea level
BGCMA	Breede-Gouritz Catchment Management Agency
BMC	Boland Mountain Complex
BR	Biosphere Reserve(s)
CARA	Conservation of Agricultural Resources Act (Act No. 43 of 1983)
CFR	Cape Floristic Region
CMA	Catchment Management Agency
CML	Coastal Management Line
CMP	Coastal Management Programme
CMS	Catchment Management Strategy
CPZ	Coastal Protection Zone
CSIR	Council for Scientific and Industrial Research
DAFF	Department of Agriculture, Forestry and Fisheries (now DALRRD / DEFF)
DALRRD	Development of Agriculture, Land Reform and Rural Development (formerly DAFF)
DEA	Department of Environmental Affairs (now DEFF)
DEA&DP	Western Cape Government's Department of Environmental Affairs & Development Planning
DEFF	Department of Environment, Forestry and Fisheries (formerly DEA / DAFF)
DEFF: WfW	Department of Environment, Forestry and Fisheries: Working for Water
DM	District Municipality
DMA	Disaster Management Act (Act 57 of 2002)
DSL	Development Setback Line
DST	Department of Science and Technology
DWS	Department of Water and Sanitation
EAF	Estuary Advisory Forum
EFZ	Estuarine Functional Zone
EIA	Environmental Impact Assessment
EMC	Estuarine Management Co-ordinator
EMFIS	Western Cape Estuarine Management Framework and Implementation Strategy
EMP	Estuarine Management Plan(s)
HWM	High Water Mark
I&APs	Interested & Affected Parties
IAPs	Invasive Alien Plants
ICM	Integrated Coastal Management
ICMA	National Environmental Management: Integrated Coastal Management Act (Act No. 24 of 2008)
IDP	Integrated Development Plan
KBR	Kogelberg Biosphere Reserve
KBRC	Kogelberg Biosphere Reserve Company
KNR	Kogelberg Nature Reserve
LED	Local Economic Development
LM	Local Municipality
LUPA	Land Use Planning Act (Act No. 3 of 2014)
MAR	Mean Annual Runoff

MEC	Member of the Executive Council
MLRA	Marine Living Resources Act (Act No. 18 of 1998) as amended
MOU	Memorandum of Understanding
MRPDA	Mineral Resource and Petroleum Development Act (Act No. 28 of 2002)
MSA	Municipal Systems Act (Act No. 32 of 2000)
NBA	National Biodiversity Assessment
NEM: BA	National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
NEM: PAA	National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
NEM: WA	National Environmental Management: Waste Act (Act No. 59 of 2008)
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NEMP	National Estuarine Management Protocol (2013)
NWA	National Water Act (Act No. 36 of 1998)
PAES	Protected Area Expansion Strategy
PSU	Practical Salinity Units
RDM	Resource Directed Measures
REC	Recommended Ecological Category
RMA	Responsible Management Authority
RQO(s)	Resource Quality Objectives
SAHRA	South African Heritage Resource's Agency
SANBI	South African National Biodiversity Institute
SAPS	South African Police Service
SAR	Situation Assessment Report
SDF	Spatial Development Framework
SOP(s)	Standard Operating Procedures
SUDS	Sustainable Urban Drainage Systems
SWOT	Strengths, Weaknesses, Opportunities and Threats analysis
WC BRA	Western Cape Biosphere Reserves Act (Act No. 6 of 2011)
WC DoT&PW	Western Cape Department of Transport and Public Works
WC TIA	Western Cape Transport & Infrastructure Act (Act No. 1 of 2013)
WUA	Water Users Associations
WUL	Water Use License
WWTW	Waste Water Treatment Works

1 INTRODUCTION

1.1 Background

The National Environmental Management: Integrated Coastal Management Act (Act 24 of 2008) (ICMA) was developed to facilitate the sustainable use and management of South Africa's coastline and coastal and estuarine resources. The ICMA requires that estuaries within South Africa be managed in a co-ordinated and efficient manner, and in accordance with the 2013 National Estuarine Management Protocol (hereafter referred to as the NEMP), the National Coastal Management Programme (CMP) as well as the Western cape Provincial CMP, which lay out specific objectives for management of the South African coastline, including estuaries.

In response to the directive issued under the ICMA and the 2013 NEMP, the Western Cape Government, and specifically the Provincial Department of Environmental Affairs and Development Planning (DEA&DP), commissioned the development of the Western Cape Estuarine Management Framework and Implementation Strategy (EMFIS), a strategic project emanating from the provincial CMP, specifically priority area 7, to facilitate the consistent development and implementation of Estuarine Management Plans (EMPs) in the Western Cape Province.

This document represents the first generation EMP for the Rooiels River estuary (Figure 1) developed under the auspices of the Western Cape EMFIS.

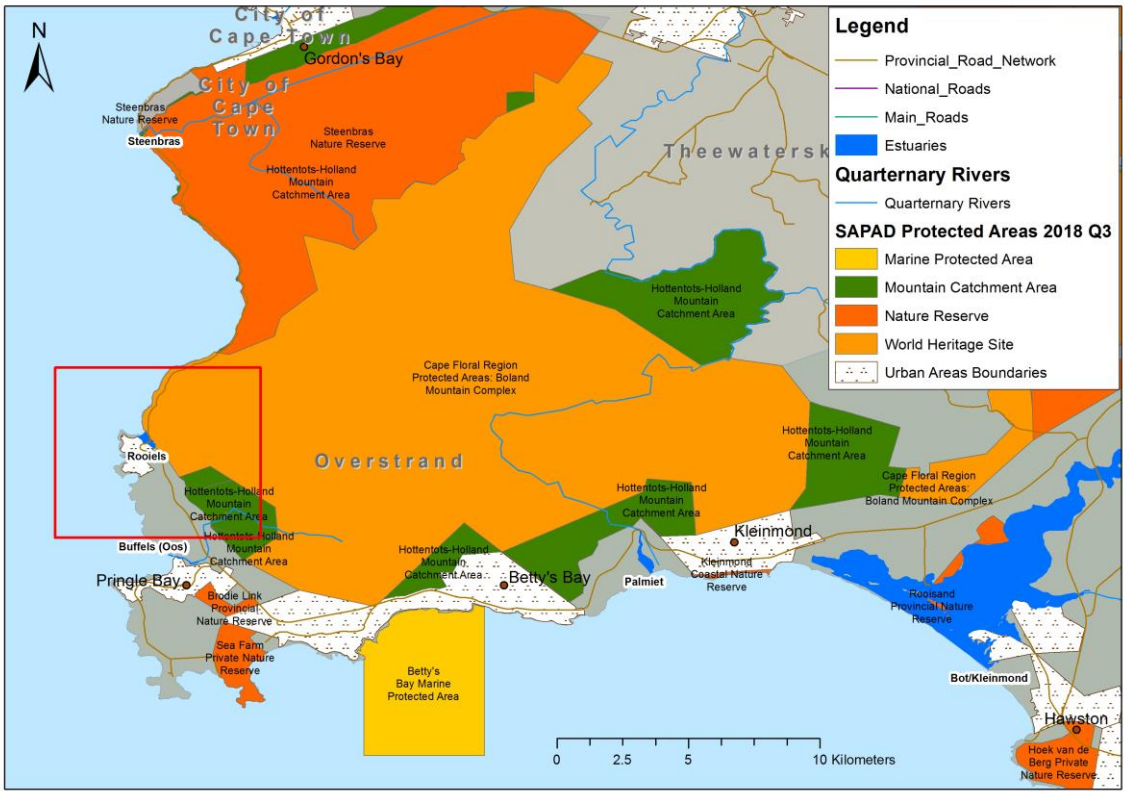

Figure 1: Location of the Rooiels River estuary within the Overstrand Local Municipality

1.2 Purpose of the EMP

The development of an EMP is a three-phase process, as illustrated in Figure 2, comprising an initial scoping phase, followed by an objective setting phase, and finally an implementation phase. An adaptive management approach should be adopted during the latter phase with detailed reviews bring conducted at five-yearly intervals.

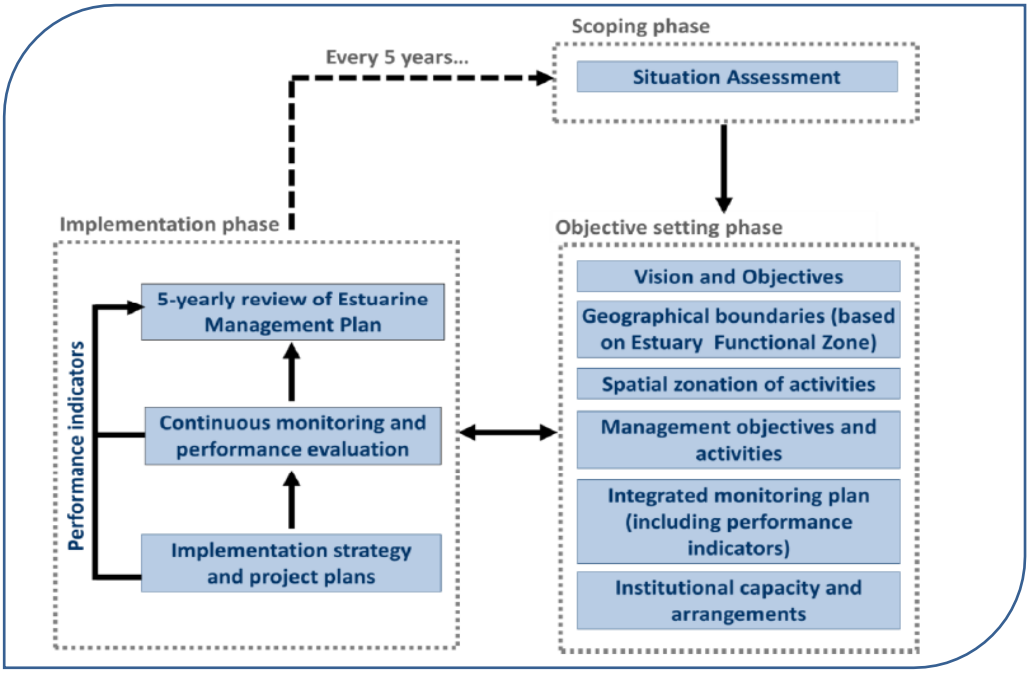

Figure 2: A framework for integrated estuarine management in South Africa

This report constitutes the second objective and core component of the estuarine management planning process, namely the EMP. The purpose of this component is to provide the vision of the future desired state of the Rooiels River estuary and guide the management of human activities in and around the system by setting out strategic objectives, management priorities and detailed management strategies with actions/activities.

Estuarine management is by definition not only focused on the Estuarine Functional Zone (EFZ) but inclusive of coastal hinterland and marine influences, shoreline status, catchment management, climate change and human development impacts such as tourism, recreation and agriculture, amongst many others. This EMP is the primary document for use by the identified Responsible Management Authority (RMA) to facilitate coordination of the identified management interventions to ultimately ensure the longevity of the estuarine system concerned. This is also the critical reference document for the incorporation of estuarine management into the municipal Integrated Development Planning (IDP) and Spatial Development Framework (SDF) processes.

1.3 Mandate and responsibilities of the RMA

The co-ordination of the implementation of the EMP vests with the RMA as per the 2013 NEMP. One of the strategic objectives of this EMP is to promote and facilitate the cooperative governance relationship between the RMA and an existing or new estuary advisory forum (EAF), or any other supporting structures or organisations with estuarine-related duties and functions.

The designated RMA is responsible for the development of the EMP and the overall co-ordination of the actions of other implementing agencies, and not necessarily the implementation actions themselves. Section 7.3 of the 2013 NEMP, indicates that:

"…management actions…shall be translated into project plans by the responsible government department that is responsible for certain aspects of estuary management (as per legislative mandates…"

Specifically, the RMA responsibilities are described by the Protocol as:

Section 5:	*"…authorities are **responsible for the development of EMPs** and **coordination of the implementation process**…"*
Section 5(e):	*"The identified responsible management authority to development the EMP needs to **budget accordingly for the development of these plans**."*
Section 8(1):	*"The responsible management authority developing an EMP must **actively engage all the relevant stakeholders** including government departments, non-government organisations and civil society in the development and implementation of the EMP."*
Section 9.1(1) and 9.2:	*"…it **must obtain formal approval** for the EMP…" and "Once approved…the EMP shall be… **Integrated**.." and "**incorporated** into into that protected area's management plan as contemplated in section 39 of NEMPAA."*

The responsible body contemplated in Section 33(3)(e) of the ICMA who develops an EMP must:

a) follow a public participation process in accordance with Part 5 of Chapter 6 of the ICMA;
b) ensure that the EMP and the process by which it is developed are consistent with:
   i) the 2013 NEMP; and
   ii) the National CMP and with the applicable provincial CMP and CMP referred to in Parts 1, 2 and 3 of Chapter 6 of the ICMA;
c) If applicable, ensure that relevant legislation is enacted to implement the EMP; and
d) Submit an annual report to the Minister on the implementation of the EMP, the legislation and any other matter.

Coordination of the implementation actions by the RMA and its strategic partners can be supported by an EAF representing all key stakeholder groups on the estuary.

1.4 Structure of Report

This report is structured as follows:

- **Section 2** introduces the estuary and details the **geographical boundaries** of the estuary, i.e. the management area to which this EMP applies;
- **Section 3** provides a synopsis of the **situation assessment report,** thereby providing context to the vision, strategic objectives and management objectives and management priorities;
- **Section 4** presents the **local vision and strategic objectives** as informed by the stakeholders, for the management of the Rooiels River estuary. They collectively describe the desired future state and provide the overarching logical framework for the action plans;
- **Section 5** prescribes the **management priorities** and associated **activities,** i.e. the required actions and activities to be undertaken within the next 5 years, captured as individual action plans. This EMP contains refined or detailed management objectives accompanied by action plans to facilitate implementation, and in this manner, serves to mobilise and co-ordinate all relevant government departments, institutions and other role players to undertake specific actions within their mandate or sphere of influence;
- **Section 6** describes the various components and zones included in the proposed **spatial zonation** of the estuary;
- **Section 7** set out the **integrated monitoring plan** encompassing resource monitoring, compliance monitoring, as well as performance monitoring in respect to achieving the objectives of the EMP;
- **Section 8** details the **institutional capacity and proposed arrangements** that are required to implement the actions contained in the plan, including key role players and participating institutions, and the recommended projects provided for in the action plans; and
- **Section 9** details key **recommendations** and **concludes** the plan.

2 GEOGRAPHICAL BOUNDARIES

The Rooiels River is defined in the 2018 National Biodiversity Assessment (NBA) (SANBI, 2018) as a small temporarily closed estuarine system situated approximately 70 km east of Cape Town on the Cape south-west coast within the cool temperate biogeographic region of South Africa. It is located on the eastern side of False Bay, adjacent to the small settlement of Rooiels, in the Overstrand Local Municipality (LM), Overberg District (Figure 3).

The geographical boundaries of the estuary are defined as follows:

Table 1: The Rooiels River estuarine functional zone

DOWNSTREAM BOUNDARY:	Estuary mouth 18.820488° E -34.297582° S
UPSTREAM BOUNDARY:	Head of estuary 18.825019° E -34.301940° S
LATERAL BOUNDARIES:	Approximated by the 5 m contour above Mean Sea Level (amsl) along each bank

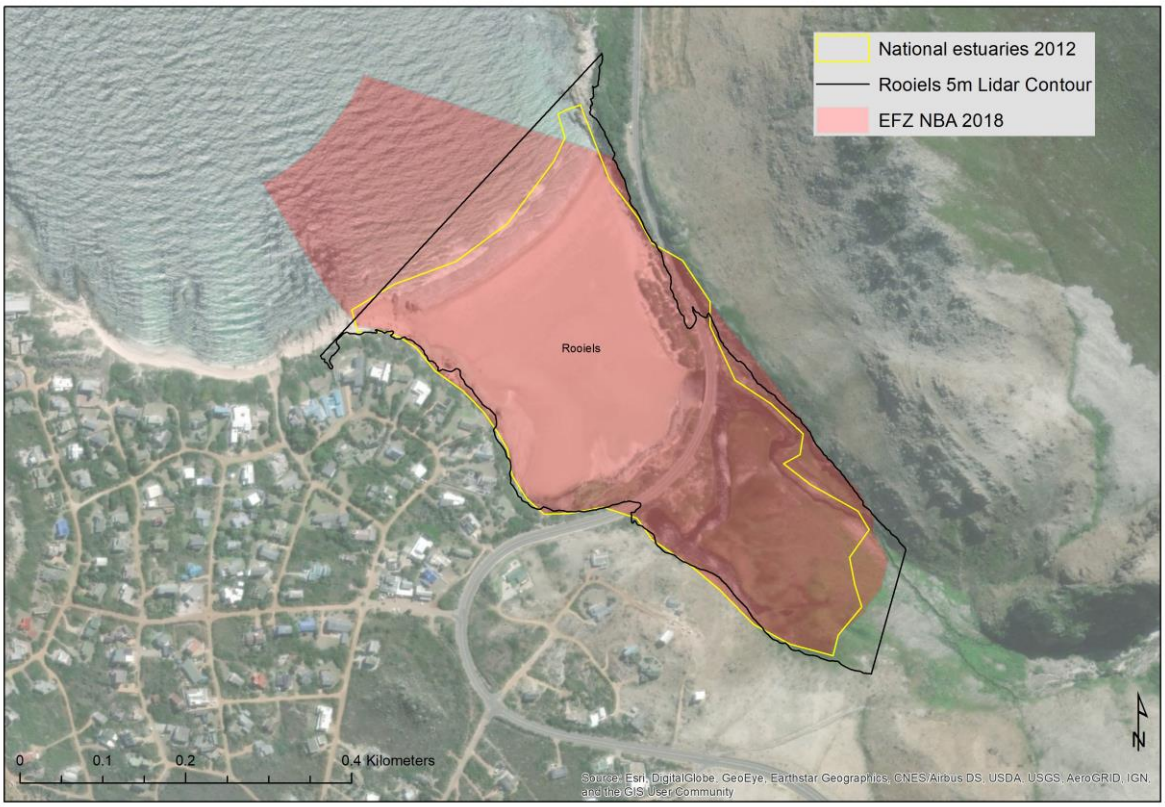

Figure 3: Geographical boundaries of the Rooiels River estuary showing the 5 m topographical contour and 2018 NBA EFZ boundary

3 SYNOPSIS OF THE SITUATION ASSESSMENT

Introduction

Estuary Management Planning Process

The development an EMP takes cognisance of and is written in accordance with the National Guidelines for the Development and Implementation of Estuarine Management Plans. The development of an EMP is preceded by a scoping phase with the compilation of a Situation Assessment Report (SAR) reflecting the current status of estuarine management in the specific estuary.

Purpose of the Situation Assessment Report

The information collection component of the Rooiels River EMP, the SAR has gathered and interpreted the information that will, together with the empirical data gathered on site, serve as the basis for the development of a vision and applicable management objectives for the Rooiels River estuary.

Structure of the Report

The report will include details on the broader catchment, ecological characteristics and functioning, ecological goods and services, current impacts, socio-economic context, legal instructions and related strategies and plans as well as opportunities and constrains for the Rooiels River estuary.

Catchment Characteristics

The Overberg forms part of the Cape Fold Mountains, and as such the geology of the surrounding area comprises the formations of the Cape Supergroup, primarily the quartzitic sediments (sandstone) of the Table Mountain Group. The steep mountainous sides of the Rooiels River valley comprise predominantly coarse, thick bedded sandstone of the Peninsula Formation, reflecting continuous re-working in a shallow high-energy marine environment.

The climate of the region is typically Mediterranean, comprising cold wet winters and hot dry summers. The average annual precipitation for the Overstrand LM is 450-830 mm, which falls all year round. Mean average temperatures range from 25.6 °C in January to 6.3°C in July.

The Rooiels River catchment falls within the Fynbos Biome and is located entirely within the Kogelberg Nature Reserve, a component of the Boland Mountain Complex (BMC) protected areas, as well as the Kogelberg Biosphere Reserve (KBR) and Cape Floral Region (CFR) World Heritage Site. It is almost entirely naturally vegetated. The size of the estuary, as defined by estuarine functional zone, is approximately 16 ha, extending over a length of 0.65 km.

Abiotic function

In terms of the hydrology, there has been little change in mean annual runoff (MAR) between the Reference (9.571 Mm^3/a) and Present state (9.439 Mm^3/a) (1.4% reduction in MAR), which is not unexpected given the lack of any dams or significant use of water in the catchment.

Very little information is available on the hydrodynamics of the Rooiels system. The mouth is at times in a closed state due to a sandbar that forms across the mouth. However, this tends is to be the exception; due to its small size the estuary is most often in a semi-open state as it meanders through an outflow channel to the sea.

Total open water area is estimated at less than 2 ha up to the head of tidal effect about 1 km from the mouth. The estuary has a multi-channel configuration through its floodplain. During high tide, very little water flows out of the estuary and seawater enters the system over the beach. The estuary is generally less than 1 m deep, however, the main channel above the bridge has a depth of 3 m. When the mouth is open, this part of the estuary is subjected to tidal effects. During floods, the river can cut directly to the sea across the centre of the beach. Once the flood dissipates under the influence of waves and longshore drift, the mouth moves across the beach to a position against the rocky shoreline on the southern side of the bay. The 1938 historical aerial photographs show that at that time, the river formed an extensive meander across the lower end of its floodplain. It is evident that, with the construction of the bridge and embankment for the coastal road in the early 1950s, the main flow channel was relocated towards the northern side of the floodplain under the present configuration with a meander on the seaward side of the road embankment. The shifts in the hydrodynamics are largely unrelated to changes in the flow regime of the system. The construction of the bridge is the main reason for change in the dynamics of the system.

In 1982, variations in surface salinity of 24-28 Practical Salinity Units (PSU) in the southern arm of the system were recorded. In 2011, average surface salinity values of 0-10 PSU, and average bottom salinity values of 10-30 PSU were recorded. This is expected as the system is relatively deep in the upper reaches (~ 3 m), and therefore retains saltwater effectively under low flow conditions. The salinity in the system is very similar to reference with potentially slightly more retention in the upper reaches above the bridge due to the bridge bisecting the system. Considering the undisturbed catchment and available information, pollution in this system is largely limited to litter in picnic areas and potential seepage from septic tanks of the adjacent developments

In terms of changes to physical habitat, historical records show no evidence of catchment-derived siltation in this system. However, there has been some loss of subtidal and intertidal area from the natural state due to infilling around the bridge embankments. The road bridge has also caused stabilisation and loss of variability in the meandering section of the lower estuary. As the system is relatively sediment-starved from a catchment perspective, it is assumed that the subtidal areas (and related estuary volume) in the upper reaches will remain relatively unmodified under the future scenarios. However, of concern is marine siltation processes in the lower reaches which is likely to escalate as a result of loss of floods. The sediment structure is not likely to change much due to the system at present having a strong marine sediment signal.

Biotic function

Very little information is available on the microalgae of the Rooiels River estuary. Due to little change in the abiotic environment, the present state of the microalgae is likely close to natural. Small reductions in flow for future scenarios would increase retention

time and therefore biomass. There are no signs of nutrient enrichment and therefore the microalgal species richness and community composition is also largely unchanged. In terms of anthropogenic impacts, the bridge may have increased retention time in the upper reaches of the estuary resulting in a small deviation from natural conditions.

A large island of *Juncus acutus* situated above the road bridge is the dominant macrophyte habitat in the Rooiels River estuary. Grassy banks in the upper reaches of the estuary cover the second largest area. The common reed, *Phragmites australis,* fringes the banks of the estuary in some areas. The reeds occurred mostly in the upper reaches of the estuary although a narrow fringe of reeds was present along the seaward side of the road bridge. Young individuals of an unidentified sedge were abundant in the undergrowth of the reeds in the upper reaches as well as fringing the banks of the estuary above the road bridge. The submerged macrophyte pondweed, *Potamogeton pectinatus*, although not mapped, was identified during a field survey in July 2016, and a small area was present in the upper reaches adjacent to the reed habitat. The steeper banks of the estuary were vegetated with Kogelberg Sandstone Forest and Overberg Dune Strandveld. The invasive red eye wattle, *Acacia cyclops* (Rooikrans), was present amongst the coastal habitat in the lower reaches, mostly on the seaward side of the road bridge. Some evidence of invasive clearing was present in this area.

The health of the macrophytes was assessed in terms of species richness, abundance and community composition. Change in species richness was measured as the loss in the average species richness expected during a sampling event, excluding species thought to not have occurred under reference conditions. Abundance was measured as the change in area cover of macrophyte habitats. The macrophytes are 83% similar to what they were under reference conditions.

Very little information is available on the invertebrate of the Rooiels River estuary. There is no available information on zooplankton, insects, nor invertebrates residing in the vegetation in the Rooiels River estuary. There was, however, limited information on benthic and hyperbenthic invertebrates. A survey in 1978 sampled six sites below the road bridge and a further two sites above the road bridge and identified 10 benthic and hyperbenthic invertebrate species from three taxonomic classes. Subsequently, a survey in 2003 identified six species from two taxonomic classes. However, this study was restricted to only two sampling sites; one below and one above the road bridge. Differences in numbers of species, taxa and abundances between the two surveys is likely due to the different number of sites sampled, time of year, sampling effort and technique at each of the sites.

Under the reference condition, invertebrate richness, abundances and composition would have been similar to the natural conditions. The available invertebrate habitat (macrophytes and benthic sediment composition) has changed very little over time. Regular overtopping events, along with relatively stable water flow rates, have ensured the predominately open status of the estuary, allowing the influx of saline water and persistence of marine and estuarine taxa within the system. However, abundances of invertebrates were likely to be greater under reference conditions (especially prawns),

as bait collection for fishing during the baseline condition would have negatively affected overall numbers.

Historical studies of the icthyofauna of the Rooiels River estuary include surveys conducted in 1968, 1978, 1979 and 1981 Estuarine and Coastal Research Unity surveys. These surveys recorded six species including estuarine resident and estuary-dependent marine species. Harrison (1999), sampled the estuary in 1994 when the mouth was open, recording four species with the southern mullet dominating these samples. A total of nine species were caught in the 2016 survey, bringing the total number of species recorded for the estuary to date to ten. Small white steenbras were found recruiting to the Rooiels River estuary as this endangered sparid is known to undertake spawning migrations to the Eastern Cape, which is thought to be the only spawning area. No freshwater species were recorded in any of the surveys, but this may reflect the relatively high salinities in the areas that were sampled. Sampling further upstream may reveal the presence of some indigenous or alien freshwater fish.

The Rooiels River estuary fish community under reference conditions was probably very similar. The fish currently inhabiting the Rooiels River estuary are largely euryhaline, estuarine residents or estuary associated marine species. The road bridge may have restricted the natural migration of the estuary channel across the flood plain but does not appear to have altered the intertidal or subtidal habitats in a way that would have negatively impacted on fish. The reference fish community may have had higher abundance of exploited marine species, the stocks of which have been reduced by fishing throughout their range.

There is little historic information available on the avifauna of the Rooiels River estuary. The historic counts suggest that the waterbirds, in particular waders, were infrequent. The highest count was in December 1979 when 118 birds from seven species were recorded. Although the numbers of birds observed in individual counts tend to be low, a bird list published online by Allison Ayre and Helen Jones on personal bird sightings from 1986 – 2013 shows that a relatively large number of species use the estuary. The avifaunal community of the Rooiels River estuary under reference conditions was probably very similar.

Ecological Health Status, Importance, and Recommended Future State

The Rooiels Estuarine Health Assessment was conducted as an Ecological Water Requirement study desktop procedure in 2016 using a standardized approach also applied in Ecological Water Requirement studies for the Department of Water and Sanitation (DWS). The health condition (also referred to as the Present Ecological State (PES)) of an estuary is typically defined on the similarity of its current condition to an estimated natural condition. The overall ecological health of the Rooiels River estuary is in an A/B Category (i.e. natural / largely natural with few modifications).

The 2011 National Biodiversity Assessment developed a biodiversity plan for the estuaries of South Africa by prioritising and establishing which estuaries should be assigned partial or full Estuarine Protected Area status. The Rooiels River estuary was not identified as a

priority estuary in need of formal protection; however, it does fall within the Kogelberg Nature Reserve.

The Estuary Importance Score for an estuary takes size, the rarity of the estuary type within its biographical zone, habitat diversity and biodiversity importance of the estuary into account. Biodiversity importance, in turn is based on the assessment of the importance of the estuary for plants, invertebrates, fish and birds, using rarity indices. These importance scores ideally refer to the system in its natural condition. The Rooiels River estuary was deemed of average overall importance.

The Recommended Ecological Category (REC) or desired state, signifies the level of protection assigned to an estuary from a flow perspective. The REC for the Rooiels River estuary is an A or A/B Category. However, it is noted that the 2018 National Biodiversity Assessment (SANBI, 2018) suggests an A category. Key interventions required to achieve, and maintain, the REC include:

- Developing an Estuarine Management Plan (Western Cape Government in the processes of prioritising this system for a plan);
- Ensuring summer low flows (baseflows) to the estuary; and
- Maintaining good water quality.

Important Ecosystem Goods and Services

The natural environment provides a range of valuable ecosystems services (also termed goods and services) to society, including provisioning services (such as food, water and other resources), regulating services (e.g. climate regulation, as well as air and water purification), cultural services (e.g. aesthetic, spiritual, recreational, educational and cultural benefits), and life-support services (such as nutrient cycling and soil formation). The rating of all these services for the Rooiels River estuary is low except for the refugia/nursery areas which was medium to low, and the structure and composition of biological communities' service which was medium. The yearly nursery monetary value for this estuary is R300 000, which is the second lowest value when compared to the other estuaries along the Kogelberg Biosphere Reserve (KBR) coast. The main recreational activities taking place within the Rooiels River estuary at a low intensity include bait harvesting (prawn pumping), fishing, swimming and walking.

Impacts or Potential Impacts

The Rooiels River estuary is in a relatively pristine condition, despite significant historical alterations to the channel configuration during the construction of the R44 major road bridge. The catchment area of the estuary is located in the Kogelberg Nature Reserve and KBR and is thus fairly natural and undisturbed. Litter that is left by the picnickers or washed up by the tide is a common source of pollution in the area. The Rooiels system is thought to be a low productivity, which could easily become degraded if over utilised. Septic tank seepages and storm water run-off from houses built against the southern slope, above the estuary, could results in the estuary becoming polluted. Of concern is also the narrow buffer zone along the edge of the Rooiels beach and the lower reaches of the estuary. This has allowed the urban core to extend up to estuary edge. In addition, clearing of vegetation is becoming common practise for security purposes. In

terms of recreational activities, dogs that are off the leash are disturbing the birds utilising the beach as a roosting area, and this reduces the refuge or habitat value of the system for coastal and wetland associated bird species. There is also some concern regarding the presence of herbicides and pesticides recorded in the system. In summary, there are no major pressures on the Rooiels River estuary.

Overview of Socio-Economic Context

The Overstrand LM covers a land area of approximately 1708 km^2, and covers the areas of Hangklip/Kleinmond, Greater Hermanus, Stanford and Greater Gansbaai. The municipal area has a coastline of approximately 230 km long, stretching from Rooiels in the west to Quinn Point in the east. The Overstrand LM is the second most populated local municipality within the Overberg District Municipality (DM), with an estimated total population of 93 408 people (StatsSA, 2016), and has an average growth rate of 3.42% (StatsSA, 2011).

Of the population aged 20 years and older, 2% have no form of schooling (StatsSA, 2016). There are 35 719 households in the Overstrand LM, of which 78% have access to piped water within their dwellings (StatsSA, 2016). Electricity for lighting is provided to 97% of all households (StatsSA, 2016). Approximately 35 553 people are economically active, with an overall unemployment rate of 23.3%, and a youth unemployment rate of 31.1% (StatsSA, 2011). Approximately 36% of the population earns an average household income of less than R38 200 per annum, while a further 16.4% receive no income at all (StatsSA, 2011). In respect to poverty, the poverty headcount shows that the number of poor people within the Overstrand LM increased from 1% of the population in 2011 to 1.6% in 2016 (OLM IDP, 2017).

Within the estuary surrounds, the Rooiels River estuary and its catchment, falls within Ward 10 of the Overstrand LM, which has a total population of 5 881 people (StatsSA, 2011). The town of Rooiels has a total population of 125 and a population density of 109 persons per km^2 (OLM IDP, 2017). Approximately 59.7% of the population falls within the economically-active age group between 15-64 years and 70.3% have a higher education (OLM IDP, 2017).

In terms of the local economy, the Overstrand LM contributed 31.6% to the district Gross Domestic Product at the end of 2015 (OLM IDP, 2017). The economy grew by 3.3% per annum between 2005 and 2015 (OLM IDP, 2017). The three main sectors in 2015 contributing to this growth were the commercial services sector (58.1%), the manufacturing sector (14.2%) and the government and community, social and personal services sector (14.1%) (OLM IDP, 2017). The Overstrand LM employed 28.8% of the district's labour force in 2015, with a growth rate of 2.9% during the 2005-2015 period even though there were significant job loses prior to and during the recession (OLM IDP, 2017). These jobs have been recovered and about 8 491 (net) additional jobs have been created since 2005 (OLM IDP, 2017).

The direct and indirect benefits derived from estuarine ecosystem services are manifested directly or indirectly in tangible income and employment. There are no known subsistence communities that rely on the natural resources of the Rooiels River

estuary for their livelihoods or income generation. The main form of social dependency associated with the Rooiels River estuary relates to tourism and recreational activities, where the estuary and beach are used extensively for general beach-oriented recreation, mainly over weekends and during holiday periods. These recreational activities include swimming, bait harvesting and fishing, and there are also popular dive sites around Rooiels.

In terms of Local Economic Development (LED), opportunities to reduce poverty and socio-economic pressures, including poaching and other illegal activities, should be sought. For example, the main focus of the Overstrand LM is: tourism, aquaculture/agriculture, manufacturing, finance, real estate and business services, as well as the secondary service industry. As tourism is a major draw card for the region, eco–adventure activities and other sectors related to tourism, such as catering and accommodation, retail and wholesale, transport and business services should be investigated as avenues for LED opportunities.

Legislative Instruments and Related Strategies / Programmes

The main directive for instituting estuarine management stems from the ICMA (Act No. 24 of 2008) and the associated 2013 NEMP, which prescribes the national estuarine management objectives, the contents and minimum requirements of EMPs, as well as assigns responsibilities for developing and coordinating EMPs to various levels of government based on municipal jurisdiction. According to the 2013 NEMP, the overall co-ordination of the implementation of the EMP for the Rooiels River estuary vests with CapeNature as the identified Responsible Management Authority (RMA), given the location of the Rooiels River estuary fully within the Kogelberg Nature Reserve and within the transitional zone of the KBR, along the Kogelberg Coast. Under the legislative review, key legal instruments that are applicable to estuarine management are described, and include national, provincial and local management documents, as well as the BMC Protected Area Management Plan. At the local management level, both the Overberg DM IDP and the Overstrand LM IDP address the management of estuaries within their jurisdiction areas, e.g. the Overberg District CMP, advocates the preservation of the coastal zone, and all watercourses, wetlands and estuaries are considered vital components of the ecological infrastructure of the region.

Opportunities and Constraints

A Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis for the management of the Rooiels River estuary was undertaken. One of the main strengths is that the estuary, and its largely undeveloped catchment, fall within the Kogelberg Nature Reserve, and the KBR, which is South Africa's first biosphere reserve. While the estuary itself has not been identified as a priority estuary in need of formal protection, it is however protected under the KBR in terms of the Western Cape Biosphere Reserves Act (WC BRA). The status of the lower section of the estuary must be confirmed and must be incorporated in the KBR spatially and in all planning policies and documentation. Rooiels is regarded as a holiday town with little or no potential for development outside of housing and recreation. Nonetheless, the near pristine estuary has undeniable recreational and aesthetic value and there is strong community interest and sense of ownership. In terms of weaknesses, the greatest shortfall is the exclusion of

the estuary mouth and beach/ sandbar from conservation area. In addition, the lower portion of the estuary has been encroached upon and a very narrow buffer strip remains, whilst various sources of urban pollution and invasive alien plants are prevalent. The main threats to the management of the Rooiels River estuary include limited scientific knowledge, ambiguity regarding the roles and responsibilities of the different agencies, lack of capacity to provide the development needs of the growing population and burgeoning visitor numbers, and the lack of capacity for compliance and enforcement activities.

In terms of opportunities for restoration, the priority actions to be taken to maintain the estuary in its current A or A/B Category include ensuring summer low flows (baseflows) to the estuary and maintaining good water quality.

Recommendations to Address Major Information Gaps

The current information available on the Rooiels River estuary is outdated (or lacking) and research needs to be undertaken to update the available baseline information, which will be used to facilitate the management of the estuary. Ecological monitoring, as recommended in in this SAR, should also be undertaken; the results of which can be compared to the baseline information to highlight any impacts that are occurring and to monitor the state of the estuary. In addition, all data generated through regional and local projects and monitoring programmes should be sourced, collated and stored at a central repository to build up long–term datasets to facilitate adaptive estuarine management.

4 LOCAL VISION & OBJECTIVES

4.1 Vision

The Vision for an estuary should be inspirational, representing a higher level of strategic intent and aligned with the strategic objectives of the 2013 NEMP, Western Cape CMP and the greater Cape Floristic Region (CFR) as well as the BMC Protected Area Management Plan. The National Vision and Vision of the estuaries of the CFR are as follows:

The estuaries of South Africa are managed in a sustainable way that benefits the current and future generations

The estuaries of the CFR will continue to function as viable systems which are beautiful, rich in plants and animals, attract visitors, sustain our livelihoods and uplift our spirits

The 2016 Western Cape Provincial Coastal Management Programme (PCMP), identifies estuarine management as one of its nine priority areas and sets out the goal for the Western Cape as:

Co-ordinated and integrated estuarine management which optimises the ecological, social and economic value of these systems on an equitable and sustainable basis

As the foundation for the Vision for the Rooiels River estuary, the Vision of the BMC is as follows (CapeNature, 2018):

Vision:
The Boland Mountain Complex is an ecologically resilient landscape that sustains ecosystem services and infrastructure, and promotes indigenous biodiversity essential for human well-being.

The following Vision for the Rooiels River estuary was proposed at a public meeting[1] held in October 2017 in Pringle Bay, and supported at a second meeting held in April 2018[2].

[1] Minutes of the 1st stakeholder meeting for the Rooiels, Buffels and Palmiet River estuaries, 11 October 2017, Pringle Bay Community Hall, Pringle Bay

[2] Minutes of the 2nd stakeholder meeting for the Rooiels, Buffels and Palmiet River estuaries, 23 April 2018, Proteadorp Community Hall, Kleinmond

Tucked between mountain and sea, the Rooiels River estuary is well managed and protected to add value, diversity and beauty to our local and wider community

The vision highlights the following aspects of the estuary that are valued and need to be preserved or enhanced:

- The sense of place and beauty of the estuary by virtue of its location that is appreciated by the local community and transient visitors;
- The linkage that the estuary serves between the surrounding landscape and sea;
- The importance of protecting biodiversity;
- The role that the estuary provides in terms of local economic benefits; and
- The need to manage activities around the estuary to ensure that these values are retained.

4.2 Strategic Objectives

Objectives are qualitative statements of the values derived from the vision and typically reflect the overarching issues. They should answer the following question, *"How will you know when you have achieved the Vision?"*. The strategic objectives inform the development of the detailed management strategies that are carried forward as plans of action.

The strategic objectives for the Rooiels River estuary were discussed at the stakeholder meeting. Based on the feedback received from the participants, the strategic objectives for the Rooiels River estuary align with the following identified sectors or categories of issues:

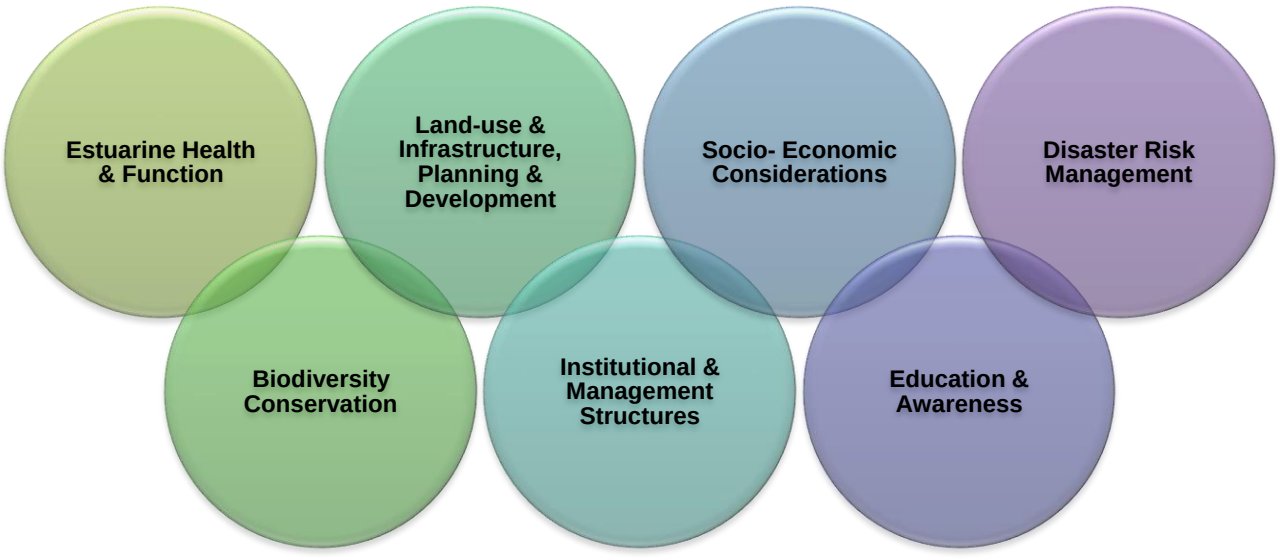

Figure 4: Sectors or categories of issues relevant to the management of the Rooiels River estuary

According to these categories, the strategic objectives for the Rooiels River estuary are as follows (Table 2):

Table 2: Strategic Objectives for management of the Rooiels River estuary, their indicators and level of priority

	Sector / Category	Strategic Objective	Performance Indicator(s)	Priority
1	Estuarine Health and Function	The ecological health and natural functioning of the Rooiels is maintained and safeguarded, its living resources are sustainably managed and estuary nursery function protected in a hotter, drier future	• Maintain an A or A/B ecological health status • Ecological Reserve secured and implemented • Ecological health of the estuary is improved • Effective catchment management and maintenance of good water quality • Pollution reduced • Water quality monitoring programme in place • Invasive alien plant infestations managed • Ecological monitoring programme in place • Resources utilised within legal and sustainable limits • Illegal activities controlled	**HIGH**
2	Biodiversity Conservation	The biodiversity of the Rooiels River estuary is conserved	• Protected area expanded • EMP incorporated into the BMC Management Plan • Spatial zonation plan is adopted and enforced • Healthy biological communities	**HIGH**
3	Land-use and Infrastructure Planning and Development	Impacts associated with developments and proposed changes in land-use, including infrastructure and agriculture, are minimised	• EMP included in all relevant planning documents • All development and land use changes surrounding and within the Estuarine Functional Zone (EFZ) comply with environmental legislation and environmental best practice / risk aversion approach • Any additional transformation of estuary margins prevented	**MEDIUM**
4	Institutional and Management Structures	The Rooiels River estuary is managed well through effective co-operative governance	• EMP is seamlessly incorporated into the BMC Management Plan • Estuary advisory forum is established and meets regularly • Estuarine bylaws or regulations are gazetted	**HIGH**

5	Socio-Economic Considerations	Socio-economic benefits are enhanced and regulated to ensure sustainable use of the Rooiels River estuary and its resources	• Standard operating procedures in place to manage visitor numbers • Viable alternative livelihood opportunities identified and implemented	**MEDIUM**
6	Education and Awareness	Members of society are sensitive to and aware of the value and importance of the Rooiels River estuary.	• Increase in number of research projects • Signage erected • Information disseminated • Awareness programme developed and successfully implemented on an on-going basis	**LOW**
7	Disaster Risk Management	Potential risks that could impact the Rooiels River estuary are reduced (inclusive of climate change impacts)	• Rehabilitation of degraded areas • Contingency plans in place • Key infrastructure is well defended	**MEDIUM**

5 PRIORITY MANAGEMENT OBJECTIVES AND ASSOCIATED ACTIVITIES

After the review of the background information, as well as after conducting stakeholder engagement, a SWOT analysis of the Rooiels River estuary under the current management practices was prepared (Table 3).

Table 3: SWOT Analysis

STRENGTHS *(highlights, uniqueness?)*	**WEAKNESSES** *(what could be improved?)*
• Undeveloped, sparsely populated landscape • Near pristine estuarine system • Recreational and Aesthetic value • Strong community interest and stewardship • Upper reaches protected under the BMC • Banner of KBR as a conservation-worthy area • Presence of a conservation authority • Presence of endangered fish species (white Steenbras) • Limited catchment/land use impacts • Fixed urban edge (i.e. no further expansion) and no further subdivisions of property are permitted	• Development encroachment / narrow buffer zone • Birds roosting in estuary / on the beach disturbed by dogs • Litter, contaminated urban runoff and pollution from septic tanks • Prevalence of invasive alien plant species • Limited scientific information and knowledge • Poaching • Exclusion of estuary mouth and beach/ sandbar from conservation area • Ambiguity regarding Kogelberg BR roles and responsibilities
OPPORTUNITIES *(Opportunities for positive change)*	**THREATS** *(what could prevent the EMP from working?)*
• Inclusion of estuary mouth and beach environment in protected area • Development of local livelihoods based on recreational / sporting activities (fishing, nature trails in KBR) • Increased public awareness • Monitoring & scientific research • Updating of available ecological data • Formal protection as part of the Biosphere Reserve	• Water quality issues if more development occurs in the area • Overexploitation of living resources (prawn pumping, fishing) • Influx of people and overpopulation of Rooiels and growing burdens on limited infrastructure and the natural environment • Lack of capacity for compliance and enforcement • Lack of capacity for additional municipal services and infrastructure (e.g. potable water, waterborne sewage) • Climate change, drought conditions and loss of aquatic habitats, and increased winds and fire risk

The management objectives detailed below were informed by the SWOT analysis and critical issues identified as part of the scoping phase and stakeholder engagement. They represent the focus areas for the 5-year cycle of this EMP. An illustrative overview of the priority management objectives for the Rooiels River estuary is provided in Figure 5 below.

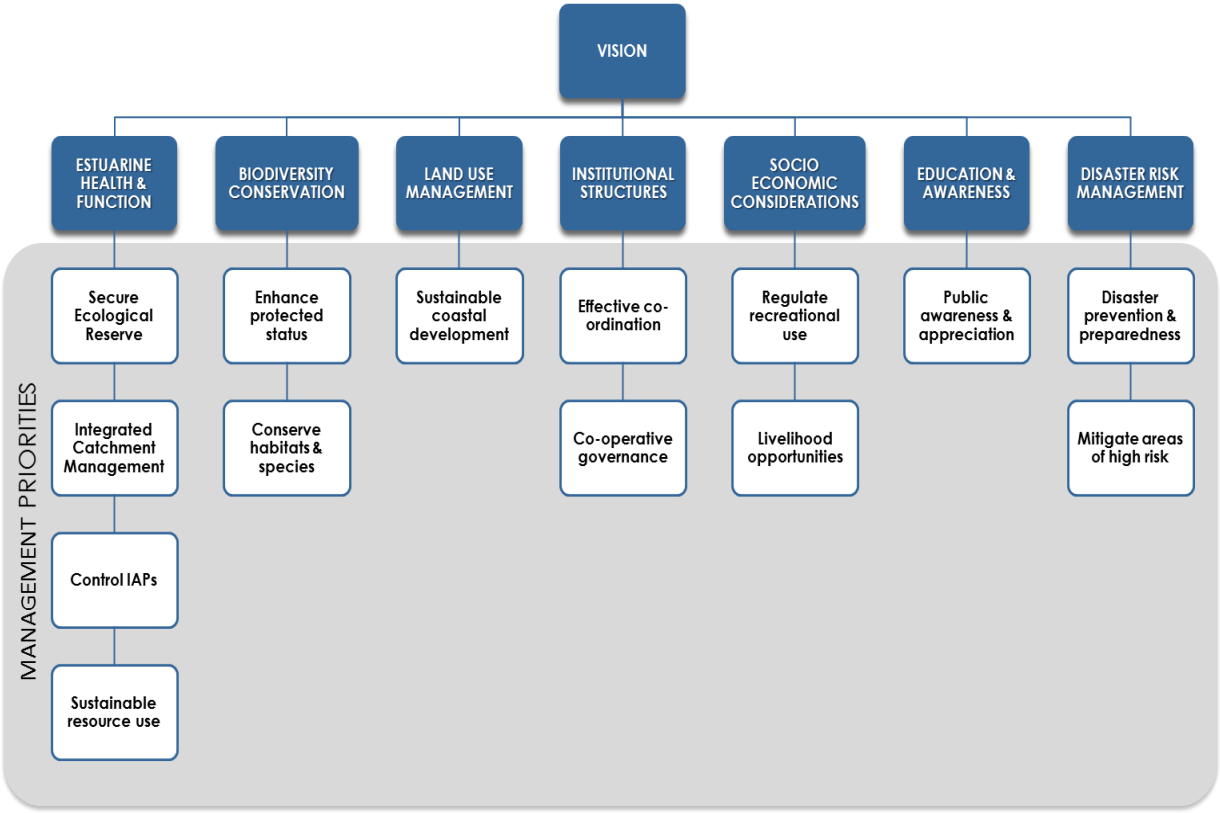

Figure 5: Summary of management priorities per management sector

5.1 Estuarine Health and Function

<u>Strategic Objective 1</u>: The ecological health and natural functioning of the Rooiels is maintained, living resources are sustainably managed and estuary nursery function protected in a hotter, drier future.

Table 4: Management Objectives and Actions for Estuarine Health and Function (includes water quantity and quality as well as utilisation of living resources)

	Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
Management Objective 1.1: Secure adequate quantity and quality of freshwater input to improve and maintain ecosystem health and functioning					
a.	Lobby Department of Water & Sanitation (DWS) Minister to sign off the recommended freshwater reserves	National Water Act (NWA)	• Meetings held and correspondence written • Recommended reserve(s) signed off • A or A/B ecological state is maintained	HIGH	Breede-Gouritz Catchment Management Agency (BGCMA), RMA
b.	Once classification study signed off, follow up on implementation of water resource classification process	NWA	• Meetings held and correspondence written • Water resource classified	HIGH	BGCMA, Department of Agriculture, Land Reform and Rural Development (DLRRD), RMA
c.	Install flow gauging probe in the catchment above the estuary (if identified as priority estuary) *	NWA	• Determination of the importance/prioritisation of the Rooiels estuary completed • Flow gauging probe installed • Data generated	If Rooiels identified as priority estuary	DWS, BGCMA
d.	Implement and document Department of Environment, Forestry and Fisheries (DEFF) and DWS policy to not allow Waste Water Treatment Works (WWTW) discharge to the estuary	NWA	• Discharge of wastewater prohibited	HIGH	RMA, DWS, DEFF, Overstrand LM

	Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
e.	Monitor natural mouth dynamics (in partnership with neighbouring land owners and other Interested & Affected Parties (I&APs))	NWA (RDM)	• Mouth state documented • Photographic database generated	HIGH	RMA, Rooiels Conservancy
f.	Undertake seasonal monitoring (summer/winter) of fish and bird populations, taking RQOs into account	NWA	• Data produced and reported on • Data incorporated into EMP 5-year review	MEDIUM	RMA, DWS, South African National Biodiversity Institute (SANBI), Rooiels Conservancy (funding from WRC, DST)
g.	Undertake full Resource Directed Measures (RDM) monitoring every 3 years	ICMA, NWA	• Required basic monitoring undertaken • Data produced and reported on • Data incorporated into EMP 5-year review	LOW	DWS, BGCMA, RMA (funding from Water Research Commission (WRC), Department of Science and Technology (DST)
Management Objective 1.2: Ensure estuary requirements are integrated into catchment processes to ensure healthy water quality					
a.	Catchment land use map developed and updated annually	NWA	• Updated land use map produced every year	MEDIUM	DWS
b.	Land use and effluent management included in the Catchment Management Strategy (CMS)	NWA	• CMS identifies sources of pollution (land use and effluent) to the estuary and provides mitigation strategies	LOW	BGCMA
c.	Water use plan updated on an annual basis	NWA	• Updated water use plan produced every year	LOW	DWS (Resource protection)
d.	SDF and environmental overlay updated as and when required	Municipal Systems Act (MSA)	• Updated SDF and overlays produced	MEDIUM	Overstrand LM
e.	Catchment water quality to be summarised and reported on	NWA	• Annual report submitted to RMA and EAF	LOW	DWS BGCMA

	Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
Management Objective 1.3: Minimise pollution by addressing activities that lead to poor water quality					
a.	Identify activities, monitor and control all discharges (i.e. stormwater, septic tank seepages).	MSA, NWA, ICMA	• Patrols undertaken by appropriate municipal dept. • Blocked systems reported, inappropriate activities halt and reported • Mitigation / clean-up undertaken • Identity and prosecute offenders	MEDIUM	Overstrand LM
b.	Enforce best practice guidelines in respect to sustainable urban drainage systems	MSA, NWA, ICMA	• 1-day training for officials convened and attended • Sustainable Urban Drainage Systems (SUDS) applied by building control and technical services	MEDIUM	Overstrand LM
c.	Implement waste management plan, with a focus on peak visitor periods	National Environmental Management: Waste Act (NEM: WA), MSA	• Appropriate preparation for peak periods • Clean-up operations undertaken after peak visitor periods	LOW	Overstrand LM, RMA, Rooiels Conservancy
d.	Undertake basic water quality monitoring on a monthly basis, taking Resource Quality Objectives (RQOs) into account	NWA	• Water quality programme implemented • Estuary water quality database maintained to facilitate long term monitoring • EMP informed by monitoring results going forward	HIGH	RMA, BGCMA

	Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
Management Objective 1.4: Control the spread and densification of invasive alien plant species					
a.	Identify and prioritise infested areas	Conservation of Agricultural Resources Act (CARA), NWA	• Priority areas identified • Appropriate methods of control determined	MEDIUM	RMA, DEFF: Working for Water (WfW)
b.	Develop and implement invasive alien species eradication programme	CARA, NWA	• Invasive Alien Plants (IAPs) eradication programme implemented • Increased area of IAPs removed (and kept clear)	MEDIUM	DEFF: WfW, RMA
Management Objective 1.5: Ensure sustainable resource use through an effective level of compliance management					
a.	Adopt, implement and enforce spatial zonation plan	ICMA, National Environmental Management: Protected Areas Act (NEM: PAA)	• Expansion of protected area • EFZ controls enforced and offenders prosecuted • Reduced illegal activities • Reduced habitat loss/degradation and disturbance, and inappropriate behaviour • Improved fish and invertebrate populations	HIGH	RMA, KBRC
b.	Monitor number of harvesters and estuarine users on the system	Marine Living Resources Act (MLRA), ICMA	• Monitoring programme developed and implemented • Monthly counts of number of harvesters and users • Ad hoc patrols conducted • Cell phone link established • Investigative surveys/ questionnaires undertaken	MEDIUM	Rooiels Conservancy RMA/ KBRC, DEFF

	Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
c.	Determine and adopt the carrying capacity of the system in respect to fishing and bait harvesting	MLRA	• Carrying capacity established and enforced • Improved fish and invertebrate populations	LOW	RMA, KBRC, DEFF
d.	Initiate and enforce ban on night fishing	MLRA	• Ad hoc patrols conducted • Incidents of poaching reduced • Transgressors prosecuted	When adopted	RMA, DEFF
e.	Develop a regional compliance monitoring network and deploy human resources to address illegal activities	MLRA, NEMA, NEM:BA, MSA	• Network established • Rapid response protocol(s) developed • Incidents reported and documented • Transgressors prosecuted	MEDIUM	RMA, KBRC, DEFF, DWS, Overstrand LM

* Priority estuaries to be identified by DWS, DEA&DP, CapeNature and DEFF/DALRRD and monitoring should be allocated accordingly

5.2 Biodiversity Conservation

Strategic Objective 2: The biodiversity of the Rooiels River estuary is conserved.

Table 5: Management Objectives and Actions for Conservation

	Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
Management Objective 2.1: Enhance the protected area status of the Rooiels River estuary					
a.	Expand protected area to include Rooiels mouth and beach/ sand berm environment	ICMA, NEM: PAA, WC BRA	• Protected area expanded to include estuary mouth and beach / sand berm	HIGH	RMA, CapeNature, Kogelberg Biosphere Reserve Company (KBRC)
b.	Incorporate Rooiels EMP into BMC Protected Area Management Plan and KBR Plan	ICMA, NEM: PAA, WC BRA	• EMP included in management plans for the Kogelberg Area	HIGH	RMA, KBRC
c.	KBRC to include estuaries into the KBRC Marine Working Group	WC BRA, ICMA	• Estuarine management capacity established, and estuarine co-ordinator appointed	HIGH	RMA, KBRC
d.	Engage with landowners and stakeholders to encourage environmental custodianship on adjacent properties.	National Environmental Management Act (NEMA) (Duty of Care)	• Meeting with adjacent land owners convened • Signed agreements with land owners • Degraded areas rehabilitated • Integrity of estuarine margin improved	LOW	KBRC, Rooiels Conservancy

	Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
Management Objective 2.2: Ensure the conservation of estuarine habitats and indigenous species					
a.	Adopt, implement and enforce spatial zonation plan	ICMA, NEM: PAA, WC BRA	• Expansion of protected area • EFZ controls enforced and offenders prosecuted • No further permanent development in the EFZ (e.g. only new sacrificial infrastructure within EFZ permitted) • No infilling of EFZ • Reduced habitat loss/degradation and disturbance, and inappropriate behaviour/activities	HIGH	RMA, KBRC
b.	Develop and publish estuarine bylaws or regulations to support spatial zonation	MSA, ICMA	• Bylaws developed and gazetted	MEDIUM	RMA/ Overstrand LM
c.	Instate educational signage to promote conservation	WC BRA, NEM: PAA, NEM: BA	• Signage created and erected in key public spaces	LOW	KBRC, RMA
d.	Engage with landowners and stakeholders regarding sustainable land use activities	NEMA (Duty of Care), Land Use Planning Act (LUPA)	• Meeting with adjacent land owners convened • Signed agreements with land owners • Unsustainable land-use activities prevented • Integrity of estuarine margin improved	LOW	RMA, KBRC, Overstrand LM

5.3 Land-use and Infrastructure Planning and Development

Strategic Objective 3: Impacts associated with developments and proposed changes in land-use, including infrastructure and agriculture, are minimised.

Table 6: Management Objectives and Actions for Land-use and Infrastructure Planning and Development

	Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
Management Objective 3.1: Ensure appropriate and sustainable coastal development in and around the Rooiels River estuary, considering ecosystem services and sense of place					
a.	Incorporate Rooiels EMP into the BMC Management Plan and KBR Plan	ICMA, WC BRA, NEM: PAA	• EMP included in management plans for the Kogelberg Area and Heritage Site Management Plan	HIGH	RMA, KBRC
b.	RMA to adopt and incorporate EMP and spatial zonation plan into all municipal and relevant government department planning documents and processes (e.g. municipal IDP, SDF, zoning scheme & overlay, Water Use Licence (WUL) Applications, Environmental Impact Assessment (EIA) Applications)	MSA, LUPA, NEMA,	• EMP included in all relevant planning documents	HIGH	All authorities
c.	Ensure that all proposed developments adhere to the full suite of relevant environmental legislation	NEMA, NWA, NEM:BA, NEM: PAA, National Health Act (NHA)	• Inspections undertaken • New developments are compliant	HIGH	RMA, Overstrand LM
d.	Implement coastal management line and associated development controls	ICMA, LUPA, MSA	• No further permanent development, infilling or land transformation of EFZ in the EFZ (e.g. only new sacrificial infrastructure permitted)	HIGH	Overstrand LM, RMA, DEA&DP

	Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
			• Transgressors prosecuted • Corrective action undertaken • Reduced habitat loss/degradation and disturbance, and inappropriate behaviour		
e.	Use EAF as source of I&APs for Environmental Impact Assessments (EIAs)	MSA, LUPA, ICMA, NEMA	• EAF partakes in development planning affecting the estuary • Impacts on the estuary are mitigated/prevented	HIGH	RMA, Overstrand LM, Overberg DM, DEA&DP

5.4 Institutional and Management Structures

Strategic Objective 4: The Rooiels River estuary is well managed through effective co-operative governance.

Table 7: Management Objectives and Actions for Institutional and Management Structures

	Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
Management Objective 4.1: Ensure effective co-ordination of estuarine management responsibilities					
a.	Ensure incorporation of Rooiels EMP into BMC Management Plan to facilitate implementation of EMP	ICMA, NEM: PAA, WC BRA	• EMP and zonation plan adopted by RMA • EMP included in management plans for the Kogelberg Area	HIGH	RMA
b.	Undertake needs analysis and identify skills and equipment required	ICMA, NEM: PAA, WC BRA	• Needs and shortages identified • Motivation for acquisition drafted and approved • Equipment purchased and maintained	LOW	RMA
c.	Implement skills development, training or co-opt additional members / secondment for estuarine management	ICMA, NEM: PAA, WC BRA	• Motivation for training drafted and approved • Staff attend relevant accredited training courses • Memorandum of Understanding (MOU) to be developed for secondments	LOW	RMA
d.	Develop good communication protocols and processes with implementing agents (The RMA to develop working relationships with mandated department & agreements need to be developed to address each management action).	ICMA	• Project champions identified • Networks established, and contacts database compiled • Regular email correspondence	MEDIUM	RMA

	Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
e.	Source support and additional budget, and confirm budget allocation annually	ICMA, MSA, LUPA, NWA, NEM: PAA, Mineral Resource and Petroleum Development Act (MRPDA)	• An action plan for securing future funding drafted and approved • Funding secured for 5-year cycle	HIGH	All authorities
f.	Integrate estuary advisory forum (EAF) (or other applicable forum, e.g. protected area advisory forum) needs to KBRC Marine Working group platform to facilitate co-operative governance	ICMA, MSA, LUPA, NWA, NEM: PAA, MRPDA,	• EAF constituted (Membership includes representatives of government and stakeholders/civil society) • EAF meets on a quarterly basis • Meetings are minuted	HIGH	RMA
g.	Identify and invite missing stakeholders/ interest groups to partake in regional EAF	ICMA	• Networks established • Stakeholder database developed and regularly updated	HIGH	RMA
h.	EMC present on critical forums to ensure that estuarine issues are tabled, e.g. Catchment management agency (CMA), Water Users Association (WUA), Agriculture groups etc.		• EMC attendance at critical forum meetings • Meetings are minuted	HIGH	DEA&DP
i.	Monitor and report on the progress of EMP actions and achievements on annual basis as part of the CapeNature Governance Tool	ICMA	• Feedback received from participating agencies • Biannual and annual reporting to DEFF and EAF, undertaken by EMC • Action plans updated as and when required • CapeNature Governance Tool implemented	MEDIUM	RMA, DEA&DP

	Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
j.	Undertake formal 5-year review as prescribed by the 2013 NEMP	ICMA	• Motivation for updated EMP drafted, approved and funding confirmed • Terms of reference drafted • Consultants appointed • Plan updated	LOW	RMA
Management Objective 4.2: Define and enable co-operative governance					
a.	Identify and implement procedures to ensure cooperative governance between all gov. depts. with a mandate to act	ICMA, Inter-governmental relations Act (Act 13 of 2005)	• Roles and responsibilities defined and accepted via MOUs signed between RMA and spheres of government and participating agencies • Regional EAF meets on a quarterly basis • Meetings are minuted • Active collaboration of various implementing agents	HIGH	All authorities
b.	EAF to monitor performance of RMA in respect to implementation of plan	ICMA	• Authorities to provide formal feedback on mandated activities • Regional EAF meets on a quarterly basis	MEDIUM	All authorities, All stakeholders
c.	Individual agencies to identify and address training needs, with possible secondment to address training and capacity shortfalls	ICMA	• Motivation for training drafted and approved • Staff attend relevant accredited training courses • MOU to be developed for secondments	LOW	All authorities
d.	Individual agencies to allocate resources, create and fill posts (including project champions), and acquire necessary	MSA, NWA, ICMA, NEMA, NEM: PAA	• Need and Desirability investigation undertaken • Motivation for acquisition drafted and approved	LOW	All authorities

	Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
	infrastructure, resources and equipment of fulfil their mandates		• Equipment purchased and maintained • Project champion(s) for allocated management actions • Staff appraisals in terms of management actions and projects		
e.	Mandated authorities and participating agencies to confirm budget allocations for mandated activities/actions	MSA, NWA, ICMA, NEMA, NEM: PAA	• Formal feedback from authorities on mandated activities • Motivation for budget drafted and approved • Funding secured for 5-year cycle	LOW	All authorities

5.5 Socio-economic Considerations

<u>Strategic Objective 5</u>: Socio-economic benefits are enhanced and regulated to ensure sustainable use of the Rooiels River estuary and its resources.

Table 8: Management Objectives and Actions for Social-economic Considerations

	Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
Management Objective 5.1: Regulate recreational use of the estuary					
a.	Adopt, demarcate and enforce spatial zonation plan	ICMA, NEM: PAA, WC BRA	• Expansion of protected area • EFZ controls enforced and offenders prosecuted • Reduced habitat loss/degradation and disturbance, and inappropriate behaviour	HIGH	RMA / KBRC, Rooiels Conservancy
b.	Informative signage, indicating zonation and allowable activities, to be placed at strategic points	ICMA, NEM: PAA	• Signage created and erected in key public spaces	LOW	KBRC
c.	Develop Standard Operating Procedures (SOPs) to regulate high visitor numbers and minimise environmental disturbance/damage during peak season	ICMA, NEM: PAA, MSA	• SOP developed • SOP implemented as and when required • MOU signed between necessary parties	HIGH	RMA, Overstrand LM, Necessary authorities
Management Objective 5.2: Develop and regulate local livelihoods associated with the estuary					
a.	Investigate and implement alternate livelihoods that promote non-consumptive enterprises involving previously disadvantaged communities, which are compliant with all forms of legislation and planning frameworks	NEM: PAA	• Target groups identified • Potential alternatives identified • Sustainability study initiated • Community projects identified	LOW	RMA, KBRC Overstrand LM

5.6 Education and Awareness

<u>Strategic Objective 6</u>: Key ecological and estuarine usage indicators are monitored, whilst general public awareness is cultivated.

Table 9: Management Objectives and Actions for Education and Awareness

	Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
Management Objective 6.1: Promote high levels of public awareness and appreciation of the value of Kogelberg estuaries					
a.	Develop and effective education and awareness programme for residents and visitors to the Kogelberg coast	ICMA	• Education & awareness programme developed and implemented at schools and through interest groups • Increased educational opportunities at group gatherings, community meetings, conferences etc.	MEDIUM	KBRC
b.	Source and/or commission educational and informative material including signage, posters, pamphlets and webpage design	ICMA	• Educational signage erected at strategic points • Posters and pamphlets erected/ disseminated • Kogelberg estuaries webpage operational	MEDIUM	KBRC
c.	Engage and educate estuary users (including fishers/harvesters)	ICMA	• Reduction in illegal activities • Reduced habitat loss/degradation and disturbance, and inappropriate behaviour • Informative surveys/talks undertaken	LOW	KBRC Rooiels Conservancy, DEFF

5.7 Disaster Risk Management

<u>Strategic Objective 7</u>: Potential risks that could impact the Rooiels River estuary are reduced (inclusive of climate change impacts)

Table 10: Management Objectives and Actions for Disaster Risk Management

	Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
Management Objective 7.1: Disaster prevention and preparedness					
a.	Conduct and maintain a risk assessment portfolio and identify areas and infrastructure of potential concern (catchment/marine pollution, flooding, erosion, etc.)	Disaster Management Act (DMA) (Act 57 of 2002), NEMA, ICMA, NWA,	• Risk assessment portfolio compiled • High risk areas identified and included in relevant plans	HIGH	RMA, Overstrand LM
b.	Develop an integrated flood or drought disaster management plan (flooding, marine storm surge), including estuary early warning and monitoring system, and evacuation protocols, etc.		• Integrated drought and flood disaster management plan developed • Estuary risks and early warning system compiled • Emergency response networks established	HIGH	RMA, Overstrand LM, BGCMA
Management Objective 7.2: Mitigate areas of high risk					
a.	Identify, estimate costs, prioritise and rehabilitate areas of bank erosion, trampling, disturbed riparian vegetation (priority areas and hot spots).	NEMA, Western Cape Transport Infrastructure Act (WC TIA) (Act 1 of 2013)	• Priority areas needing rehabilitation identified • Degradation profiles compiled • Rehabilitation programme developed • Priority degraded areas restored	MEDIUM	Overstrand LM, KBRC, RMA

	Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
b.	Identify areas and infrastructure at risk of flooding and erosion, and include in relevant plans (e.g. regional disaster management plan)	DMA, WC TIA	• High risks and risk areas identified • Relevant plans updated with early warning and monitoring systems and evacuation protocols, and contingency plans for high erosion and flood risk areas.	HIGH	RMA, Overstrand LM, KBRC, WC Local Gov: Disaster Management
c.	Install and maintain appropriate defence for critical infrastructure	ICMA, NEMA, WC TIA	• Appropriate defence methods identified • Infrastructure protected	MEDIUM	Overstrand LM,

6 PROPOSED ZONATION OF ACTIVITIES

6.1 Introduction

Spatial zonation of activities on an estuary is necessary to avoid user conflict and to guide sustainable utilization of resources without degradation of the estuarine environment. The spatial zonation plan provides a means of geographically transposing the aims of the management objectives, where applicable, and is informed by the following (DEA, 2015):

- The geographical boundary of the estuary also indicating important habitats (e.g. floodplain, open water, reed beds, sandflats, etc.);
- The surrounding land uses and existing infrastructure;
- Areas designated for the conservation and protection of biodiversity;
- Appropriate buffers in which land use and development are strictly controlled and monitored; and
- Zones where certain types of activities (recreational, commercial, industrial, harvesting etc.) are permissible and others not permissible.

6.2 Habitat zones

A habitat sensitivity analysis is the baseline which guides the differentiation of the various zones, specifically identifying:

- threatened, ecologically important habitats as no-go or minimal disturbance zones;
- those areas which can support controlled, sustainable exploitation of marine living resources; and
- those areas where various forms and levels of appropriate water-based recreation are acceptable.

The habitat map shown in Figure 6 is used as the baseline for the identification of sensitive estuarine habitats and informs the zonation of activities in the Rooiels River estuary.

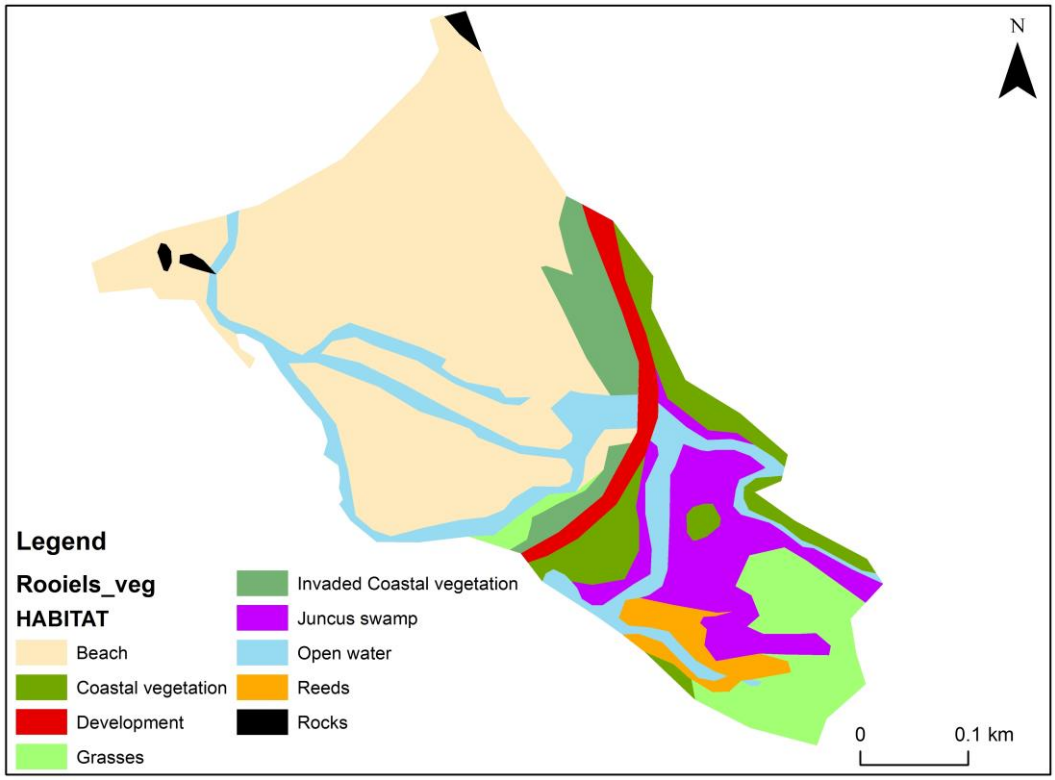

Figure 6: Habitats identified in the Rooiels River estuary

6.3 Legislated Coastal Boundaries and Buffer Zones

6.3.1 Estuarine Functional Zone

The ICMA defines an estuary as "*a body of surface water -*

a) that is permanently or periodically open to the sea;
b) in which a rise and fall of the water level as a result of the tides is measurable at spring tides when the body of surface water is open to the sea; or
c) in respect of which the salinity is higher than fresh water as a result of the influence of the sea, and where there is a salinity gradient between the tidal reach and the mouth of the body of surface water".

Similarly, the National Water Act (NWA) defines an estuary as "*a partially or fully enclosed water body that is open to the sea permanently or periodically, and within which the seawater can be diluted, to an extent that is measurable, with freshwater drained from land*".

However, the 2018 National Biodiversity Assessment provides a more detailed definition of an estuary, that is: "a partially enclosed permanent water body, either continuously or periodically open to the sea on decadal time scales, extending as far as the upper limit of tidal action, salinity penetration or back-flooding under closed mouth conditions. During floods an estuary can become a river mouth with no seawater entering the formerly estuarine area or, when there is little or no fluvial input, an estuary can be isolated from the sea by a sandbar and become fresh or even hypersaline" (SANBI 2019).

The EFZ is defined by the 2014 Environmental Impact Assessment (EIA) Regulations (as amended in 2017) (GN 324) as "the area in and around an estuary which includes the open water area, estuarine habitat (such as sand and mudflats, rock and plant communities) and the surrounding floodplain area", as defined by the 5 m topographical contour (referenced from the indicative mean sea level).

The 2013 NEMP acknowledges the EFZ as the geographical boundary of estuaries in South Africa. In practice, it is found that the 5 m topographic contour approximates the EFZ for most estuaries in South Africa. It is consequently commonly used to delineate the EFZ in the absence of specific biophysical assessments. Where biophysical information is available, the EFZ can be delineated according to the presence of estuarine vegetation or features such as wetlands that are directly supportive of the estuary. This approach informed the EFZ used in the 2018 NBA (SANBI, 2018) (refer to Figure 3).

6.3.2 Coastal Protection Zone and proposed Coastal Management Line

The Integrated Coastal Management (ICM) Act defines a default **Coastal Protection Zone (CPZ)** which, in essence, consists of a continuous strip of land, starting from the High Water Marks (HWM) and extending 100 m inland in developed urban areas zoned as residential, commercial, or public open space, or 1 000 m inland in areas that remain undeveloped or that are commonly referred to as rural areas. It also includes certain sensitive or at-risk land such as estuaries, littoral active zones and protected areas.

The Provincial Member of the Executive Council (MEC), in consultation with the Local Municipalities, is required to refine and formally adopt the CPZ. A process is currently underway to formally establish a CPZ for the Western Cape Coastline. In accordance with provisional delineation of the CPZ for estuaries in the Overberg, as per draft delineations recommended in the Coastal Set-back / Management Lines for the Overberg District project (WCG, 2015), the CPZ is informed by a coastal risks zone approximated by the **10 m above mean sea level (amsl) contour or 1:100 year floodline** around an estuary, whichever is wider.

The ICMA also provides for the establishment of a **Coastal Management Line (CML)**, designed to limit development in ecologically sensitive or vulnerable areas, or an area where dynamic natural processes pose a hazard or risk to humans. A CML, as envisaged by the amended ICM Act, is informed by the projections of risk emanating from dynamic coastal processes such as sea level rise or erosion, information on ecological or other sensitivities adjacent to the coast, as well as the location and extent of existing development and existing executable development rights. The CML is a continuous line, seawards of which lies:

- Areas of biophysical or social sensitivities such as sensitive coastal vegetation identified as priority conservation areas and formal protected areas,
- those areas that should be left undeveloped, or only be granted appropriately restricted development rights, due to a high risk from dynamic coastal processes, or
- coastal public property.

In estuaries, the CML is delineated by the 5 m amsl contour or 1:100 year floodline, whichever is wider, to differentiate a zone where formal development should be discouraged. The coastal boundaries for the Rooiels River estuary are illustrated in Figure 7.

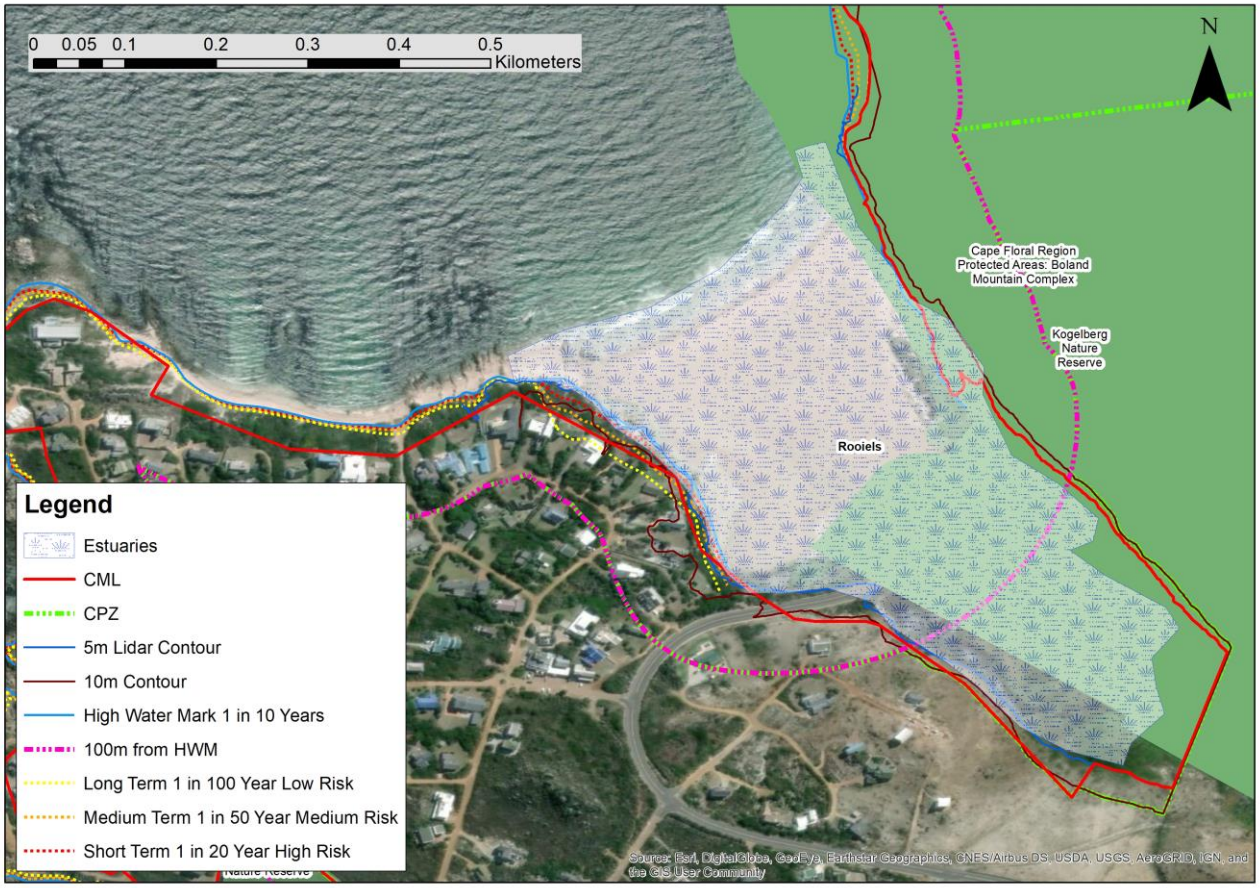

Figure 7: Coastal boundaries of the Rooiels River estuary and risk projections (WCG, 2015)

6.3.3 Boland Mountain Complex Protected Areas

The BMC encompasses the Hottentots-Holland Mountain Range component of the CFR World Heritage Site. It comprises eight core protected areas supported by a network of conserved areas ranging from Provincial Nature Reserves to Mountain Catchment Areas. Kogelberg Nature Reserve (Figure 8) is the component of the BMC is situated between Sir Lowry's Pass and Bot River in the north and Hangklip and Bot River Estuary in the south (CapeNature, 2012). The nature reserve falls within the Cape Floristic Kingdom biodiversity hotspot and forms and integral part of the core area of the KBR. It is under the administration of CapeNature.

The estuary and its catchment are protected under the BMC and the KBR. The boundaries of the BMC are implicated in the designation of the RMA.

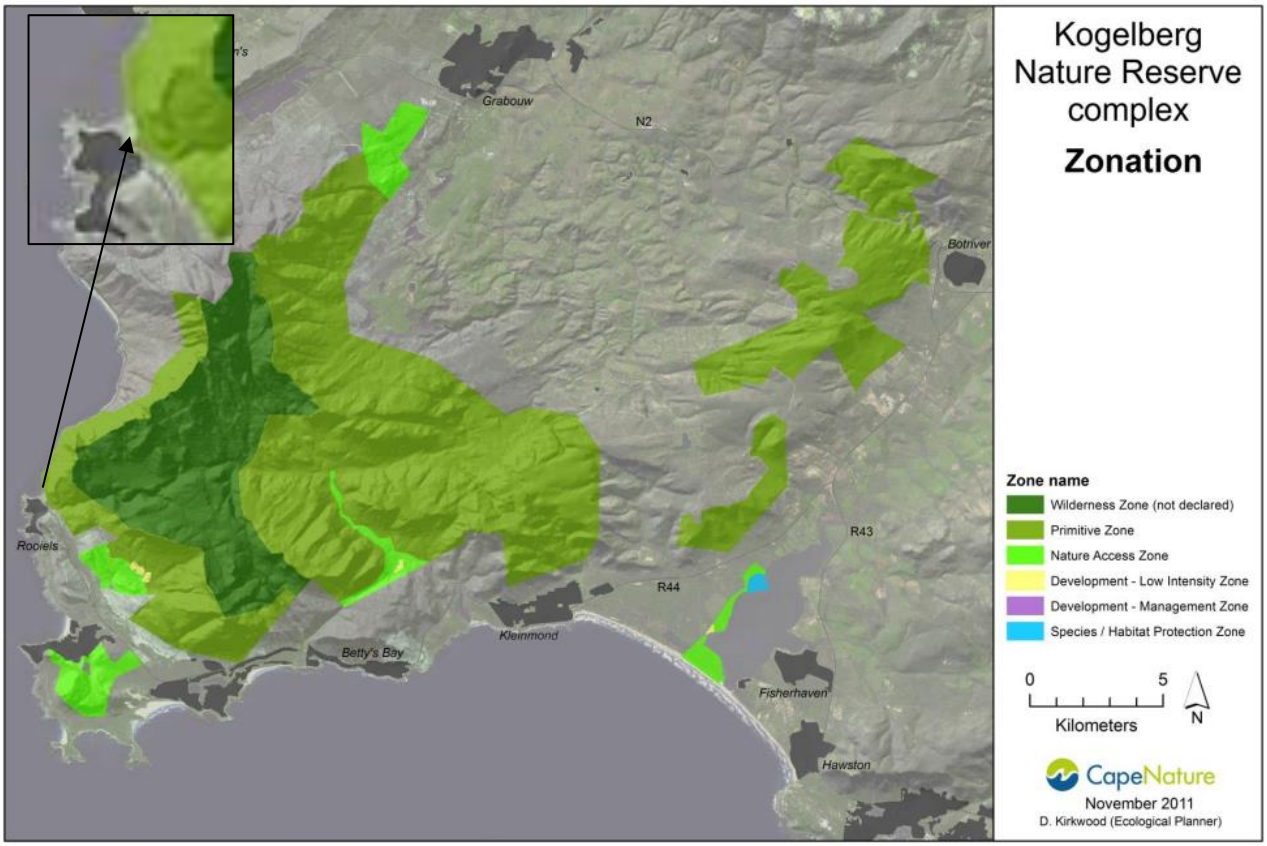

Figure 8: Location and extent of the Kogelberg Nature Reserve with detail of Rooiels River estuary (CapeNature, 2012)

6.3.4 Environmental Impact Assessment regulatory line

In respect of the EIA regulatory scheme, an additional line called the Development Set-Back Line (DSL) needs to be differentiated as it relates to the 'development set-back' referred to in the EIA regulations[3] rather than the coastal management lines described in the ICM Act. However, as part of the on-going process of defining coastal management lines for the Western Cape, it is currently **proposed that the CML, as defined under ICMA, also be used as the DSL**.

Reference to development set-backs is found in the EIA Listing Notices that list a range of activities that require different levels of environmental impact assessment and the issuing of an environmental authorisation prior to being undertaken.

Typically, an activity would be listed in the form of a range of thresholds which, if exceeded, trigger the need for an environmental impact assessment in the form of a Basic Assessment or EIA. In some cases, however, a development set-back line is used as spatial reference to include or exclude activities. The EIA regulations indicate that: "*development setback" means a setback line defined or adopted by the competent authority*". This implies that if

[3] The Environmental Impact Assessment Regulations, 2014 (as amended in 2017), published under Government Notice No. 326 in Gazette No. 40772 of 4 April 2017, in terms of sections 24(5) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998)

such a setback is defined, the setback delineation replaces the default parameters for an activity, as read within the context of that activity. The competent authority in the Western Cape is DEA&DP or the National Department of Environmental Forestry and Fisheries.

The EIA regulations also refer to whether a development is in front or behind the line – for a coastal development set-back this equates to any development seaward of the line being 'in front of', whilst landward of the line being 'behind'.

An important further point to note is that the development set-backs are usually linked to the presence of urban built-up areas. The regulations indicate that ""*urban areas*" *means areas situated within the urban edge (as defined or adopted by the competent authority), or in instances where no urban edge or boundary has been defined or adopted, it refers to areas situated within the edge of built-up areas*". These exclusion areas create *de facto* islands in the area below the DSL, within which the specifically excluded EIA triggers don't apply.

The Western Cape Government, as designated competent authority, considers the area below/seaward of existing development as falling outside of the 'built-up area'. Therefore, any exclusions based on a listed activity taking place within the built-up area would not apply to this strip of coastal land, and the prescriptions for environmental assessments related to the particular activity will apply. For example, the beach in front of seafront houses is not considered 'built-up' and environmental authorisations will be required to execute any listed activities on that beach.

6.4 Zonation of Activities

6.4.1 Current zonations and uses

The table below (Table 11) lists the surrounding land use types as per the Overstrand Municipal Town Planning Scheme (Figure 9), and activities occurring in and/or adjacent to the Rooiels River estuary.

Table 11: Current zonations and activities occurring in and/or adjacent to the Rooiels Estuary

LAND USE	DESCRIPTION
Agriculture (Kogelberg Nature Reserve -Primitive Zone)	The northern shoreline and the area from just below the road bridge extending into the catchment is zone as agriculture. This area falls within the Kogelberg Nature Reserve and KBR and is considered a sanctuary (no-take) zone. *Note the exclusion of the beach / sand berm from both agriculture and open space zone 1*.
Open Space Zone 1: Nature Reserve	A large portion of the coastline and the vast majority southern bank of the estuary is deemed nature reserve and thus affords the estuary some protection outside of the protected area.
Residential	Numerous residential and holiday establishments of the town of Rooiels are located on the southern bank

LAND USE	DESCRIPTION
Transport	R44 coastal road bridge, numerous residential roads
Undetermined	Land on the southern bank in the upper reaches, above the estuary and around Rooiels has no determined land use type
ACTIVITIES	
Fishing	Limited recreational angling up to the road bridge
Bait harvesting	Limited sand prawn pumping on southern bank at corner of the bridge
Swimming	Limited swimming associated with beach amenity, and up to road bridge
Beach-based recreational activities	Sunbathing, picnicking etc. on the expansive beach / sand bar

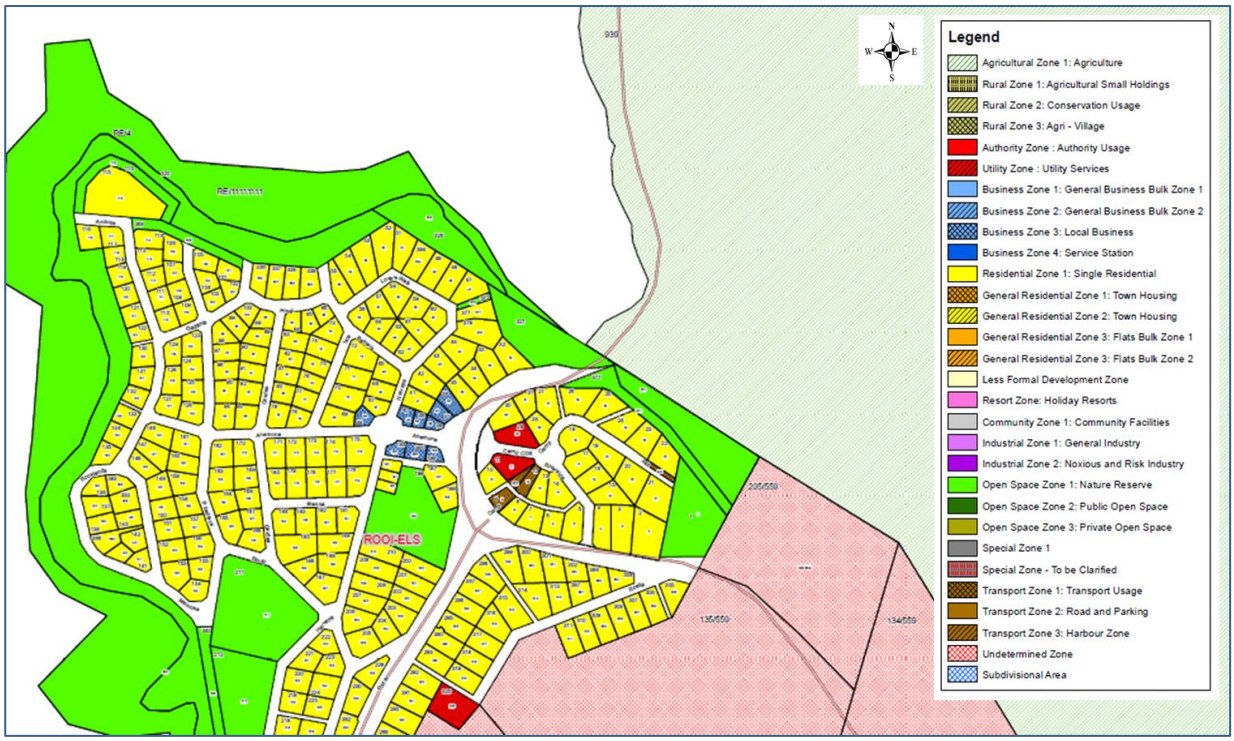

Figure 9: Extract of the Overstrand Municipality Town Planning Scheme for Rooiels

6.4.2 Proposed spatial zonation

Zonation of the Rooiels River estuary is informed by the zonation of the Kogelberg Nature Reserve (CapeNature, 2012) and CapeNature prescriptions apply. The proposed zonation includes a Primitive Zone and a Nature Access Zone (Figure 10). Should the lower portion of the estuary be absorbed in the Kogelberg Nature Reserve, this will need to be reflected in the Overstrand Municipal Town Planning Scheme, whereby the Rooiels estuarine area will need to be re-zoned to reflect a single zonation type, i.e. Open Space Zone 1 Nature Reserve.

6.4.2.1 Primitive Zone

By virtue of the Kogelberg Nature Reserve, the area above the R44 road bridge is zoned as Primitive (CapeNature, 2012). The objectives of this zone are as follows:

- To limit visitor use, numbers and infrastructure to minimise impact in sensitive environments;
- To reduce need for management of users and visitor impacts; and
- Allows for minimal or more intensive biodiversity management intervention.

6.4.2.2 *Nature Access Zone*

The area below the R44 road bridge is proposed to be zoned as Nature Access. This is to reflect the current use as a popular recreational area for nearby residents and visitors, specifically during peak holiday periods. According to the Kogelberg Nature Reserve zonation scheme, the objectives of this zone are as follows:

- To manage and direct visitor use, and plan infrastructure to minimise impact on sensitive environments;
- To actively manage users and visitor impacts; and
- Allows for minimal or more intensive biodiversity management intervention.

Allowable activities in these zones are to be managed as per Table 12 below. Formal development or construction activities in either zone are to be regulated according to the EIA Regulations and any future controls emanating from the Provincial determination of coastal management lines.

Table 12: Proposed zonation prescriptions for the Rooiels River estuary*

ZONE/USE	CONDITIONS OF USE	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITY	ENFORCEMENT
PRIMITIVE ZONE (existing CapeNature zonation)	• Guided or unguided nature observation • Primarily intended for hiking or walking access (i.e. no water-based craft, motorised or unmotorised) • Visitor access only by permit (i.e. no access without permit) • Control of visitor numbers, frequency and group sizes to meet zone objectives. • Defined or non-defined hiking and day trail routes. • On foot always. Bicycle, 2x4 or 4x4 vehicle, or horseback on designated routes only. • Fishing/ harvesting subject to approval by CapeNature. • No development within the EFZ. See Plan for further details on Primitive Zone.	NEM: PAA	CapeNature	CapeNature
NATURE ACCESS	• Guided or unguided nature observation. • Day hiking trails and/or short trails. • Bird hides, canoeing, mountain biking & rock-climbing where appropriate. • No special access control or permits required. • Vehicle access on designated routes, with pedestrian access from parking areas or adjacent development zones. • No accommodation or camping. • Frequent interaction with other users.	NEM: PAA	CapeNature	CapeNature

ZONE/USE	CONDITIONS OF USE	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITY	ENFORCEMENT
	• On water – only non-motorised craft permitted (e.g. canoeing), unless specifically noted. • Fishing/ harvesting subject to approval by CapeNature and possession of an appropriate permit. See Plan for further details on Nature Access Zone.			

*Extracted from Kogelberg Nature Reserve Complex Management Plan (CapeNature, 2012). See plan for additional details.

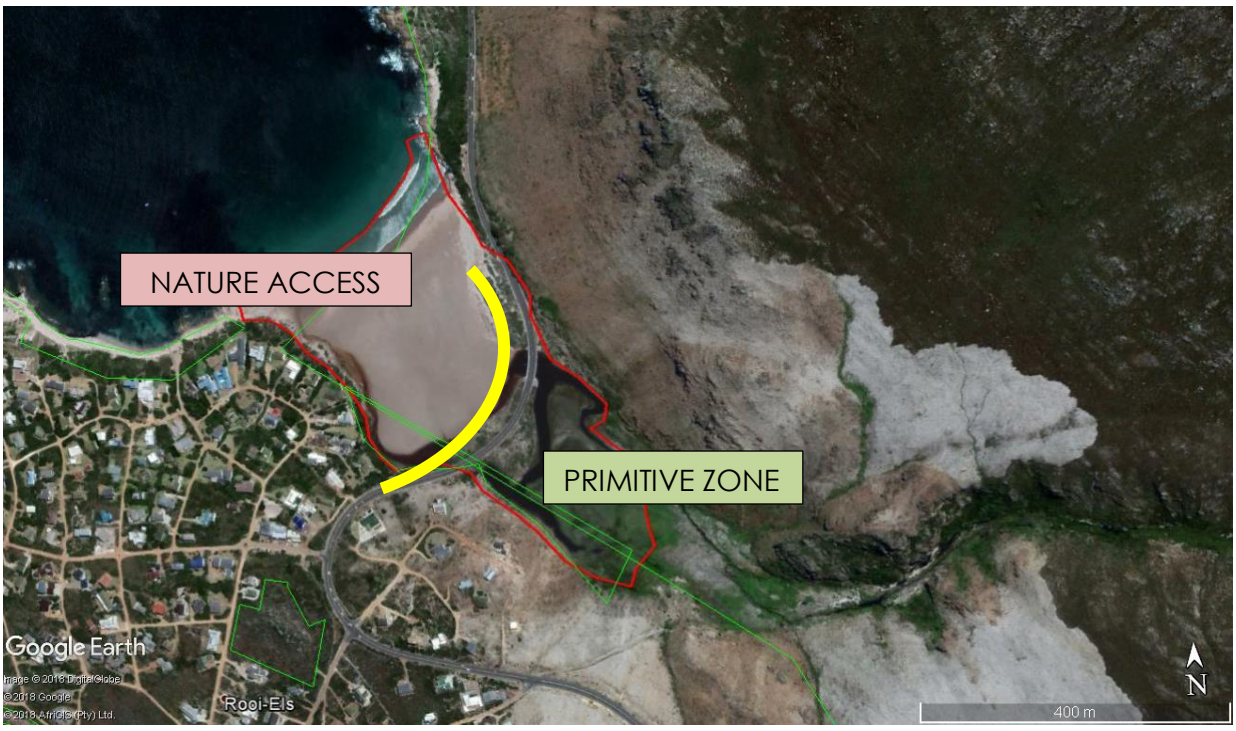

Figure 10: Proposed zonation of the Rooiels River estuary

6.4.3 Areas requiring rehabilitation

The vegetated areas west of the road bridge are priority areas for rehabilitation in terms of invasive alien vegetation removal.

There are several (informal illegal) access routes through the narrow dune cordon arising from the developments on the southern bank which require closure and rehabilitation. Illegal/informal access from the R44 down into the EFZ needs to be investigated and eroded areas rehabilitated as required. Although not within the EFZ, erosion at the car park on the northern bank and other vehicular stopping points along the R44 must be similarly addressed.

7 INTEGRATED MONITORING PLAN

According to the standards for estuarine management, management actions should be based on sound scientific evidence. Thus, monitoring is a crucial aspect of the adaptive estuarine management planning process as the generated data will be used to inform and update management decisions. However, the collection, processing and interpretation of such data, particularly ecological data, are generally costly and time-consuming and often require considerable scientific expertise.

In the context of estuarine management, there are three broad categories of monitoring which should be incorporated into an integrated monitoring plan, namely resource monitoring, compliance monitoring and performance monitoring (DEA, 2015). These components are discussed in the following sections.

7.1 Resource Monitoring

7.1.1 Current Resource Monitoring

A basic water quality monitoring programme funded by the BGCMA is currently in place for the Rooiels River estuary and all water quality data collected is submitted to the Overberg District. It is strongly recommended that this monitoring programme is maintained, and the data stored and utilised to inform the future management of the Rooiels River estuary.

7.1.2 Recommended Resource Monitoring Programmes

In the context of the Rooiels River estuary, general baseline information is generally lacking. The recommended minimum monitoring requirements as prescribed by Breede-Gouritz Water Classification Study (DWS, 2017) to ascertain impacts of changes in freshwater flow, and current and future impacts on the estuary and/or any improvement or reductions therein are listed in Table 13 (Appendix 1). The purpose of recommended long-term monitoring programme, is also to test for compliance with Ecological Specifications (Ecospecs) and to continuously improve understanding of ecosystem function. Recommended baseline monitoring requirements to improve the confidence of the reserve determination are listed in Table 14 (Appendix 1).

7.1.3 Resource Quality Objectives / Ecological Specifications

Resource Quality Objectives (RQOs) or Ecological Specifications (EcoSpecs) are clear and measurable specifications of ecological attributes (in the case of estuaries - hydrodynamics, sediment dynamics, water quality and different biotic components) that define a specific ecological category, in the case of the Rooiels River estuary, a Category A. The EcoSpecs, are presented in Table 15 (Appendix 2) (DWS, 2018).

7.2 Compliance Monitoring

Compliance monitoring refers to the monitoring of the type and intensity of uses/activities and developments within an estuary, i.e. the EFZ. Such monitoring is usually prescribed in relevant legislation, regulations, policies, standards, guidelines and or permits and license agreements (DEA, 2015). The purpose of this form of monitoring is to test whether activities are compliant with the established limits and objectives as well as to detect growing pressures on resources.

By and large, compliance monitoring will be the responsibility of CapeNature, and will be undertaken according to legislation and policies applicable to protected areas (CapeNature, 2018) and by means of law enforcement and compliance monitoring protocols and enforcement operational plans internal to CapeNature.

It is recommended that a scheduled compliance/law enforcement programme be developed, beginning with frequent patrols to ascertain degree and timing of estuary use (e.g. holiday periods), and then modified based on the findings.

Compliance monitoring should include:

- Number of fishers;
- Number of harvesters;
- Species targeted and catch volume;
- Gear utilised; and
- Number of offences, arrests and convictions for contravening regulations stipulated in the Marine Living Resources Act (No 18 of 1998).

The following guiding principles are extracted from the Kogelberg Nature Reserve Complex Management Plan (CapeNature, 2012):

- Reserve Management and personnel will ensure that all law enforcement actions are executed in a fair, reasonable and objective manner, with due respect for Human Rights and in accordance with applicable Law;
- Reserve Management and personnel will identify and prioritise sensitive areas and species and prioritise law enforcement patrols accordingly, in order to ensure that resources are allocated in the most efficient and effective manner;
- Reserve Management and personnel will partner with local law enforcement role-players, such as South African Police Service (SAPS), local authorities and Oceans and Coasts, in order to effectively utilise resources to combat biodiversity crime within the protected area; and
- Reserve Management will liaise with adjacent communities, in conjunction with relevant components, in order to identify and prioritise areas of natural and cultural heritage significance, in order to effectively manage impacts and to prevent illegal activities in these areas.

7.3 Performance Monitoring (Review & Evaluation)

A performance monitoring plan is used by the RMA, and/or identified implementing agents, to assess the effectiveness with which planned management activities contained in the EMP are being performed and ultimately to gauge progress in achieving the vision and objectives. This component utilises the performance indicators included for the various actions, specifically the management priorities, and includes a temporal scale or the frequency of the collection of the performance data and the targets that should be achieved. CapeNature has developed a Governance Tool to address this field.

Ultimately the EMP must be holistically reviewed every 5 years from the date it was adopted, ideally in line with the review cycles of the applicable IDP, SDF and/or CMP. This review is the responsibility of the RMA. According to the 2013 NEMP this review should include an assessment of:

- The effectiveness of the EMP and success with meeting the objectives (i.e. the performance monitoring plan);
- Environmental changes at a local or a wider scale that could affect the estuarine resources or the implementation of the EMP; and
- Changes (if any) to legislation, land-use planning, goals or policies that may require the EMP to be amended.

This review may involve revisiting the SAR to determine the progress or changes that have come about because of the EMP in terms of the objectives that were originally set. It may also require the EMP to be amended, including a revision of the objectives, amendments to the management actions, and/or monitoring protocols. Ideally, representatives and experts in the major sectors (e.g. water quantity and quality, land-use and infrastructure planning and development), should evaluate the efficiency of the EMP in the context of their mandate or area of expertise. Public participation will be required before the amended EMP can be approved.

Table 16 in Appendix 3 provides the performance monitoring plan relative to the proposed management priorities.

8 INSTITUTIONAL CAPACITY & ARRANGEMENTS

It is essential that this EMP is regarded as a strategic plan that can guide the detailing of management actions and identification of implementing agents. Therefore, it does not specify the required resources (human and financial) required for effective management of the estuary. It does, however, offer a schedule or phased planning approach that incorporates capacity building and implementation at the local level over a five-year period. It is crucial that champions/project leaders/teams are identified who will be responsible for the formulation of detailed project plans and the implementation thereof.

8.1 Key Role Players

Co-management and effective governance have been identified as vital aspects to the efficient and effective management of the Rooiels estuarine system. Figure 11 displays the key role players that should be included in its management.

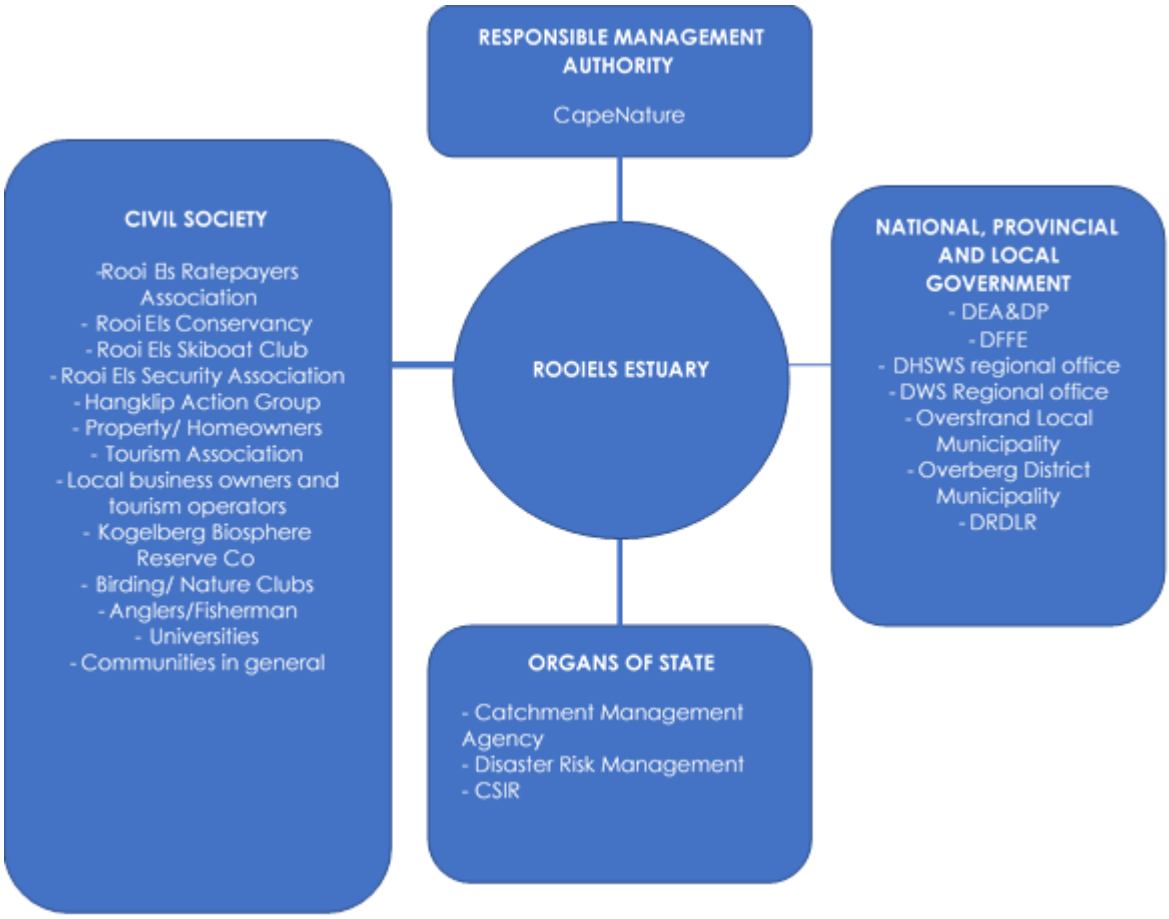

Figure 11: Key role players for the management of the Rooiels River estuarine system

8.2 Responsible Management Authority

According to the 2013 NEMP, the RMA responsible for the co-ordination of the implementation of the Rooiels River EMP, is CapeNature by virtue of the estuary's location within the Kogelberg Nature Reserve, where CapeNature is legally responsible for the management thereof. **It is noted that in the proposed amendments to the 2013 NEMP, such responsibilities remain allocated to the applicable conservation authority, in this case CapeNature, in respect to estuaries in protected areas or part of a protected area expansion strategy**. Ultimately the role of the RMA must be designated through formal signed agreement.

Effective implementation of this EMP requires the augmentation of capacity within CapeNature, with the recommended appointment of a regional estuarine management co-ordinator (EMC) within DEA&DP. This individual will play a pivotal co-ordinating role for all other implementing agencies as well as CapeNature departments (e.g. Scientific Services).

There is an additional and existing support structure within the Kogelberg Biosphere Reserve Company (KBRC), advised by a strong technical management committee and funded by DEA&DP. The appointment of a regional EMC could alternatively be explored and promoted within this structure.

Specific implementation actions identified in this EMP remain the responsibility of mandated government agencies as well as respective departments within the RMA. As an example, the DWS will monitor water quality, while fisheries compliance issues are devolved to CapeNature within the protected area. It is crucial that champions/project leaders/teams are identified who will be responsible for the formulation of detailed project plans and the implementation thereof.

Progress towards achieving the objectives set out in this EMP should be reviewed on an annual basis by the RMA and communicated to stakeholders as well as to DEA&DP and DEFF via an annual report. This EMP will need to be revisited and updated after five years to reflect goals that have been achieved and to accommodate changing priorities.

8.3 Government Departments and Organs of State

The key to successful implementation of this EMP is the commitment and contribution of all spheres of government to the process, including:

- CapeNature as RMA; who is also responsible for general conservation in the region, including the Kogelberg Nature Reserve, biological monitoring, compliance management and facilitating rehabilitation;
- Overstrand Local Municipality: responsible for providing key municipal services, as well as the provision of management, technical and legislative support;

- Overberg District Municipality: Responsible for issues relating to water and sanitation, disaster management as well as the provision of management and technical support;
- Western Cape Government departments: Responsible for legislatively mandated responsibilities as well as support, including compliance, funding, and monitoring (e.g. DEA&DP, Department of Transport and Public Works, etc.);
- Relevant National government departments, especially DEFF, DWS (via the regional office), Department of Agricultural, Land Reform and Rural Development (DALRRD); and Department of Science and Technology (DST); and
- Organs of State: e.g. BGCMA, Council for Scientific and Industrial Research (CSIR), SAHRA.

A crucial element towards achieving the vision and objectives of this plan, now and in future, is to ensure that the responsible authorities and their constituent departments, fulfil their roles and responsibilities as identified within the EMP. In terms of practical implementation of the EMP, each responsible government department is required to produce internal project plans linked the identified management actions, and in line with their legislative mandates (See below). Funding and staff resources will need to be sourced within each respective sector department and/or institute. Alternatively, departments may fund other entities to undertake their necessary functions on their behalf.

The DEFF is generally responsible for national standardisation of estuarine management and approval of provincially-compiled estuarine management plans. Direct involvement in individual estuaries will occur via existing forums for intergovernmental coordination. These forums will have the estuarine management on their agendas, and include:

- The Overberg Municipal Coastal Committee: Responsible for facilitating co-management, effective governance and district level co-ordination of coastal and estuarine management issues; and
- Western Cape Provincial Coastal Committee: Responsible for facilitating co-management and effective governance and provincial co-ordination of estuarine management.

8.3.1 Project Plans for Implementation

Effective implementation of this EMP requires the conversion of the priority actions into detailed project plans, which must be prepared and adopted into the respective departmental implementation strategies. A template for such project plans is provided in the EMP Development Guideline (DEA, 2015) and is attached as Appendix 4 for ease of reference. This template can also be utilised to facilitate the implementation of other projects proposed in the EMP.

8.4 Estuary Advisory Forum

While the establishment of an EAF for each estuary is no longer a requirement in the 2013 NEMP, the Western Cape Government still support their establishment and recommend that private entities and non-government organisations continue to play a supporting role in the

implementation of this EMP. While an individual EAF is not recommended, the establishment of a regional EAF is supported, incorporating the estuaries of the Kogelberg area, namely the Rooiels, Buffels, Palmiet and Bot/Kleinmond estuaries. The existing Kogelberg Biosphere Reserve Marine Working Group can provide this communication platform.

Government departments should be represented on this regional EAF by delegates mandated by the respective department to do so. Each government representative on the EAF will be tasked to convey recommendations to his/her department and report back to the EAF on behalf of the department. Moreover, representatives from the authority/ies who have executive powers within the specific sector should also be present. This ensures that recommendations are executed, and resources are made available for priority tasks or activities. This also streamlines the flow of information and decreases the turnaround time of required interventions. The various local members of the EAF will play an invaluable role in providing on the ground, local insight and support to the various authorities as well as to the RMA.

9 RECOMMENDATIONS AND CONCLUSION

The following items/issues are considered critical towards the ultimate achievement of the vision and should be immediately addressed and/or receive greatest effort in respect to human/financial resources:

- Protected area expanded and proposed zoning reflected in the Overberg Municipal Town Planning Scheme;
- The vegetated areas to the west of the road bridge cleared and kept clear of alien invasive vegetation;
- Informal illegal access routes to be closed and rehabilitated; and
- The DEA&DP to consider the appointment of a Regional estuarine management co-ordinator/champion within either DEA&DP or CapeNature.

In conclusion, this plan adopts the principle of adaptive management and presents an integrated and holistic approach to addressing not just the impacts but also the social and economic drivers that affect estuarine health. The actions proposed in this EMP reflect an ongoing process of implementation and should accommodate potential amendment due to changing circumstances. They are the first steps of a long-term process designed to secure ongoing and sustainable improvements to the current situation.

10 REFERENCES

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APPENDIX 1: RECOMMENDED MONITORING PROGRAMMES

Table 13: Recommended minimum requirements for long-term monitoring (Priority: Red = High; Orange = Medium, Yellow = Low) (DWS, 2017)

COMPONENT	MONITORING ACTION	TEMPORAL SCALE (FREQUENCY AND WHEN)	SPATIAL SCALE (NO. STATIONS)	PRIORITY
Hydro-dynamics	Record estuary water levels.	Continuous	In main water body	
	Satellite photographs of estuary (30x 30 m).	Every 3 years	Entire estuary	
Sediment dynamics	Bathymetric surveys: Series of cross-section profiles and a longitudinal profile collected at fixed 100-200 m intervals, but in more detail in the mouth. The vertical accuracy should be about 5 cm.	Every 3 years	Entire estuary	
	Set sediment grab samples (at cross section profiles) for analysis of Particle Size Distribution (PSD) and origin (i.e. using microscopic observations).	Every 3 years (with invert sampling)	Entire estuary	
Water quality	Water quality (e.g. system variables (e.g. pH, oxygen, turbidity), nutrients and toxic substances) measurements in Groundwater entering the head of the estuary.	Monthly continuous	Close proximity to head of estuary	
	In situ salinity and temperature observations.	Continuous	In main water body (1 to 3 stations)	
	Longitudinal salinity and temperature profiles (in situ) collected over a spring and neap tide during high and low tide at: • End of low flow season (i.e. period of maximum seawater intrusion). • Peak of high flow season (i.e. period of maximum flushing by river water).	Every year at end of dry season	Entire estuary (3-5 stations)	
	Water quality measurements (i.e. system variables, and nutrients) taken along the length of the estuary (surface and bottom samples).	Seasonal surveys, every 3 years	Entire estuary (3-5 stations)	
	Measurements of organic content and toxic substances (e.g. trace metals and hydrocarbons) in sediments along length of the estuary, where considered an issue.	Every 6 years	Focus on sheltered, depositional areas	
	Water quality (e.g. system variables, nutrients and toxic substances) measurements on near-shore seawater.	Use available literature	Seawater adjacent to estuary mouth at salinity 35	
Microalgae	Record relative abundance of dominant phytoplankton groups, i.e. flagellates, dinoflagellates, diatoms and blue-green algae.	Summer survey every 3 years	Entire estuary	
	Chlorophyll-a measurements taken at the surface, 0.5 m and 1 m depths, under typically high and low flow conditions using a recognised technique, e.g. HPLC.	Summer survey every 3 years	Entire estuary	
	Intertidal and subtidal benthic chlorophyll-a measurements.	Summer survey every 3 years	Entire estuary	

COMPONENT	MONITORING ACTION	TEMPORAL SCALE (FREQUENCY AND WHEN)	SPATIAL SCALE (NO. STATIONS)	PRIORITY
Macrophytes	Ground-truthed maps to document changes in macrophyte habitats over time. Document area covered by sensitive habitats i.e. submedged macrophytes.	Summer survey every 3 years	Entire estuary	
	Record number of macrophyte habitats, identification and total number of macrophyte species, number of rare or endangered species or those with limited populations documented during a field visit.	Summer survey every 3 years	Entire estuary	
	Note extent of macroalgal blooms, floating aquatic macrophytes and area occupied by invasive vegetation.	Summer survey every 3 years	Entire estuary	
	Take measurements of depth to water table	Summer survey every 3 years	Upper reaches	
Invertebrates	Record species and abundance of zooplankton, based on samples collected across the estuary.	Summer survey every 3 years	Entire estuary (3-5 stations)	
	Record benthic invertebrate species and abundance, based on subtidal and intertidal grab samples at a series of stations up the estuary, and counts of hole densities.	Summer survey every 3 years	Entire estuary (3-5 stations)	
	Measures of sediment characteristics at each station.	Summer survey every 3 years	Entire estuary (3-5 stations)	
Fish	Record species and abundance of fish, based on seine net sampling.	Summer survey every 3 years	Entire estuary (3-5 stations)	
Birds	Undertake counts of all water associated birds, identified to species level.	Annual winter (Jul/Aug) and summer (Jan/Feb) surveys	Entire estuary	

Table 14: Generic baseline surveys to improve confidence in the preliminary reserve determination of estuaries (Priority components are highlighted) (based on DWS, 2015)

Monitoring action	Temporal Scale (frequency and timing)	Spatial Scale (Number of stations)
Hydrology		
For larger systems record river inflow at head of estuary (smaller systems hydrology to be simulated every 10 years).	Continuous.	Install recorder near head of estuaries.
Hydrodynamics		
Record water levels Large system (permanent recorder DWS levelled to mean sea level). Smaller systems (small in situ probe).	Continuous.	Near mouth.
Aerial photography (or using high resolution satellite imagery i.e. 5x5 m pixel size, e.g. Google Pro or BirdEye).	Once-off.	Entire estuary.
Sediment dynamics		
Monitoring berm height using appropriate technologies.	Quarterly.	Mouth.
Bathymetric surveys: Series of cross section profiles and a longitudinal profile collected at fixed 500 m intervals, but in more detail in the mouth including the berm (every 100 m). Vertical accuracy at least 5 cm.	Once-off.	Entire estuary.
Collect sediment grab samples (at cross section profiles) for analysis of particle size distribution and organic content (and ideally origin, i.e. microscopic observations).	Once-off.	Entire estuary.
Water quality		
Electrical conductivity, pH, inorganic nutrients and organic content (e.g. Total P and Kjeldahl N) in river inflow (preferably also suspended solids and temperature).	Monthly (as in DWS monitoring programme).	Include monitoring station near head of estuary.
Salinity and temperature profiles (and any other in situ measurements possible e.g. pH, DO, and turbidity).	Quarterly, preferably for two years.	Along entire length of estuary (at least three stations covering all zones).
Inorganic nutrient concentrations (together with above).	Quarterly, preferably for two years.	Along entire length of estuary (at least three stations covering all zones).
Measure pesticides/herbicides and metal accumulation in sediments (for metals investigate establishment of distribution models – refer to Newman and Watling, 2007)	Once-off.	Entire estuary, including depositional areas (i.e. muddy areas).

Monitoring action	Temporal Scale (frequency and timing)	Spatial Scale (Number of stations)
Microalgae		
Record relative abundance of dominant phytoplankton groups, i.e. flagellates, dinoflagellates, diatoms, chlorophytes and blue-green algae. Chlorophyll-a measurements taken at the surface, 0.5 m and 1 m depths, under typically high and low flow conditions using a recognised technique, e.g. spectrophotometer, HPLC or fluoroprobe. Intertidal and subtidal benthic chlorophyll-a measurements (four replicates each) using a recognised technique, e.g. sediment corer or fluoroprobe.	Quarterly preferably for two years.	Along length of estuary minimum five stations.
Macrophytes		
Map area covered by different macrophyte habitats using recent imagery. Conduct field survey to record total number of macrophytes habitats, identification and total number of macrophytes species, number of rare or endangered species, or those with limited populations. Assess extent of invasive species in EFZ. Where there are salt marsh areas greater than 1 ha measure % plant cover along elevation gradient. Sediment samples collected along the transect and analysed in the laboratory for sediment moisture, organic content, EC, pH and redox potential. In the field measure depth to water table and ground water salinity	Once-off, in summer.	Entire estuary (mapping). Where there is salt marsh (minimum three transect sites).
Invertebrates		
Collect duplicate zooplankton samples at night from mid-water levels using WP2 nets (190 µm mesh) along estuary Collect sled samples (day) at same zooplankton sites for hyper benthos (190 µm) Collect grab samples (five replicates) (day) from the bottom substrate in mid-channel areas at same sites as zooplankton (each sample to be sieved through 500 µm). Intertidal invertebrate hole counts using 0.25 m2 grid (five replicates per site). Establish the species concerned *(C. kraussi* or *U. africana*) using a prawn pump. Collect sediment samples using the grab for	Quarterly, preferably for two years.	Minimum of three sites along length of entire estuary. For hole counts –three sites in each of muddy or sandy areas.

Monitoring action	Temporal Scale (frequency and timing)	Spatial Scale (Number of stations)
particle size analysis and organic content (at same sites as zooplankton) (preferably link with sediment dynamics).		
Fish		
Record species and abundance of fish, based on seine net and gill net sampling. Sampling with a small beam trawl for channel fish should also be considered. Seine net specifications: 30 m x 2m, 15 mm bar mesh seine with a 5 mm bar mesh with a 5 mm bar mesh 5 m either side and including the cod-end. Gill nets specifications: Set of gill nets each panel 30 m long by 2 m deep with mesh sizes of 44 mm, 48 mm, 51 mm, 54 mm, 75 mm, 100 mm and 145 mm. Gill net sampling can be replaced by a large mesh seine (44 mm stretch mesh, 100 m x 2 m). Trawl specification: 2 m wide by 3 m long, 10 mm bar nylon mesh in the main net body and a 5 mm bar in the cod-end.	Once-off, in spring/ summer and autumn/ winter.	Larger system (> 5 km): 10 - 15 stations along length of estuary) (~ length/10). Small systems (< 5 km): 3 - 5 stations (mouth, mid, top).
Birds		
Undertake count of all water birds.	Once-off.	Entire estuary.

APPENDIX 2: ECOLOGICAL SPECIFICATIONS

Table 15: EcoSpecs for the Rooiels River Estuary (Category A) (DWS, 2018)

ECOLOGICAL COMPONENT	ECOSPECS	NUMERICAL VALUES
Hydrology	Maintain at least present-day base flows	Varies more than 10% of MAR.

Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	**Annual**
MMR/ MAR (%Nat)	99.0	989.9	98.4	98.0	98.3	98.0	98.1	98.3	98.5	98.6	98.6	98.8	**98.6**

Hydrodynamics	Maintain connectivity with marine environment at a level that ensures water quality and habitat remains suitable for biota typically found in the estuary	Closed mouth state should not increase by >10% from established baseline
Water quality	Salinity distribution not to cause exceedance of TPCs for fish, invertebrates, macrophytes and microalgae System variables (temperature, pH, turbidity, dissolved oxygen, suspended solids and turbidity) not to cause exceedance of TPCs for biota Dissolved inorganic Nitrogen (DIN)/dissolved inorganic phosphate (DIP) concentrations not to cause exceedance of TPCs for macrophytes and microalgae Concentrations of waterborne pathogens should be maintained in an Acceptable category for full contact recreation	10 < Salinity <40 Entire estuary and river inflow: DO > 6 mg/ℓ Turbidity < 5 NTU Entire estuary and river inflow: DIN <100µg/ℓ Entire estuary and river inflow: DIP <10 µg/ℓ ≤130 E. coli/100 ml (95th percentile)
Sediment dynamics	Flood regime is sufficient to maintain natural bathymetry and sediment characteristics	Channel shape/size, sediment grain size and organic matter must not change by >30% from established baseline
Microalgae	Maintain the composition and richness of phytoplankton and benthic microalgae groups and medium-low biomass	Maintain the distribution of different phytoplankton groups and low biomass (< 20 µg.l^{-1})
Macrophytes	Maintain the distribution of current macrophyte habitats Maintain extent, distribution and richness of macrophyte groups, Limit colonisation/spread of the EFZ by alien species	<20 % change in the area covered by different macrophyte habitats (accounts for natural changes due to the dynamic nature of estuaries); Submerged macrophytes such as pondweed (*Potamogeton pectinatus*) should be present during low flow conditions
Invertebrates	Maintain composition, richness and abundance of different groups of benthic macrofauna and zooplankton	The estuary should have viable populations of *Callianassa kraussi* in sandy zones and *Upogebia africana* in muddy zones

ECOLOGICAL COMPONENT	ECOSPECS	NUMERICAL VALUES
Fish	Maintain composition, richness and abundance of different groups of fish, prevent colonisation/increase of alien species	Maintain fish assemblage that includes: at least 2 estuarine breeding species (Category I), 3 estuary dependent marine species (Category IIa & IIb); 1 indigenous catadromous species (Category V); Estuarine residents should dominate numerically, but the proportion of estuary dependent marine species (based on abundance) should not fall below 2%.

APPENDIX 3: PERFORMANCE MONITORING PLAN

Table 16: Recommended Performance Monitoring Plan for the management of the Rooiels River estuary

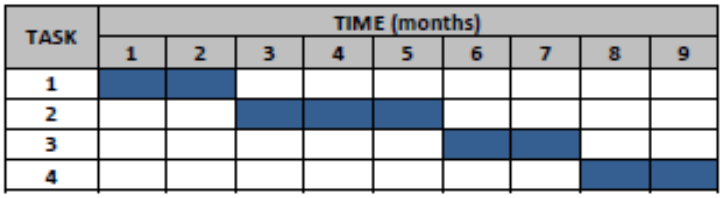
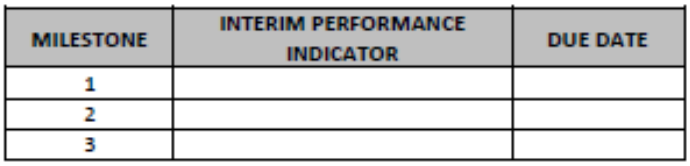
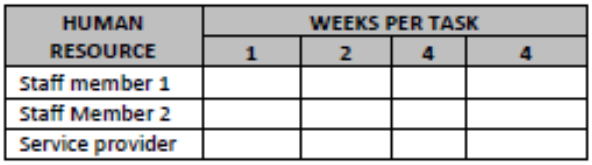
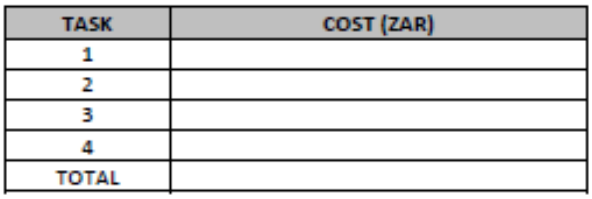
MANAGEMENT OUTPUT	PERFORMANCE INDICATOR	TEMPORAL SCALE (frequency)	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITY
1. ESTUARINE HEALTH AND FUNCTION				
1.1 Secure adequate quantity and quality of freshwater input to improve and maintain ecosystem health and functioning	• Recommended reserve(s) signed off and implemented • Sustained river flow • Good water quality • Natural mouth dynamics • Ecological monitoring programme (fish and birds) implemented • Annual reporting on state of estuary • A or A/B ecological state is maintained	• Twice a year for DWS • Twice a year	NWA	DWS, BGCMA, CapeNature, RMA
1.2 Ensure estuary requirements are integrated into catchment processes to ensure healthy water quality	• Critical catchment maps updated • Effective catchment management • Good catchment water quality preserved	• Twice a year	MSA, NWA, NEM: PAA	RMA, CapeNature, BGCMA, DWS
1.3 Minimise pollution by addressing activities that lead to poor water quality	• Water quality programme implemented • Discharge are monitored and controlled. • SUDS are implemented. • Waste management plan is implemented • Clean up operations are effective	• Twice a year	NEM: Waste Management Act, MSA, NWA, ICMA	Overstrand LM, RMA, Pringle Bay Conservancy
1.4 Control the spread and densification of invasive alien plant species	• IAPs eradication programme implemented • Increased area / tonnes of IAPs removed	• Annually	CARA, NWA	RMA, DEFF: WfW, CapeNature, KBRC
1.5 Ensure sustainable resource use through an effective level of compliance management	• Designated conservation zone demarcated and enforced • Monitoring programme for estuary users developed and implemented	• Twice a year	ICMA, MLRA, NWA, NEM: PAA, MSA	RMA, KBRC, CapeNature, Overstrand LM,

MANAGEMENT OUTPUT	PERFORMANCE INDICATOR	TEMPORAL SCALE (frequency)	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITY
	• Reduced habitat degradation and inappropriate behaviour/activities • Improved fish and invertebrate populations • Compliance network established • Reduction in illegal activities			Rooiels Conservancy
2. BIODIVERSITY CONSERVATION				
2.1 Enhance the protected area status of the Rooiels River estuary	• Protected area expanded to include estuary mouth and beach / sand berm • Rooiels EMP incorporated into Kogelberg Nature Reserve, BMC and KBR Plans • KBRC establishes an estuarine division for the Kogelberg estuaries	• Quarterly until resolution achieved	ICMA, NEM:PAA, WC BRA, NEMA	RMA, CapeNature, KBRC
2.2 Ensure the conservation of estuarine habitats and indigenous species	• Spatial zonation plan adopted, implemented and enforced • Signage created and erected in key public spaces • Reduced habitat degradation and inappropriate behaviour/activities • Participation of land owners and stakeholders	• Annually	NEM: PAA, NEM: BA, WC BRA, LUPA	RMA, KBRC, CapeNature, Overstrand LM
3. LAND USE AND INFRASTRUCTURE DEVELOPMENT PLANNING				
3.1 Ensure appropriate and sustainable coastal development in and around the Rooiels River estuary, considering ecosystem services and sense of place	• Rooiels EMP approved and incorporated into Kogelberg Nature Reserve, BMC and KBR Plans • EMP included in all relevant planning documents • Regional EAF partakes in development planning affecting the estuary • No new development, infilling or land transformation in the EFZ • Inspections undertaken, transgressors prosecuted, and remedial actions implemented	• Annually	ICMA, NEM: PAA, WC BRA, LUPA, MSA, NEMA	KBRC, CapeNature, Overstrand LM, Overberg DM, DEA&DP
4. INSTITUTIONAL AND MANAGEMENT STRUCTURES				
4.1 Ensure effective co-ordination of estuarine	• Rooiels EMP adopted and incorporated into Kogelberg Nature Reserve, BMC and KBR Plans	• Quarterly	ICMA, MSA, LUPA, NWA, NEM: PAA,	RMA, DEA&DP, CapeNature

MANAGEMENT OUTPUT	PERFORMANCE INDICATOR	TEMPORAL SCALE (frequency)	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITY
management responsibilities	• KBRC establishes an estuarine division for the Kogelberg estuaries • Regional Estuarine management function established and EMC appointed • RMA official(s) are well-trained, knowledgeable and well-equipped • Funding secured for 5-year cycle • Regional EAF constituted and chaired by RMA • Stakeholder database maintained • Annual reporting undertaken by RMA • Good communication and working relationship established with implementing agencies		MRPDA, WC BRA	
4.2 Define and enable co-operative governance	• MOUs signed between RMA and spheres of government and participating agencies • Active collaboration of various institutions, private and civil stakeholders • Individual agencies knowledgeable and with capacity and resources to carry out mandated actions • Regional EAF constituted and meets on quarterly basis • Formal review of EMP every 5 years	• Annually	ICMA, NEMA, MSA, NEM:PAA, WC BRA	RMA supported by all authorities
5. SOCIO-ECONOMIC CONSIDERATIONS				
5.1 Regulate non-extractive use	• EFZ demarcated with markers/signage (if necessary) which are maintained • EFZ controls enforced and offenders prosecuted • SOP for peak holiday season developed and implemented	• Annually	ICMA, NEM:PAA, WC BRA, MSA	RMA, Overstrand LM, CapeNature/KBRC, Necessary authorities

MANAGEMENT OUTPUT	PERFORMANCE INDICATOR	TEMPORAL SCALE (frequency)	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITY
5.2 Develop and regulate local livelihoods associated with the estuary	• Alternative livelihood opportunities investigated and implemented	• Annually	ICMA, NEM:PAA, WC BRA, MSA	RMA, Overstrand LM, CapeNature/KBRC, Necessary authorities
6. EDUCATION, AWARENESS, MONITORING AND RESEARCH				
6.1 Promote high levels of public awareness and appreciation of the value of the Kogelberg estuaries	• Education & awareness programme developed and implemented • Educational signage erected, and information disseminated • Kogelberg estuaries webpage operational • Reduced illegal fishing activities	• Every 3 years	ICMA, MLRA	KBRC, Rooiels Conservancy, DEFF
7. DISASTER RISK MANAGEMENT				
7.1 Disaster prevention and preparedness	• Risk assessment portfolio compiled, and key areas identified • Health incident evacuation plan developed • Emergency response networks established • Integrated flood disaster management plan developed • All developments and activities are legally compliant • Estuarine issues incorporated in relevant disaster management planning documents • No future development within EFZ, and development setback from EFZ	• Every 3 years	NEMA, ICMA, WC TIA, DMA	RMA, Western Cape Dept of Transport: Public Works (WC DoT&PW), WC Dept of Local Gov: Disaster Management, Overstrand LM, CapeNature, KBRC
7.2 Mitigate areas of high risk	• Rehabilitation programme developed & implemented • Risk areas included in regional disaster management plan and contingency plans developed • Critical infrastructure defended • Reduced incidence of pollution, and timeous implementation of mitigation	• Annually	NEMA, ICMA, WC TIA, DMA	

APPENDIX 4: PROJECT PLAN TEMPLATE

ACTION	Describe the action to be undertaken
COMPLETION DATE	Provide date of expected completion
PERFORMANCE INDICATOR	
Requirements stipulated in policy and legislation	
Available methods, protocols and best practice-guides	
Spatial zonation consideration (e.g. limits/targets)	
Detailed work plan	Task 1: Task 2: Task 3: Task 4:
Scheduling	
Milestone/interim performance indicator	
Responsibilities for different tasks	E.g. Identify specific departments, personnel and/or service providers responsible for execution of this action
Monitoring and reporting plan	E.g. • Define data and information to measure in order to monitor performance indicator/s • Specify frequency at which data/information should be collected/monitored • Where and when to report on progress
Human resource plan	
Financial resource plan	

MILESTONE	INTERIM PERFORMANCE INDICATOR	DUE DATE
1		
2		
3		

HUMAN RESOURCE	WEEKS PER TASK			
	1	2	4	4
Staff member 1				
Staff Member 2				
Service provider				

TASK	COST (ZAR)
1	
2	
3	
4	
TOTAL	

Source: DEA (2015)