



**Western Cape  
Government**  
Environmental Affairs and  
Development Planning



# **Sout River Estuarine Management Plan**

Final

October 2019

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## DOCUMENT DESCRIPTION

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Sout River Estuarine Management Plan (final October 2019)

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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 be 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 Sout 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 Sout 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 Sout River estuary is defined in the 2018 National Biodiversity Assessment (NBA) (SANBI, 2019) as an arid predominantly closed estuarine system situated on the west coast of South Africa, in the Matzikama Local Municipality (LM), West Coast District. It is located 60 km north of the Olifants River and is situated in between the small towns of Strandfontein to the South and Hondeklip Bay in the Northern Cape province to the north. The size of the estuary, as defined by the estuarine functional zone (EFZ), is approximately 433.4 ha (with the amount of open water being 28 ha), extending over a length of 7.8 km over the eastern arm.

### Vision and Objectives

The following vision for the Sout estuary was proposed at a public meeting held at Cawood Salts in August 2017 and confirmed at a follow up meeting held in November 2018 as part of the Olifants Estuary Advisory Forum meeting.

*The Sout River vlei is a unique coastal haven balancing sustainable economic, ecological and recreational use*

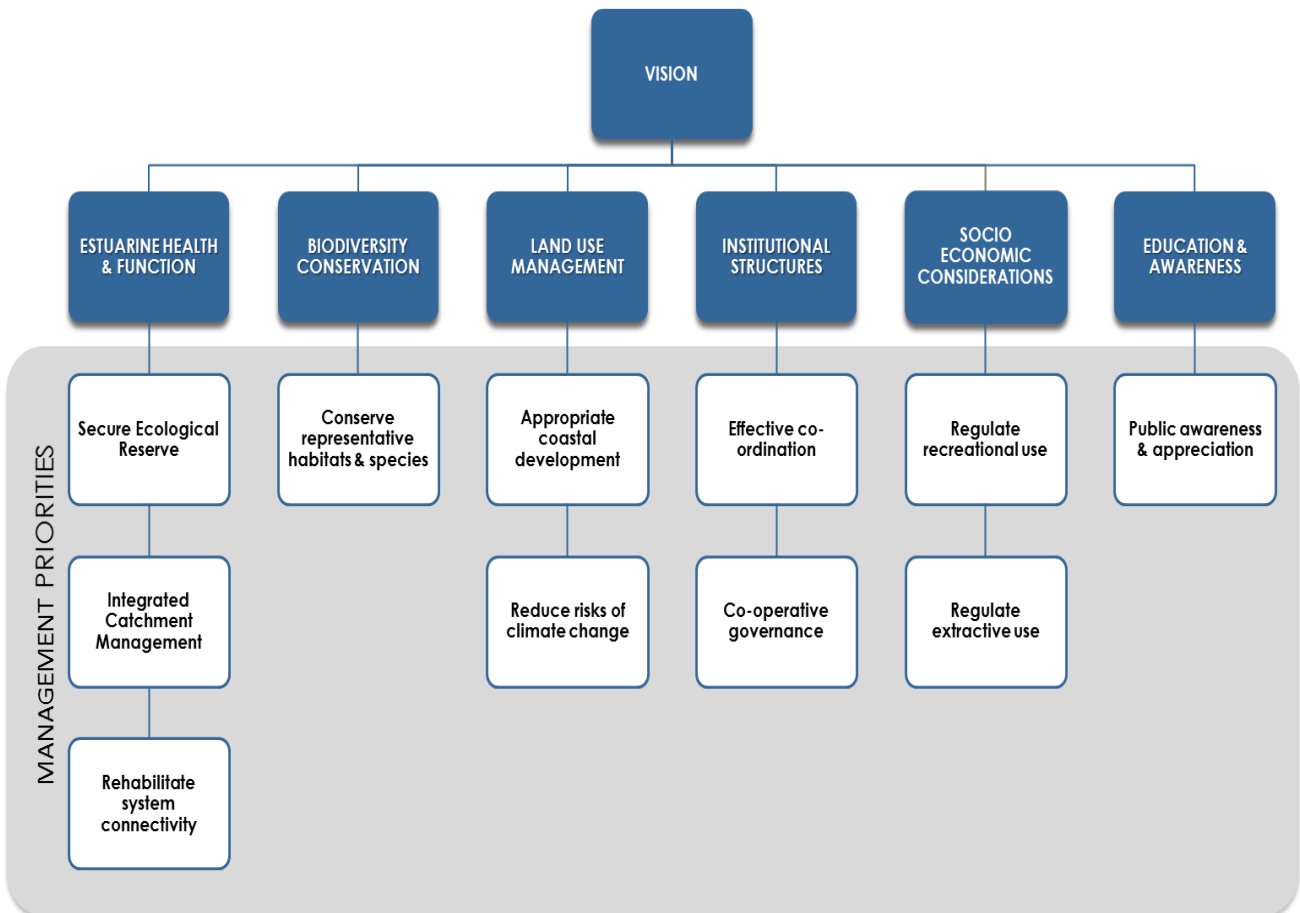
Strategic objectives, performance indicators and priorities for the Sout River estuary are as follows:

Sector / Category	Strategic Objective	Performance Indicator(s)	Priority
1	Estuarine Health and Functioning	<p>The ecological health and functioning of the Sout River estuary is improved and maintained, even as the climate gets hotter and drier</p> <ul style="list-style-type: none"> <li>• Ecological condition improved from E to D category</li> <li>• Baseflow and flood peaks to estuary is restored</li> <li>• Water abstractions are controlled</li> <li>• Reduced future water availability considered</li> <li>• Connectivity is restored</li> <li>• Ecological health of estuary is improved</li> <li>• Estuary requirements are integrated into catchment processes</li> <li>• Pollution is reduced</li> <li>• Ecological monitoring programmes are in place</li> <li>• Best practice promoted</li> </ul>	<b>HIGH</b>
2	Biodiversity Conservation	<p>The biodiversity of the Sout River estuary is conserved</p> <ul style="list-style-type: none"> <li>• Conservancy established for remaining habitat</li> <li>• EMP incorporated into the Matzikama Integrated Development Plan (IDP) and Spatial Development Frameworks (SDF)</li> <li>• Spatial zonation plan is adopted and enforced</li> <li>• Further transformation of estuary prevented</li> <li>• Monitoring programmes are in place</li> </ul>	<b>MEDIUM/LOW</b>
3	Land-use and Infrastructure Planning and Development	<p>Impacts associated with developments and proposed changes in land-use, including infrastructure and agriculture, are minimised</p> <ul style="list-style-type: none"> <li>• Coastal Management Line implemented</li> <li>• Further transformation/habitat degradation of estuary prevented</li> <li>• Disaster management plan implemented</li> </ul>	<b>MEDIUM</b>
4	Institutional and Management Structures	<p>The Sout River estuary is managed well through effective co-operative governance</p> <ul style="list-style-type: none"> <li>• EMP is seamlessly incorporated into the Matzikama IDP and SDF</li> <li>• RMA assigned &amp; supported</li> <li>• Mandated authorities and participating agencies are well capacitated, actions are fulfilled via West Coast Municipal Coastal Committee</li> </ul>	<b>HIGH / MEDIUM</b>
5	Socio-economic considerations	<p>Socio-economic benefits are regulated, and resilience in the face of</p> <ul style="list-style-type: none"> <li>• Illegal/damaging recreational activities are controlled</li> </ul>	<b>HIGH</b>

		climate change improved, to ensure sustainable use of the Sout River estuary and its resources	<ul style="list-style-type: none"> <li>• Extractive resource use is managed, and the Salt Works is not extended</li> <li>• 100 m buffer imposed</li> <li>• Local livelihoods continue to be supported through job opportunities (at the Saltworks)</li> <li>• Sustainable livelihoods assessment undertaken to assess potential LED opportunities</li> </ul>	
6	Education and Awareness	The scientific aspects, importance and value of the Sout River estuary is well understood and made known to members of society	<ul style="list-style-type: none"> <li>• Awareness programme developed and on on-going</li> <li>• Signage erected; information disseminated</li> <li>• Increase in number of monitoring programmes/ projects (water quality, birds)</li> </ul>	<b>MEDIUM</b>

### Priority management objectives and associated activities

An overview of the management objectives and management priorities is provided below. Detailed action plans were developed for each of these priority areas.





## 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. Three different zones are proposed and illustrated in the figure below:

- *Commercial Zone* – The zone conforms and encapsulates the boundaries of the existing salt works. This provides for ongoing operation of the saltworks and the economic role it plays in job creation;
- *Conservancy Zone* – This zone encompasses the entire estuarine functional zone, except the footprint of the saltworks. The purpose of this zone is to conserve remaining estuarine habitat, and manage and direct low impact use and interaction so as to minimise impacts on this sensitive coastal environment;
- *Recreational Overlay Zone* – The recreational zone overlaps with the conservancy zone and provides for low impact recreational use, namely, camping and 4x4 driving, in accordance with appropriate controls; and
- *Buffer Zone* – a 100 m buffer zone is enforced adjacent to the EFZ to protect both the EFZ and Salt Works.

Priority areas requiring rehabilitation area provided.



## 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.

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General baseline information for the Sout River estuary is lacking. A set of minimum monitoring requirements to ascertain impacts of current and future pressures on the estuary and/or any improvement or reductions therein is provided.

The current state of compliance monitoring on the Sout River estuary is unknown. In respect to the implementation of this EMP, compliance monitoring will be the responsibility of the Matzikama LM in respect to land-use/town planning/illegal activities (e.g. dumping/littering), Department of Agricultural, Land Reform and Rural Development (DALRRD) in respect to agricultural best practices; and Department of Water and Sanitation (DWS) for water abstractions. Compliance monitoring and enforcement will be undertaken according to applicable legislation and policies and by means of law enforcement and compliance monitoring protocols.

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. 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 Sout River estuarine system and key role players are identified.

While the 2013 NEMP identifies the Matzikama LM, or its assigned representative, as the RMA responsible for the co-ordination of the implementation of the Sout EMP, **it is noted that proposed amendments to the 2013 NEMP, allocate such responsibilities to the provincial environmental department unless agreement, or until agreement, is reached with the respective municipality to undertake the coordination of the implementation process. Ultimately, the role of the RMA must be designated through a formal signed agreement.**

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, the implementation of the Sout EMP should be monitored by the West Coast District Coastal Committee.

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:

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- The DWS be requested to consider reviewing the scoring of ecological health, specifically in respect to fish in this hypersaline system;
  - Cawood Salts to redesign the current design of the salt works improving circulation and restoring connectivity with both the catchment and the sea;
  - Consideration be given to participation in the CapeNature Biodiversity Stewardship Programme and/or the designation of a Special Management Area;
  - Undertaking practical monitoring;
  - Managing activities and specifically responding to illegal camping and beach driving; and
  - The DEA&DP to consider the appointment of a Regional estuarine management co-ordinator/champion within either DEA&DP or CapeNature, to support the RMA.



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## ACRONYMS AND ABBREVIATIONS

amsl	Above mean sea level
BOfCMA	Berg-Olifants Catchment Management Agency
CARA	Conservation of Agricultural Resources Act (Act No. 43 of 1983)
CBA	Critical Biodiversity Area
CFR	Cape Floristic Region
CML	Coastal Management Line
CMP	Coastal Management Programme
CMS	Catchment Management Strategy
CPZ	Coastal Protection Zone
CSIR	Council for Scientific and Industrial Research
CZ	Coastal Zone
DAFF	Department of Agriculture, Forestry and Fisheries (now DALRRD / DEFF)
DALRRD	Department 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)
DM	District Municipality
DMA	Disaster Management Act (Act No. 57 of 2002)
DoT	Department of Transport
DPW	Department of Public Works
DSL	Development Setback Line
DST	Department of Science and Technology
DWS	Department of Water and Sanitation
EAF	Estuary Advisory Forum
EcoSpecs	Ecological Specifications
EFZ	Estuarine Functional Zone
EIA	Environmental Impact Assessment
EMC	Estuarine Management Co-ordinator
EMFIS	Estuarine Management Framework and Implementation Strategy
EMP	Estuarine Management Plan(s)
GDP	Gross Domestic Product
GNR	Governmental Notice Regulations number
GVA	Gross Value Add
HWM	High Water Mark
I&APs	Interested & Affected Parties
ICM	Integrated Coastal Management
ICMA	National Environmental Management: Integrated Coastal Management Act (Act No. 24 of 2008)
IDP	Integrated Development Plan
LED	Local Economic Development
LM	Local Municipality
LUPA	Western Cape 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
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)

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NEMA	National Environmental Management Act (Act No. 107 of 1998)
NEMP	National Estuarine Management Protocol (2013)
PERC	Preliminary Ecological Reserve Category
NWA	National Water Act (Act No. 36 of 1998)
PAES	Protected Area Expansion Strategy
RDM	Resource Directed Measures
REC	Recommended Ecological Category
RMA	Responsible Management Authority
RQO(s)	Resource Quality Objectives
SAR	Situation Assessment Report
SMA	Special Management Area
SWOT	Strength, Weakness, Opportunities and Threats analysis
TPC	Threshold of Potential Concern
WC DoT&PW	Western Cape Department of Transport and Public Works
WC TIA	Western Cape Transport Infrastructure Act (Act No. 1 of 2013)
WfW	Working for Water
WMA	Water Management Area
WUL	Water Use License



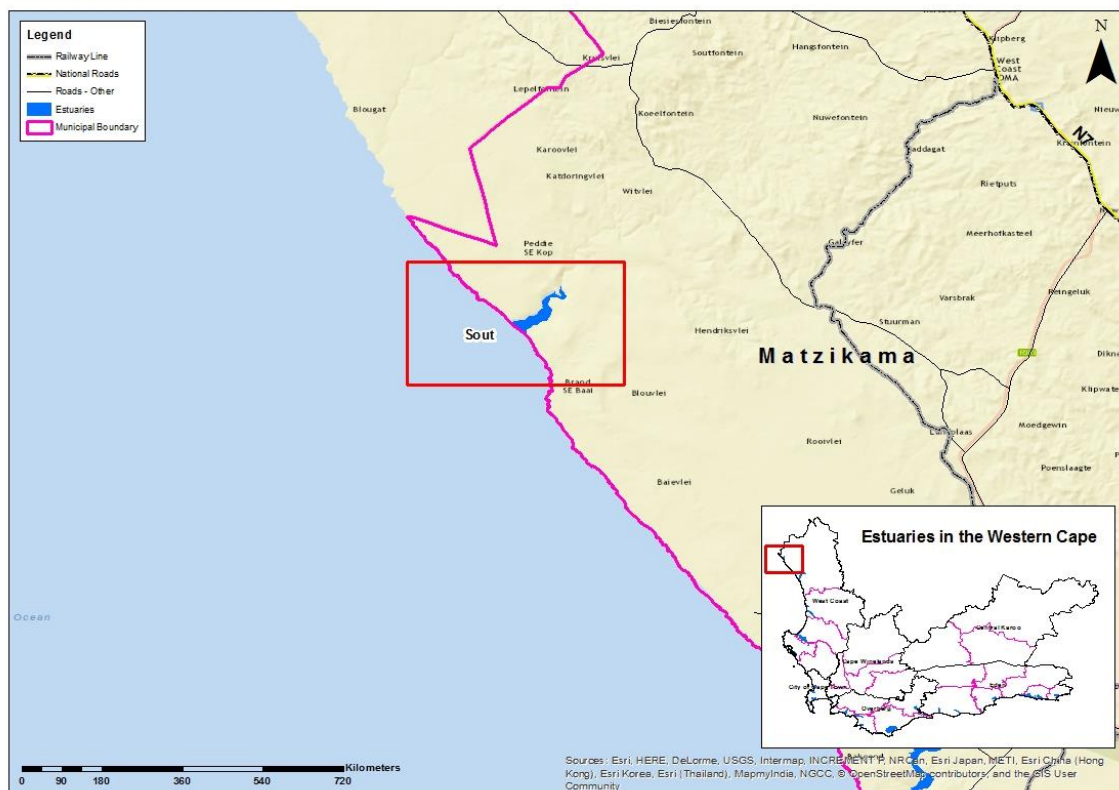
# 1 INTRODUCTION

## 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.

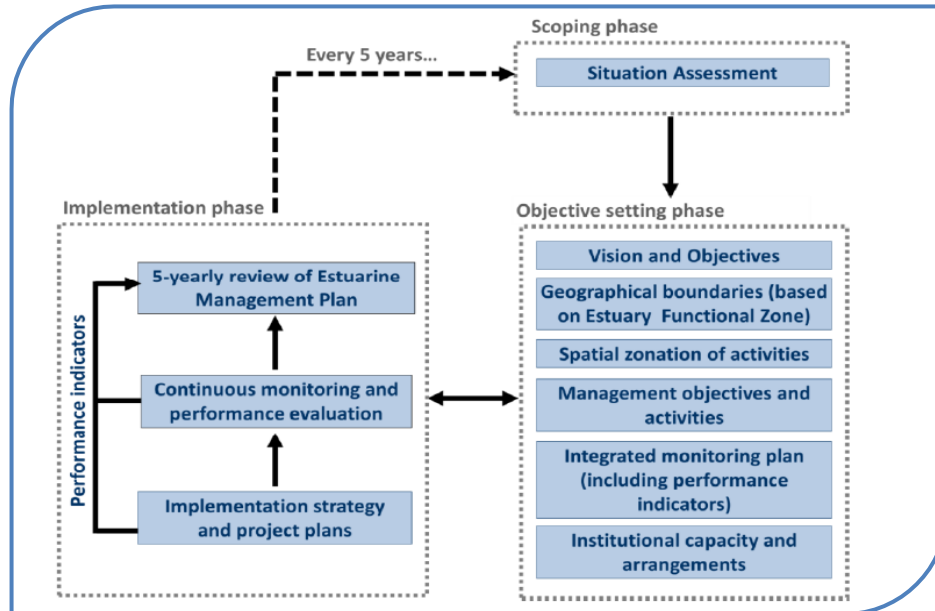
This document represents the first generation EMP for the Sout River estuary Figure 1 developed under the auspices of the Western Cape EMFIS.



**Figure 1: Location of the Sout River estuary within the Matzikama 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 being 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 Sout 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

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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<sup>1</sup> and the overall coordination 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 2013 NEMP as:

Section 5: *“...authorities are **responsible for the development of EMPs and coordination of the implementation process...**”*

Section 5(7)(e): *“The identified responsible management authority to develop 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 formally adopted by the responsible management authority and signed by the head of the responsible management authority.”*

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.

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<sup>1</sup> In this instance, the EMP for the Sout River estuary was developed under the auspices of the Western Cape EMFIS commissioned by the Western Cape Government.

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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**, 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 Sout 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 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 9** 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;
- **Section 9** details key **recommendations** and **concludes** the plan.

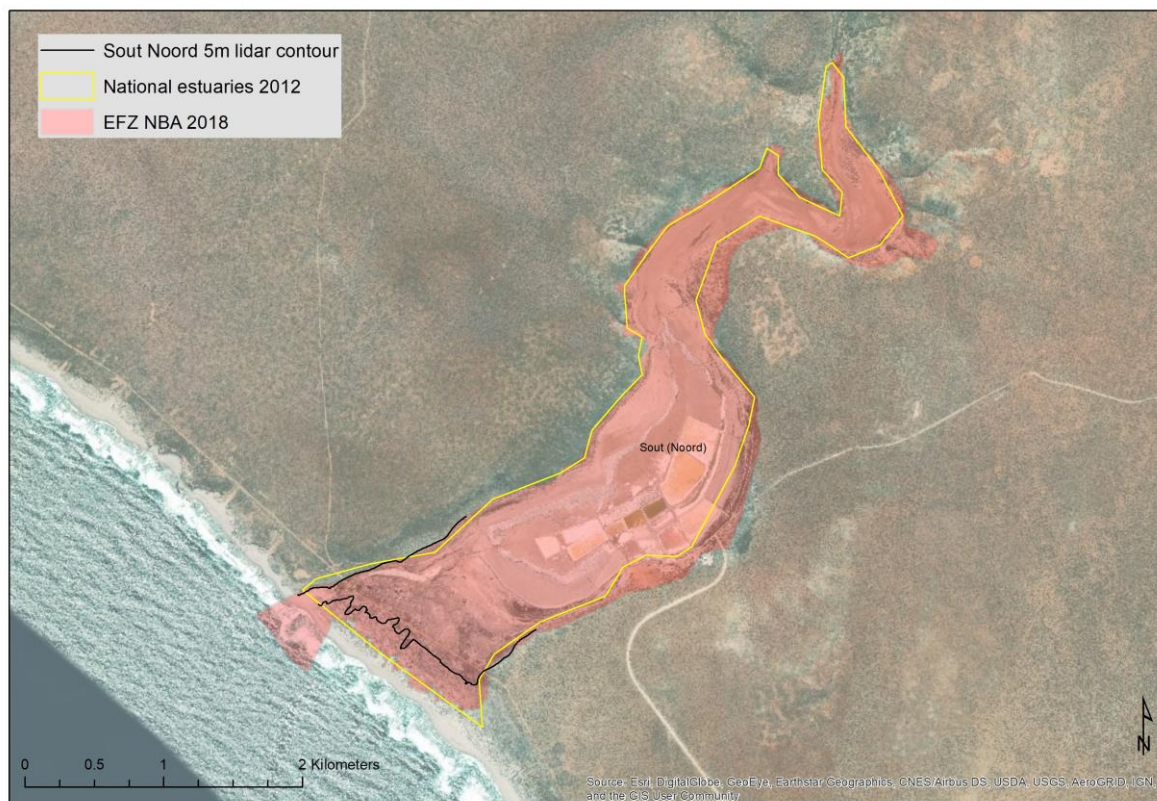


## 2 GEOGRAPHICAL BOUNDARIES

The Sout River estuary is defined in the 2018 National Biodiversity Assessment (NBA) (SANBI, 2019) as an arid predominantly closed estuarine system, situated on the west coast of South Africa, in the Matzikama Local Municipality (LM), West Coast District. It is located 60 km north of the Olifants River and is situated in between the small towns of Strandfontein to the South and Hondeklip Bay in the Northern Cape province to the north. The size of the estuary, as defined by its Estuarine Functional Zone (EFZ), is approximately 433.4 ha (with the amount of open water being 28 ha), extending over a length of 7.8 km over the south-eastern arm. The geographical boundaries of the estuary, delineating the EFZ, are provided in Table 1 and Figure 3:

**Table 1: Geographical boundaries of the Sout River estuary**

<b>DOWNSTREAM BOUNDARY:</b>	-31.247111° S; 17.853361° E (estuary mouth)
<b>UPSTREAM BOUNDARY:</b>	-31.210076° S; 17.891072° E (head of estuary)
<b>LATERAL BOUNDARIES:</b>	Approximated by the 5 m above Mean Sea Level (amsl) contour along each bank



**Figure 3: Geographical boundaries of the Sout River estuary EFZ showing the 5 m topographical contour and the 2018 NBA (SANBI 2019) EFZ boundary**



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## 3 SYNOPSIS OF THE SITUATION ASSESSMENT

### **Introduction**

The hypersaline Sout River estuary is one of only six estuarine systems in the West Coast District. Very little is known about the estuary because of its small size and remote location. It is situated 60 km north of the Olifants River estuary, and it is classified as an Arid Predominantly Closed system in the 2018 National Biodiversity Assessment (NBA) (SANBI, 2019) as it is nearly always closed to the sea due to the ephemeral nature of the inflowing river and anthropogenic modification of the water course. The Sout River estuary is a highly transformed system due to the presence of a salt works which occupies much of the system. Road infrastructure, channel diversions and infilling have severely modified the estuarine functional zone, specifically through compartmentalisation and reduced connectivity, and transformation and degradation of the intertidal and supratidal areas. In many instances, the South River estuary is not acknowledged as a functional estuary or a noteworthy ecosystem.

In accordance with the South African 2013 National Estuarine Management Protocol (NEMP), an estuarine management plan is being prepared for the Sout River Estuary, following the prescribed estuarine management planning process. This is being conducted under the auspices of the Western Cape Estuarine Management Framework and Implementation Strategy (EMFIS) commissioned by the Western Cape Department of the Environmental Affairs and Development Planning. This document, the Situation Assessment Report, documents the status quo of the Sout River Estuary and is the first outcome of the project for this system. It will serve as the platform for the development of the estuarine management plan.

### **Catchment Characteristics**

The Sout River estuary is located in the Matzikama Local Municipality (LM) falls within the winter rainfall area (May – August), with the highest rainfall (approx. 28 mm) occurring during June. Peak summer and winter daytime temperatures are in the region of 31°C and 21°C respectively, with the mean annual temperature along the coastline being approximately 17°C. The underlying geology of the Sout River estuary comprises sedimentary rock of the Kalahari Group composed of Quaternary and Tertiary dune deposits that extends across much of the coastline. Above the estuary, the non-perennial river courses traverse predominantly gneiss and sedimentary formations, the latter being dominant through the municipal area. Soils are generally very thin over the major parts of the Municipality, however deeper soils >750 mm are located along the coast, in areas generally underlain by sedimentary rock formations.

The landscape of the broader Matzikama LM is characterised by the Knersvlakte region, i.e. low, undulating hills with isolated patches of white quartz stone and saline soils. Due to the poorly developed soils, and hence low agricultural potential of the area, only 10% of the total area of the municipality is cultivated. There is no cultivation in the immediate vicinity of the Sout River estuary. However, cultivation is more prevalent in the south east portion of the catchment, affecting the major tributaries of the Sout River, and to lesser extent in the north east portion. The predominant land cover surrounding the Sout River estuary is natural (grass and shrubland) as a result of the limited urban

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development and relatively low agricultural impact along the coastline. Salt works/mining occupies the middle reaches of the estuary (and heavy mineral mining occurs 5 km south of the estuary at Brand-se-Baai, at the Tronox Namakwa Sands Mineral Separation Plant. This is the largest mining operation in the municipality. Mining of heavy mineral sands to the north of the Olifants River has significantly impacted the natural vegetation of the coastal zone, while the shoreline and offshore area is further affected by diamond extraction and prospecting.

### **Abiotic Function**

The catchment area of the Sout River estuary falls within the Berg-Olifants Water Management Area, and covers an estimated 897 km<sup>2</sup>, including peripheral portion of the Knersvlakte region. The size of the estuary, as defined by estuarine functional zone, is approximately 433.4 ha, extending over a length of 7.8 km along the eastern arm.

The annual precipitation of the area is very low. The main rivers which feed the estuary, the Sout, the Klein Goerap, and the Groot Goerap are ephemeral with surface flow only occurring after substantial rainfall. In general, very little is known about the hydrology of the Sout River system. Hydrological estimations suggest little surface flow reduction as indicated by the small difference between natural MAR (1.2 Mm<sup>3</sup>/a) and present MAR (1.128 Mm<sup>3</sup>/a) volumes. A weir constructed at the head of the estuary reduces freshwater flow and the magnitude of floods reaching the estuary.

The Sout River estuary is classified as an Arid Predominantly Closed system (SANBI 2019). It is nearly always closed to the sea and natural breaching of the mouth is likely to only occur at very long return periods, e.g. 1:100 years. Connectivity and circulation in the system have been severely modified such that the estuary is currently characterised by three water bodies separated by causeways in the lower and middle reaches, where there is very limited interconnectivity. These are associated with an extensive salt works (constructed prior to 1942) situated in the middle reaches.

Limited water quality information exists for the Sout River estuary which indicates that the system is always in a hypersaline state, with recorded salinity ranging between 38 and 101. Extreme salinities may be a combination of natural evaporation in combination with seawater/groundwater pumping associated with the salt works. Nutrients levels are elevated in the lower reaches and are correlated with lower dissolved oxygen concentrations as a result of organic loading, while turbidity levels are slightly elevated in the middle reaches, associated with feeding activity by flamingos.

### **Biotic Function**

The microalgal condition is largely reflective of the highly disturbed nature of the Sout River estuary. Phytoplankton biomass was low throughout the system except for the middle reaches ( $62.2 \pm 0.6 \mu\text{g/l}$ ) where the halophilic Chlorophyte, *Dunaliella salina* (ca. 2800 cells/ml) was dominant. Similarly, the vegetation of the estuary has been modified by the presence of the salt works. Arid Estuarine Salt Marsh is the predominant vegetation type within the estuarine functional zone (but most of the original salt marsh been replaced by the salt works), often with pure stands of *Limonium*, *Sporobolus virginicus* and *Sarcocornia pillansii*. Namaqualand Seashore Vegetation occurs around

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the mouth, and adjacent to this and along sections of the estuary, Namaqualand Coastal Duneveld. The aquatic habitat, represented by open water surface area, has changed over time due to the damming effect of the causeways and the upstream weir.

There is no available historical information for invertebrates and fish. Recent site investigations indicate that brine shrimp *Artemia* spp. are the dominant invertebrate fauna numerically and by mass in the system, with lower abundance of Harpacticoid copepods and Hydrophilid beetles in the younger pans that have not yet evaporated. An anomalous isolated population of *Palaemon* sp. in very high densities was discovered in an old sump with salinity of 40 (lower than the rest of the system). Most other invertebrates are excluded due to the persistent hypersalinity. In respect to fish, no previous records of fish in the Sout River estuary. Reference conditions would have seen recruitment into the estuary likely during marine overwash of the sandbar and short-term survival of larval and juvenile fish that were in the surf-zone at the time, most likely *Mugil cephalus* and *Liza richardsonii*. Survival and recruitment would be even more limited under the present-day conditions.

The information on birds is limited to the 15 species and 120 individuals recorded during the site visit. With the exception of kelp gull and Caspian tern that were roosting on the estuary, the avifauna was exclusively composed of birds that feed on brine shrimp and halophylic insects, such as flamingos, avocets, black-winged stilts and Cape teal. The diversity and abundance of flamingos and other birds that feed upon brine shrimp is cyclical driven by the lifecycle of the brine shrimp.

#### **Ecological Health Status, Importance, and Recommended Future State**

The ecological health of the Sout River estuary is in an E Category, that is, 'seriously modified', where the loss of natural habitat, biota and basic ecosystem functions is extensive. In terms of conservation importance, the estuary is not one of the national priority estuaries requiring formal protection and it is deemed to be of 'average importance'. However, the functional importance of the Sout River estuary was deemed relatively high as it contributes to a very rare and limited "wetland habitat type" for estuarine and coastal birds along the dry Namaqualand Coast. As the Sout River estuary is currently below ecological functional levels, the Recommended Ecological Condition defined by Department of Water and Sanitation (DWS) was a category D. However, it is noted that the 2018 NBA (SANBI 2019) suggests a Category E.

#### **Import Ecosystem Goods and Services**

Estuaries typically provide a range of services that have economic or welfare value. Apart from providing the regulating services of climate regulation and disturbance regulation, it is evident that the Sout River estuary provides very limited ecosystem services due to its highly modified state.

#### **Impacts and Potential Impacts**

The environmental processes, activities and developments that pose a threat to the Wadriest River estuary include the following:

- *Environmental hazards* – drought, floods and climate change impacts;

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- *Land-use and infrastructure development* – the system is significantly transformed by road infrastructure, numerous paths and causeways, diversions of the mainwater course, numerous artificial channels, and infilling resulting in artificially separated water bodies and destruction of habitat;
  - *Water quality and quantity issues* – despite being naturally hypersaline, extreme hypersalinities persist, and freshwater supply and flow through the estuary has been severely modified through abstraction of groundwater and channel diversions; and
  - *Exploitation of natural resources* - the integrity of the estuary has been significantly altered by the salt works, mining for diamonds and heavy minerals occurs in close proximity to the estuary, and the estuary and general area is heavily impacted on by illegal beach driving and camping and the resultant littering and degradation.

### **Socio-economic Context**

The Matzikama Local Municipality (LM) is the third most populated LM within the West Coast District, with an estimated total population of 71 045 people, and has an average growth rate of 1.28% per annum. Population density is low with an estimated 5 persons/km<sup>2</sup>.

There are 20 822 households in the municipal area, and provision of basic services (namely water and lighting) is relatively high, such that 83% have access to piped water within their dwellings, and 97.0% have electricity for lighting. According to 2011 Census results, approximately 53% are economically active, and of these 9% are unemployed. The youth unemployment rate is higher at 19.3%. Approximately 48% of the population is poor, i.e. earning an average household income of less than R38 200, while a further 8.2% receive no income at all.

The Sout River estuary and its catchment falls within the very rural, and largely undeveloped, Ward 8 of the Matzikama LM, which has a total population of 8050. Approximately 34% do not earn an income, and 12% are unemployed. The population is particularly sparse (1 persons/km<sup>2</sup>), and there are no nodes of human settlement along the coast except closer to the Olifants River mouth.

In terms of the municipal economy, the Matzikama LM saw a growth rate 0.49% from 2011 to 2012 and contributed 16.14% to the West Coast District Municipality Gross Domestic Product (GDP), which is a third of all the economies of neighbouring municipalities. The primary sector includes the agriculture and mining sectors. The agricultural sector was the largest and most important economic sector within Matzikama LM, accounting for R738 million (25.34%) (2012 values) of the total municipal Gross Value Add (GVA), and the main sector of employment occupying 32% of total employment. The community services sector contributed the second most to the GVA with 15.7%, followed by the trade sector with 13.9%. Mining makes the largest relative contribution to the economy of the Matzikama LM of all West Coast DM local municipalities (including diamonds, heavy metals and gypsum), contributing R236 million (8%) to the Matzikama GVA (2012 values). Tourism does not make a very large

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contribution to the local economy. As such, the development of this sector is a key objective for the Matzikama LM.

The direct and indirect benefits derived from estuarine ecosystems services are manifested directly or indirectly in tangible income and employment. The Sout River estuary holds little socio-economic value. The main form of social dependency associated with the estuary is the salt works which provides employment for 84 people (on and off site). In terms of Local Economic Development (LED) projects, the Matzikama LM has identified several opportunities related to the coastal zone. However, no LED opportunities have been identified specifically for the Sout River Estuary.

#### **Legislative Instruments and relevant Strategies, Plans and Policy Directives**

The legislative framework specific to estuarine management is the Integrated Coastal Management Act and the accompanying 2013 NEMP. The 2013 NEMP provides national policy and ensures alignment by providing a national vision and objectives for achieving effective integrated management of estuaries, amongst other things. The 2013 NEMP identifies the responsible management authority per estuary, in this instance the Matzikama Local Municipality. **It is noted that proposed amendments to the 2013 NEMP allocate such responsibilities to the provincial environmental department unless agreement, or until agreement, is reached with the respective municipality to undertake the coordination of the implementation process.** Key legal instruments that are applicable to estuarine management are then described, and include national, provincial and local management documents.

#### **Opportunities and Constraints**

A Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis for the management of the Sout River estuary was undertaken (**Error! Reference source not found.**). One of the main strengths is active positive management undertaken by Cawood Salts as the 'steward' of the Sout River estuary, which includes a designated bird roost area, beach clean-up operations undertaken after holiday periods, and maintenance of access roads, as well as policing illegal activities. However, the numerous forms of infrastructure within the estuary, particularly the weir at the head of the estuary, and dissection and isolation of the system, remain the primary negative impacts that need to be mitigated and will continue to undermine any potential restoration efforts. Thus, opportunities exist to rehabilitate portions of the estuary as well as boost current conservation/stewardship activities, while research is urgently needed to obtain critical information towards better understanding of the estuary. Illegal beach driving and camping, mineral prospecting and mining activities, and ongoing lack of support from organs of state and government departments are some of the threats to the success of the Sout River EMP.

The Sout River estuary was not identified as a national priority estuary in need of formal protection at the national level and in its current degraded state does not warrant formal protection. Nonetheless, a minor portion of the Sout River catchment is characterised as part of the Knersvlakte, and the estuary would benefit from conservation principles applicable to the broader Knersvlakte Bioregion in the



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hinterland. Alternatively, a stewardship agreement between the owner of the salt works and CapeNature can be entered into under the CapeNature Biodiversity Stewardship Programme (CapeNature, 2016), towards reducing the negative impacts on the estuary, undertaking various aspects of rehabilitation and gradually improving its ecological condition.

In respect to priority restoration activities, improvement of estuarine circulation and restoring connectivity with the catchment are prescribed in order to achieve the Recommended Ecological Category (Category D).

#### ***Information Gaps and Recommendations***

Since no detailed studies have been conducted on any of the ecosystem aspects of this system, very little to no quantitative data exists to confidently assess ecosystem health. Inferences can only be made on the state of the Sout River estuary based on expert opinion, information gathered during the site visits and anecdotal reports. Thus, detailed studies are required on all biotic and abiotic aspects to improve our knowledge and understanding of the system. A minimum long-term monitoring programme in line with the accepted methods is recommended. Practical monitoring could include a water quality monitoring programme, undertaking bird counts, seasonal fixed-point photography and recording recreational use/misuse.

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## 4 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 NEMP (2013), Western Cape CMP and the greater Cape Floristic Region (CFR). 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), which 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**

The following vision for the Sout estuary was proposed at a public meeting held at Cawood Salts in August 2017 and confirmed at a follow up meeting held in November 2018 as part of the Olifants Estuary Advisory Forum meeting.

***The Sout River vlei is a unique coastal haven balancing sustainable economic, ecological and recreational use***

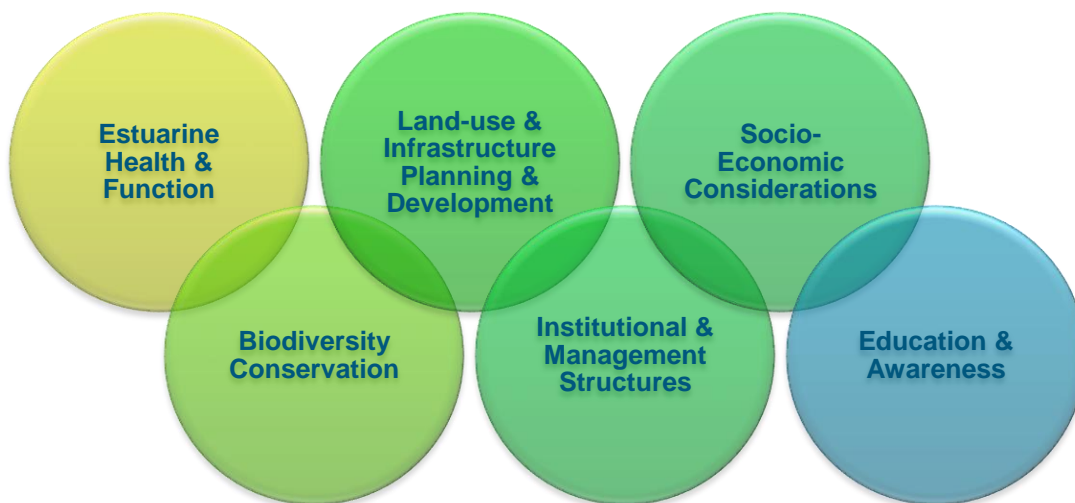
The vision highlights the following aspects of the estuary that are valued and need to be preserved or enhanced:

- The value of the system as a sheltered area or sanctuary/, specifically for bird populations;
- The role that the estuary plays in terms of local economic benefits;
- The recreational/tourism value of the system to locals and visitors alike; and
- The need to manage activities in and around the estuary to ensure that these are sustainable for the longevity of the system.

## 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 Sout River estuary were discussed at the stakeholder meeting. Based on the feedback received from the participants, the strategic objectives for the Sout 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 Sout River estuary**

According to these categories, the strategic objectives for the Sout River estuary are as follows:

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

	Sector / Category	Strategic Objective	Performance Indicators	Priority
1	Estuarine Health and Functioning	The ecological health and functioning of the Sout River estuary is improved and maintained, even as the climate gets hotter and drier	<ul style="list-style-type: none"> <li>Ecological condition improved from E to D category</li> <li>Baseflow and flood peaks to estuary are restored</li> <li>Water abstractions are controlled</li> <li>Reduced future water availability considered</li> <li>Connectivity is restored</li> <li>Projected future climate conditions and estuary requirements are integrated</li> </ul>	<b>HIGH</b>

			<p>into catchment management processes</p> <ul style="list-style-type: none"> <li>• Pollution is reduced</li> <li>• Ecological monitoring programmes are in place</li> <li>• Best practice promoted</li> </ul>	
2	Biodiversity Conservation	The biodiversity of the Sout River estuary is conserved	<ul style="list-style-type: none"> <li>• Conservancy established for remaining habitat</li> <li>• EMP incorporated into the Matzikama IDP and SDF</li> <li>• Spatial zonation plan is adopted and enforced</li> <li>• Further transformation of estuary prevented</li> </ul>	<b>MEDIUM / LOW</b>
3	Land-use and Infrastructure Planning and Development	Impacts associated with developments and proposed changes in land-use, including infrastructure and agriculture, are minimised	<ul style="list-style-type: none"> <li>• Coastal Management Line and controls implemented</li> <li>• Existing impacts reduced (through redesign)</li> <li>• Further transformation/ habitat degradation of estuary prevented</li> <li>• Disaster management plan implemented</li> </ul>	<b>MEDIUM</b>
4	Institutional and Management Structures	The Sout River estuary is managed well through effective co-operative governance	<ul style="list-style-type: none"> <li>• EMP is seamlessly incorporated into the Matzikama IDP and SDF</li> <li>• RMA assigned &amp; supported</li> <li>• Mandated authorities and participating agencies are well capacitated, actions are fulfilled</li> <li>• Reporting as part of West Coast Municipal Coastal Committee</li> </ul>	<b>HIGH / MEDIUM</b>
5	Socio-economic considerations	Socio-economic benefits are regulated, and resilience in the face of climate change improved, to ensure sustainable use of the Sout River estuary and its resources	<ul style="list-style-type: none"> <li>• Illegal/damaging recreational activities are controlled</li> <li>• Extractive resource use is managed, and the Salt Works is not extended</li> <li>• 100 m buffer imposed</li> <li>• Local livelihoods continue to be supported through job opportunities (at the Saltworks)</li> <li>• Sustainable livelihoods assessment undertaken to assess potential LED opportunities</li> </ul>	<b>HIGH</b>
6	Education and Awareness	The scientific aspects, importance and value of the Sout River estuary is well understood and made known to members of society	<ul style="list-style-type: none"> <li>• Awareness programme developed and on on-going</li> <li>• Signage erected; information disseminated</li> <li>• Increase in number of monitoring programmes/ projects (water quality, birds)</li> </ul>	<b>MEDIUM</b>

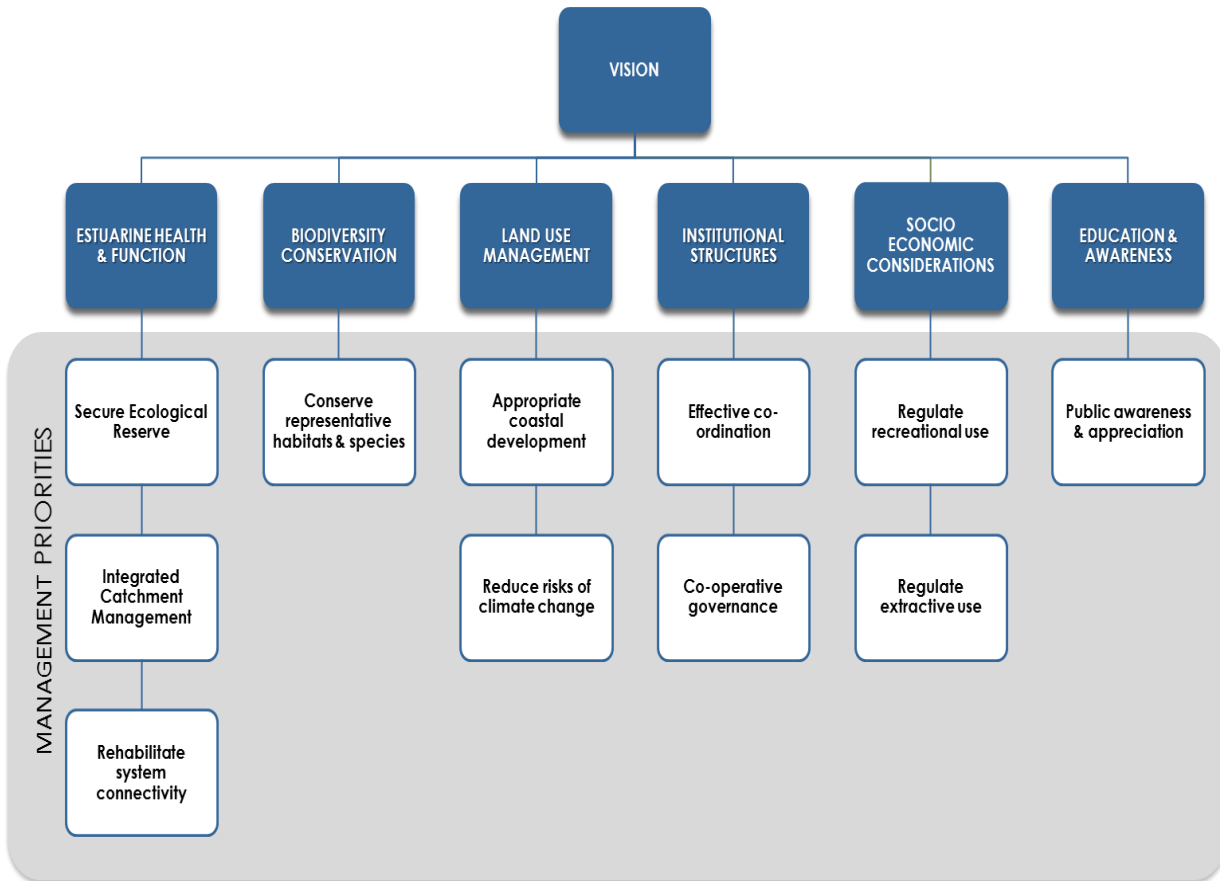
## 5 PRIORITY MANAGEMENT OBJECTIVES AND ASSOCIATED ACTIVITIES

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

**Table 3: SWOT Analysis**

<b>STRENGTHS</b> <i>(highlights, uniqueness?)</i>	<b>WEAKNESSES</b> <i>(what could you improve?)</i>
<ul style="list-style-type: none"> <li>• Undeveloped, sparsely populated landscape</li> <li>• West Coast Integrated Coastal Management Plan has been developed to facilitate co-ordinated management</li> <li>• Active conservation management by Cawood Salts of area outside of its operation e.g. designated bird roost area and remaining estuarine area preserved</li> <li>• Beach clean-up operations undertaken by Cawood Salts</li> </ul>	<ul style="list-style-type: none"> <li>• Severe degradation and loss of biodiversity</li> <li>• Degraded ecosystem services</li> <li>• Limited alternative livelihood/local economic development (LED) opportunities</li> <li>• Lack of acknowledgement of the value of the coastal zone</li> <li>• Lack of/limited capacity, resources (human and financial) and knowledge for Integrated Coastal Management (ICM)</li> <li>• Absence of dedicated environmental/coastal management department</li> <li>• Uncertainty regarding objectives, roles and responsibilities</li> <li>• Illegal beach driving and camping in the coastal zone (CZ)/EFZ</li> <li>• Lack of support from Organs of State and Government Departments</li> </ul>
<b>OPPORTUNITIES</b> <i>(Opportunities for positive change)</i>	<b>THREATS</b> <i>(what could prevent the EMP from working?)</i>
<ul style="list-style-type: none"> <li>• Rehabilitate portions of estuary</li> <li>• Research opportunities regarding the hypersaline invertebrate communities and genetics</li> <li>• Operation Phakisa funding (accessing the blue economy)</li> <li>• Potential livelihoods opportunity in respect to management of recreational use (camping, driving etc.)</li> <li>• Re-use of abandoned houses</li> <li>• Allocation of penalties from illegal beach driving to livelihoods project</li> <li>• Increase in bird population</li> </ul>	<ul style="list-style-type: none"> <li>• Illegal camping and driving in the CZ and EFZ</li> <li>• Excessive costs in respect to rehabilitation of estuary</li> <li>• Further destruction caused by mineral prospecting/mining</li> <li>• Reactionary (vs proactive) response to management requirements when necessary</li> <li>• Uncoordinated and haphazard management interventions</li> <li>• Lack of support from Organs of State and Government Departments</li> <li>• Climate change and loss of aquatic ecosystem</li> <li>• Flooding of salt works and loss of income/work opportunities</li> <li>• Future mining (minerals and diamonds) activities</li> </ul>

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



**Figure 5: Summary of priority management objectives per management sector**



## 5.1 Estuarine Health and Function

**Strategic Objective 1: The ecological health and functioning of the Sout River estuary is improved and maintained.**

**Table 4: Management Objectives and Actions for Estuarine Health and Function (includes water quantity and quality)**

Action	Relevant Legislation	Performance Indicator	Priority	Responsibility	
<b>Management Objective 1.1: Especially recognising likely future climatic conditions, secure adequate quantity and quality of freshwater input to improve ecosystem health and functioning</b>					
<b>a.</b>	Lobby Department of Water and Sanitation (DWS) Minister to sign off the recommended freshwater reserves, ensuring that the minimum flow requirement (specifically baseflow) for the estuary is restored), for example no new licenses for water abstraction in summer (low flow) period of the year (taking cognisance of climate change implications)	National Water Act (NWA)	<ul style="list-style-type: none"> <li>• Meetings held and correspondence written</li> <li>• Recommended reserve(s) signed off</li> <li>• Baseflow is restored</li> <li>• Ecological condition improved from E to D category</li> <li>• Verify that projections of reduced future water availability due to reduced overall rainfall and higher average temperatures are taken into consideration in the water use allocations</li> </ul>	HIGH	Berg-Olifants catchment Management Agency (BOfCMA), Responsible Management Authority (RMA)
<b>b.</b>	Once classification study signed off, follow up on implementation of water resource classification process	NWA	<ul style="list-style-type: none"> <li>• Meetings held and correspondence written</li> <li>• Water resource classified</li> <li>• Baseflow is protected</li> </ul>	HIGH	BOfCMA, RMA
<b>c.</b>	Identify and monitor abstraction and discharge points – both legal and illegal – and implement compliance action against illegal operations	NWA	<ul style="list-style-type: none"> <li>• Register of abstraction and discharge points compiled</li> <li>• Legal status determined</li> <li>• Illegal operations prosecuted</li> </ul>	HIGH	Department of Environment, Forestry and Fisheries (DEFF), BOfCMA
<b>d.</b>	Develop and implement a water resource utilisation plan for surface and groundwater	NWA	<ul style="list-style-type: none"> <li>• Utilisation plan developed</li> <li>• Number of licensed users</li> </ul>	HIGH	DEFF, BOfCMA

	resources (including registration and licensing)		<ul style="list-style-type: none"> <li>Regulated water use/abstraction</li> </ul>		
<b>e.</b>	Develop and implement an alien invasive vegetation eradication programme	Conservation of Agricultural Resources Act (CARA), NWA	<ul style="list-style-type: none"> <li>Invasive Alien Plants (IAPs) eradication programme implemented</li> <li>Increased area of IAPs removed (and kept clear)</li> </ul>	MEDIUM	RMA, DEFF: Working for Water (WfW)
<b>f.</b>	Monitor natural mouth dynamics (in partnership with neighbouring land owners and other Interested & Affected Parties (I&APs))	ICMA, NWA (RDM)	<ul style="list-style-type: none"> <li>Mouth state documented</li> <li>Photographic database generated</li> </ul>	MEDIUM	RMA, Matzikama LM
<b>g.</b>	Determine status of fish populations at breach/flood events to determine recruitment patterns	MLRA	<ul style="list-style-type: none"> <li>Research undertaken</li> <li>Data generated, and results reported on</li> <li>Data incorporated into EMP 5-year review</li> </ul>	LOW	DEFF (supported by e.g. CapeNature, DST, CSIR)
<b>h.</b>	Undertake seasonal (summer/winter) monitoring of bird populations (taking Resource Quality Objectives (RQOs) into account)	NWA (RDM), National Environmental Management: Biodiversity Act (NEM:BA), Marine Living Resources Act (MLRA)	<ul style="list-style-type: none"> <li>Species list and abundance data produced</li> <li>Databases developed</li> <li>Monitoring reports compiled and submitted</li> <li>Data incorporated into EMP 5-year review</li> </ul>	LOW	RMA (supported by e.g. CapeNature, DST, CSIR)
<b>i.</b>	Undertake Resource Directed Measures (RDM) monitoring every 3 years (only prioritised activities)	ICMA, NWA	<ul style="list-style-type: none"> <li>Required monitoring undertaken</li> <li>Data produced and reported on</li> <li>Data incorporated into EMP 5-year review</li> </ul>	LOW	DWS, BOfCMA, RMA (funding from WRC, DST)
<b>j.</b>	Monitor and report on the status of the estuary annually (inclusive of estuarine stresses and impacts)	NWA, ICMA	<ul style="list-style-type: none"> <li>Estuary impacts identified</li> <li>Mitigation measures established</li> <li>Climatic records obtained and analysed</li> <li>Annual report submitted to DEA and EAF</li> <li>Data incorporated into EMP 5-year review</li> </ul>	MEDIUM	RMA (supported by e.g. CapeNature, Department of Science & Technology (DST),

					Council for Scientific and Industrial Research (CSIR)
<b>k.</b>	Enforce agricultural best practice, specifically to reduce the application of inorganic fertilisers and sediment erosion from surrounding farms and catchment (taking cognisance of climate change implications)	NWA, CARA	<ul style="list-style-type: none"> <li>Engagement with famers in catchment initiated</li> <li>Best practice methods promoted and implemented, inclusive of measures to adapt to projected climate change</li> <li>Improved water quality variables</li> </ul>	LOW	Department of Agriculture, Land Reform and Rural Development (DALRRD)
<b>Management Objective 1.2: Ensure estuary requirements are integrated into catchment processes to ensure healthy water quality</b>					
<b>a.</b>	Catchment land use map developed and updated annually	NWA, CARA	<ul style="list-style-type: none"> <li>Updated land use map produced every year</li> <li>Potential sources of pollution identified</li> </ul>	HIGH	DALRRD (Land Care)
<b>b.</b>	Land use and effluent management included in the catchment management strategy (CMS)	NWA	<ul style="list-style-type: none"> <li>CMS reduces nutrient pollution from agricultural practices and identifies additional identifies sources of pollution (land use and effluent) to the estuary and provides mitigation strategies</li> </ul>	HIGH	BOfCMA
<b>c.</b>	Water use plan updated on an annual basis	NWA	<ul style="list-style-type: none"> <li>Updated water use plan produced every year, with reference to any changes in water availability due to climatic changes</li> </ul>	MEDIUM	DWS (Resource protection)
<b>d.</b>	Municipal SDF and environmental overlay updated as and when required	Municipal Systems Act (MSA)	<ul style="list-style-type: none"> <li>Updated SDF and overlays produced</li> </ul>	MEDIUM	Matzikama LM
<b>Management Objective 1.3: Rehabilitate connectivity within the system</b>					
<b>a.</b>	Identify and prioritise areas requiring rehabilitation	National Environmental Management Act (NEMA),	<ul style="list-style-type: none"> <li>Priority areas identified</li> <li>Methods investigated</li> </ul>	HIGH	RMA, DWS, DEFF
<b>b.</b>	Investigate methods to restore connectivity, including, but not limited to, partial removal		<ul style="list-style-type: none"> <li>Options for redesign investigated</li> <li>Redesigns approved</li> </ul>	HIGH	RMA, Department of Transport (DoT),

	of top weir to allow connectivity with western arm of estuary, and redesign and modification to or removal of (selected) crossings	NWA ICMA, Western Cape Transport Infrastructure Act (WC TIA) (Act 1 of 2013)	<ul style="list-style-type: none"> <li>• New operating procedures/project plans developed</li> </ul>		DWS, DEFF, Western Cape Department of Transport (WC DoT) Department of Public Works (DPW)
<b>c.</b>	Investigate means to improve the current design and/or operations of the salt works to restore estuarine habitat and functionality of the upper reaches		<ul style="list-style-type: none"> <li>• Connectivity rehabilitation programme developed</li> <li>• Corrective measures undertaken</li> <li>• Marine connectivity re-established, taking cognisance of the long-term coastal erosion trends</li> <li>• Monitoring undertaken to gauge success of intervention</li> </ul>	HIGH	RMA, DoT, DWS, DEFF
<b>d.</b>	Develop and implement a rehabilitation programme taking environmental impacts and climate change into account and including monitoring of results		<ul style="list-style-type: none"> <li>• Signage installed and maintained during and for an extended period after rehabilitation intervention</li> </ul>	HIGH	RMA
<b>e.</b>	Install educational signage informing public of rehabilitation process				

## 5.2 Biodiversity Conservation

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

**Table 5: Management Objectives and Actions for Biodiversity Conservation**

Proposed Activity/Action		Relevant Legislation	Performance Indicator	Priority	Responsibility
<b>Management Objective 2.1: Ensure the conservation of representative estuarine habitats and indigenous species in accordance with a long-term view that recognises projected climate change</b>					
<b>a.</b>	Investigate special management area or other relevant conservation status (e.g. conservancy) for the remaining estuarine habitat	NEM: PAA, ICMA	<ul style="list-style-type: none"> <li>• Conservation methods investigated and implemented</li> <li>• Area designated as Special Management Area (SMA) and published</li> </ul>	MEDIUM	RMA, CapeNature
<b>b.</b>	Adopt, implement and enforce spatial zonation plan	ICMA, Land Use Planning Act (LUPA)	<ul style="list-style-type: none"> <li>• EFZ controls enforced and offenders prosecuted</li> <li>• Reduced illegal activities</li> <li>• Reduced habitat loss/degradation and disturbance, and inappropriate behaviour</li> <li>• Improved fish and invertebrate populations</li> <li>• Provision is made in spatial and development plans for biodiversity to adapt to a drier, hotter climate</li> </ul>	HIGH	Matzikama LM
<b>c.</b>	Engage with landowners and stakeholders to encourage conservation environmental custodianship/ stewardship on adjacent properties.	NEMA (Duty of Care)	<ul style="list-style-type: none"> <li>• Meeting with adjacent land owners convened</li> <li>• Signed agreements with land owners</li> <li>• Degraded areas rehabilitated</li> <li>• Degrading activities halted</li> <li>• Integrity of estuarine margin improved</li> </ul>	HIGH	RMA, Matzikama LM CapeNature
<b>d.</b>	Identify and monitor sensitive species/ habitats of concern to assess ecosystem	NEM:BA	<ul style="list-style-type: none"> <li>• Sensitive species/ habitats identified</li> </ul>	LOW	RMA (supported by e.g.

	functionality, and develop appropriate guidelines		<ul style="list-style-type: none"> <li>• Status and trends of indicator species determined</li> <li>• Guidelines developed and implemented</li> <li>• Annual report submitted to DEFF and EAF</li> </ul>		CapeNature, DST, CSIR)
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## 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
<b>Objective 3.1: Ensure appropriate and sustainable land use and coastal development in and around the Sout River estuary</b>				
<b>a.</b> Implement coastal management line and associated development controls (i.e. ensure no development in the EFZ, high risk areas)	ICMA, LUPA, MSA	<ul style="list-style-type: none"> <li>No further development, infilling or land transformation in the EFZ</li> <li>Transgressors prosecuted</li> <li>Corrective action undertaken</li> <li>Reduced habitat loss/degradation &amp; disturbance</li> </ul>	LOW	Matzikama LM, West Coast DM, DEA&DP
<b>b.</b> Adopt and incorporate the EMP and the spatial zonation plan into the municipal planning (SDF, schemes environmental overlay) and zoning	MSA, LUPA, NEMA, ICMA	<ul style="list-style-type: none"> <li>EMP included in all relevant planning documents</li> <li>Estuary considered 'no-go' for development</li> </ul>	MEDIUM	Matzikama LM
<b>c.</b> EFZ 'no go area' to be incorporated into all relevant government department planning documents and processes (e.g. Water Use License (WUL) and mining Applications)	MSA, LUPA, NEMA, ICMA	<ul style="list-style-type: none"> <li>EMP included in all relevant planning documents</li> </ul>	MEDIUM	All authorities
<b>Management Objective 3.2: Reduce the potential risks associated with climate change</b>				
<b>a.</b> Identify areas and infrastructure at risk of flooding and erosion, and include in relevant plans (specifically regional disaster management plan)	Disaster Management Act (Act 57 of 2002) (DMA), WC TIA	<ul style="list-style-type: none"> <li>High risks/high-risk areas identified</li> <li>Relevant plans updated with contingency plans for flood, as well as extreme heat and drought risk.</li> <li>Disaster management plan implemented</li> </ul>	MEDIUM	RMA, WC DoT&PW, Matzikama LM

## 5.4 Institutional and Management Structures

**Strategic Objective 4:** The Sout 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	
<b>Management Objective 4.1: Ensure effective co-ordination of estuarine management responsibilities</b>					
<b>a.</b>	Matzikama LM incorporates the EMP and the spatial zonation plan into planning documents	MSA, LUPA, NEMA, ICMA	<ul style="list-style-type: none"> <li>EMP and zonation plan adopted</li> <li>EMP included in all relevant planning documents</li> </ul>	HIGH	RMA, Matzikama LM, West Coast DM
<b>b.</b>	Undertake needs analysis and identify skills required	ICMA	<ul style="list-style-type: none"> <li>Needs and shortages identified</li> <li>Motivation for acquisition drafted and approved</li> <li>Equipment purchased and maintained</li> </ul>	HIGH	RMA, Matzikama LM, West Coast DM DEA&DP
<b>c.</b>	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	<ul style="list-style-type: none"> <li>Project champions identified</li> <li>Networks established, and contacts database compiled</li> <li>Regular email correspondence</li> </ul>	HIGH	RMA
<b>d.</b>	Ensure that EMP is maintained, enforced and budgeted for annually	ICMA, MSA, LUPA, NWA,	<ul style="list-style-type: none"> <li>An action plan for securing future funding drafted and approved</li> <li>Funding secured for 5-year cycle</li> </ul>	HIGH	All authorities
<b>e.</b>	West Coast Municipal Coastal Committee (MCC) to facilitate co-operative governance in respect to the implementation of the Sout EMP.	ICMA, MSA, LUPA, NWA, NEM: PAA, Mineral Resource and Petroleum	<ul style="list-style-type: none"> <li>WC MCC constituted (Membership includes representatives of government and stakeholders/civil society)</li> <li>WC MCC meets on a quarterly basis</li> <li>Meetings are minuted</li> </ul>	HIGH	RMA, West Coast DM

		Development Act (MRPDA)			
<b>f.</b>	Identify and invite missing stakeholders/ interest groups to partake in West Coast MCC	ICMA	<ul style="list-style-type: none"> <li>• Networks established</li> <li>• Stakeholder database developed and regularly updated</li> </ul>	HIGH	RMA, West Coast DM
<b>g.</b>	Maintain, monitor, review and report on the progress of EMP actions and achievements on annual basis	ICMA	<ul style="list-style-type: none"> <li>• Feedback received from participating agencies</li> <li>• Biannual and annual reporting to DEA&amp;DP and DEFF undertaken by RMA</li> <li>• Action plans updated as and when required</li> </ul>	MEDIUM	RMA, West Coast DM
<b>Management Objective 4.2: Define co-operative governance arrangements</b>					
<b>a.</b>	Identify and implement procedures to ensure cooperative governance between all government departments with a mandate to act	ICMA, Inter-Governmental Relations Act (Act 13 of 2005)	<ul style="list-style-type: none"> <li>• Roles and responsibilities defined and accepted via Memorandum of Understanding (MOUs) signed between RMA and spheres of government and participating agencies</li> <li>• West Coast MCC meets on a quarterly basis</li> <li>• Meetings are minuted</li> <li>• Active collaboration of various implementing agents</li> </ul>	HIGH	All authorities
<b>b.</b>	West Coast MCC to monitor performance of RMA irt implementation of plan	ICMA	<ul style="list-style-type: none"> <li>• Authorities to provide formal feedback on mandated activities</li> <li>• West Coast MCC meets on a quarterly basis</li> </ul>	MEDIUM	All authorities, All stakeholders
<b>c.</b>	Individual agencies to identify and address training needs, with possible secondment to address training and capacity shortfalls	ICMA	<ul style="list-style-type: none"> <li>• Motivation for training drafted and approved</li> <li>• Staff attend relevant accredited training courses</li> <li>• MOU to be developed for secondments</li> </ul>	MEDIUM	All authorities

<b>d.</b>	Mandated authorities and participating agencies to confirm budget allocations for mandated activities/actions	MSA, NWA, ICMA, NEMA	<ul style="list-style-type: none"> <li>• Formal feedback from authorities on mandated activities</li> <li>• Motivation for budget drafted and approved</li> <li>• Funding secured for 5-year cycle</li> </ul>	MEDIUM	All authorities
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## 5.5 Socio-economic Considerations

**Strategic Objective 5:** Socio-economic benefits are regulated, and resilience in the face of climate change improved, to ensure sustainable use of the Sout River estuary and its resources.

**Table 8: Management Objectives and Actions for Socio-economic Considerations**

Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
<b>Management Objective 5.1: Regulate recreational and other use of the estuary to reduce habitat degradation and disturbance</b>				
<b>a.</b> Adopt, demarcate and enforce spatial zonation plan	ICMA	<ul style="list-style-type: none"> <li>• EFZ controls enforced and offenders prosecuted</li> <li>• Reduced habitat loss/degradation and disturbance, and inappropriate behaviour</li> </ul>	HIGH	Matzikama LM
<b>b.</b> Engage with landowners and commercial stakeholders (4x4 tourism operators) to encourage conservation environmental custodianship/ stewardship on adjacent properties.	NEMA (Duty of Care)	<ul style="list-style-type: none"> <li>• Meeting with landowners and 4x4 tourism operators convened</li> <li>• Signed agreements with landowners and 4x4 tourism operators</li> <li>• Degraded areas rehabilitated</li> <li>• Degrading activities halted</li> <li>• Integrity of estuarine margin improved</li> </ul>	HIGH	RMA, Matzikama LM
<b>c.</b> Develop a regional compliance monitoring network and deploy human resources during peak holiday season to monitor and address illegal activities including beach driving and camping activities	NEMA, ICMA	<ul style="list-style-type: none"> <li>• Network established</li> <li>• Rapid response protocol(s) developed</li> <li>• Incidents reported &amp; documented</li> <li>• Transgressors prosecuted</li> </ul>	HIGH	RMA, CapeNature, Matzikama LM, DEA&DP
<b>d.</b> Informative signage, indicating zonation and allowable activities, to be placed at strategic points for all users/visitors	ICMA	<ul style="list-style-type: none"> <li>• Key public spaces / access points identified</li> <li>• Signage created and erected</li> <li>• Recovery of vegetation</li> <li>• Persistence of breeding birds</li> <li>• Duty of Care perception by public</li> </ul>	HIGH	Matzikama LM, Department of Public Works (DPW)

e.	Include estuary within municipal waste management plan, with a focus on peak visitor periods	National Environmental Management: Water Act (NEM: WA), MSA	<ul style="list-style-type: none"> <li>• Appropriate preparation for peak periods</li> <li>• Clean-up operations undertaken after peak visitor periods</li> </ul>	HIGH	Matzikama LM, RMA
f.	Engage with landowners, commercial and other stakeholders to facilitate potential alternate sustainable livelihood opportunities	ICMA, MSA	<ul style="list-style-type: none"> <li>• Sustainable Livelihoods assessment undertaken, if deemed necessary, and potential local economic development (LED) opportunities proposed</li> <li>• Viable LED activities implemented</li> </ul>	HIGH	Matzikama LM, RMA
<b>Management Objective 5.2: Regulate extractive use of estuarine resources</b>					
a.	EFZ 'No-go' area to be incorporated in all relevant government departments planning documents and processes (e.g. mining applications)	MSA, LUPA, NEMA, ICMA	<ul style="list-style-type: none"> <li>• EMP included in all relevant planning documents</li> <li>• No further transformation/ degradation of EFZ</li> </ul>	HIGH	All authorities
b.	Liaise and enter into stewardship agreements with commercial operators / mining companies to conserve EFZ	MRPDA, ICMA	<ul style="list-style-type: none"> <li>• MOUs signed</li> <li>• No additional impact on the system by the salt works</li> <li>• No extension of the salt works</li> <li>• Mining restricted to outside of EFZ and 100 km buffer</li> <li>• No further transformation/ degradation of EFZ</li> </ul>	MEDIUM	RMA, DMR, mining companies
c.	Ensure that projections of future climate and climate-related extreme events are factored into the operational plan of the salt works	NEM: WA; DMA	<ul style="list-style-type: none"> <li>• Salt works operational plan recognises climate change and extreme weather events in the form of an adaptation plan</li> <li>• Local and District disaster management plans to address the socio-economic impacts of extreme climate-related events on employment opportunities such as the salt works in their adaptation planning</li> </ul>	LOW	West Coast DM, Matzikama LM, RMA



## 5.6 Education & Awareness

**Strategic Objective 6: Members of society are sensitive to, and aware of, the value and importance of the Sout River estuary.**

**Table 9: Management Objectives and Actions for Education & Awareness**

Action	Relevant Legislation	Performance Indicator	Priority	Responsibility
<b>Management Objective 5.1: Promote high levels of public awareness and appreciation of the value of estuaries</b>				
<b>a.</b> Develop and effective education and awareness programme for local farmers, residents and visitors	ICMA	<ul style="list-style-type: none"> <li>Education &amp; awareness programme developed and implemented at schools and through interest groups</li> <li>Increased educational opportunities at group gatherings, community meetings, conferences etc.</li> </ul>	LOW	RMA, Matzikama M
<b>b.</b> Source and/or commission educational and informative material indicating zonation and allowable activities (including signage, posters, and pamphlets) to be placed at strategic points for all users/visitors	ICMA	<ul style="list-style-type: none"> <li>Signage created, and erected Posters and pamphlets erected/ disseminated</li> <li>Matzikama estuaries webpage operational</li> <li>Reduction in illegal activities</li> <li>Reduced habitat loss/degradation and disturbance, and inappropriate behaviour</li> <li>Informative surveys/talks undertaken</li> <li>General coastal management and climate change information included in awareness materials</li> </ul>	LOW	RMA, tourism association

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## 6 PROPOSED SPATIAL ZONATION

### 6.1 Introduction

Spatial zonation of activities on an estuary is necessary to avoid user conflict and to guide sustainable utilization 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 typically informed by the following (DEA, 2015):

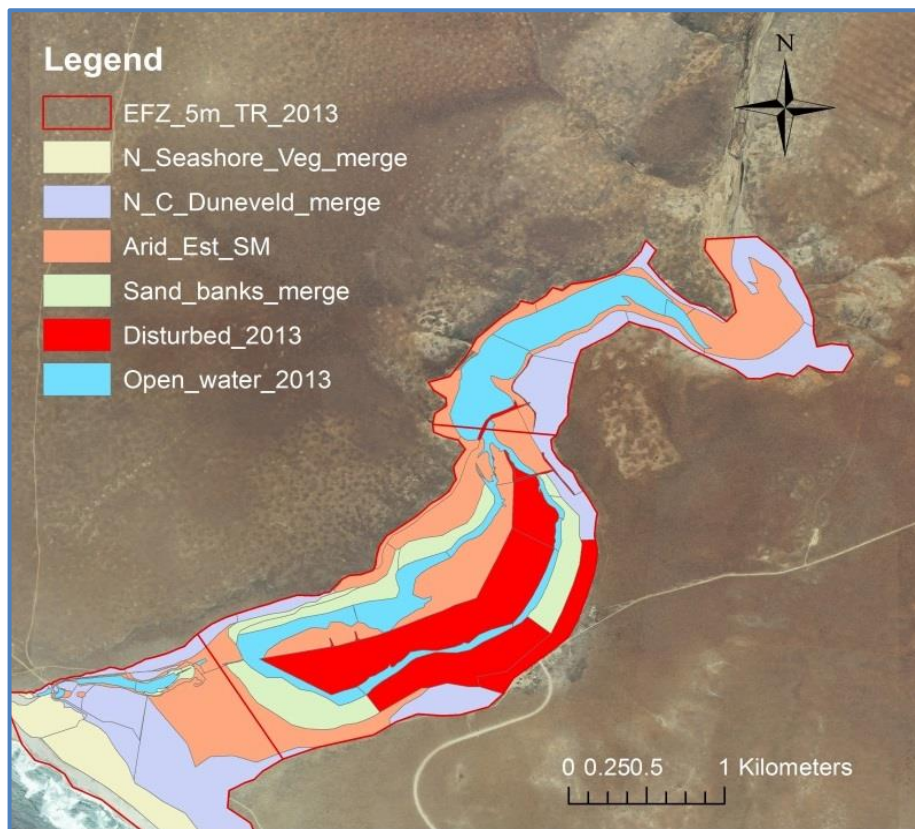
- The geographical boundary of the estuary also indicating important habitats (e.g. floodplain, open water, reed beds, sandflats, etc.);
- The surrounding land uses and existing infrastructure;
- Areas designated for the conservation and protection of biodiversity;
- Appropriate buffers in which land 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 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. All remaining natural habitat must be preserved (i.e. all areas outside/ beyond the Salt Works) with controlled recreational use near the mouth, and no further expansion or relocation of the Salt Works permitted, or further transformation of the estuarine functional zone (see Section 6.4.2) allowed/authorised.



**Figure 6: Habitats identified in the Sout 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 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).

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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 area below the 5 m topographical contour (referenced from the indicative mean sea level)”. The NEMP (2013) 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, 2019) (refer to Figure 3).

### 6.3.2 Coastal Protection Zone and proposed Coastal Management Line

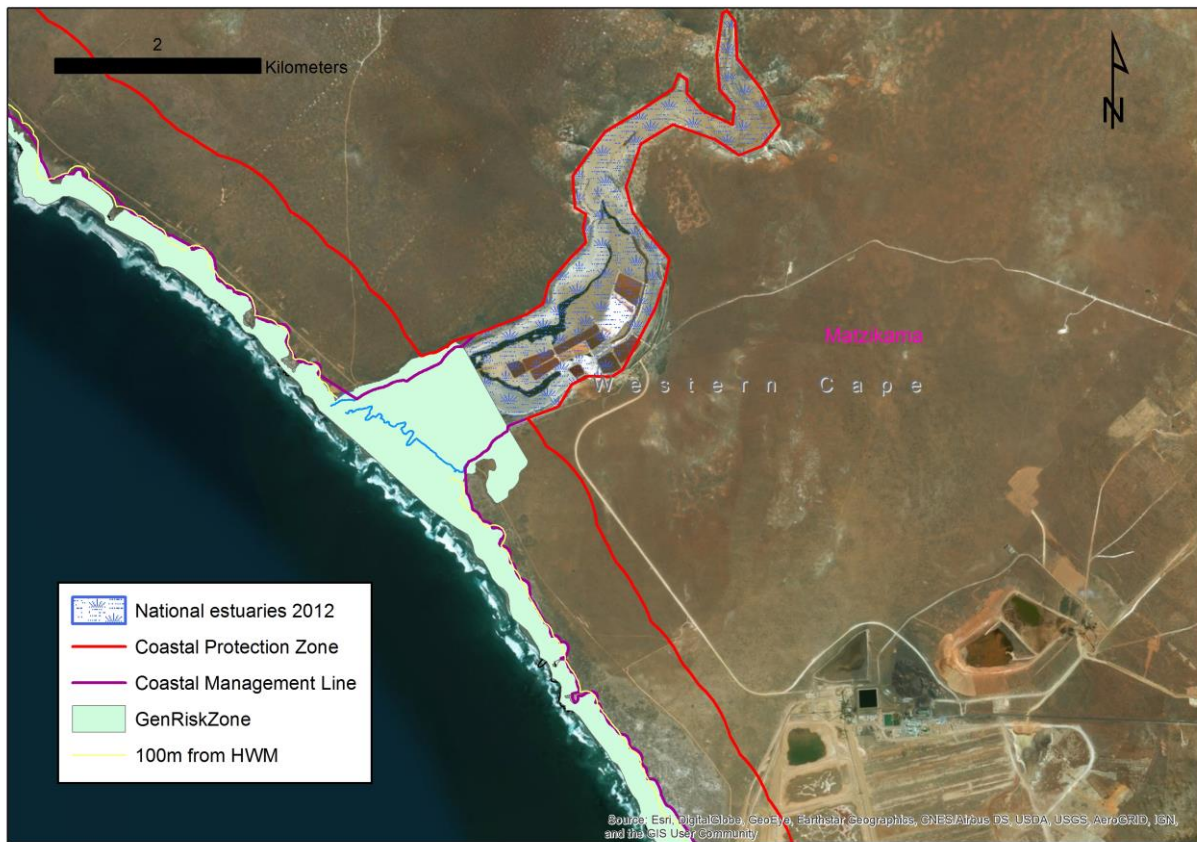
The ICM Act defines a default **Coastal Protection Zone (CPZ)** which, in essence, consists of a continuous strip of land, starting from the High Water Mark (HWM) and extending 100 m inland in developed urban areas zoned as residential, commercial, or public open space, or 1 000 m inland in areas that 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 West Coast, as per draft delineations recommended in the Coastal Set-back / Management Lines for the West Coast District project (WCG, 2015), the CPZ is informed by a coastal risks zone approximated by the **10 m amsl contour or 1:100yr 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 1:100yr floodline, whichever is wider, to differentiate a zone where formal development should be discouraged. The coastal boundaries for the Sout River estuary are illustrated in Figure 7.



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

### 6.3.3 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<sup>2</sup> 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

<sup>2</sup> The Environmental Impact Assessment Regulations, 2014 (as amended in 2017), published under Government Notice No. 326 in Gazette No. 40772 of 7 April 2017, in terms of sections 24(5) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998)



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 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 DEFF.

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 lists the surrounding land use types and activities occurring in and/or adjacent to the Sout River estuary (Table 10).

**Table 10: Current and activities occurring in and/or adjacent to the Sout River estuary**

LAND USE	DESCRIPTION
<b>Agriculture</b>	The Sout River estuary is abutted by farms on its northern and eastern margins. Farming takes the form of dry land crops as well as sheep farming.
<b>Mining lease area</b>	Namakwa Sands mining authorisation area extends to the estuary margin which places the system at risk of future prospecting and operations
ACTIVITIES	DESCRIPTION
<b>Salt mining (and alteration of channel)</b>	The Cawood Salt Works is located within the estuary margins, with the EFZ. The works is reported to have been in existence for over 65 years
<b>Abstraction of water</b>	Abstraction of ground water for both farming as well as salt mining



<b>Recreational activities</b>	Numerous vehicle tracks over dry areas (illegal driving in the coastal zone), bird watching particularly when the pan contains more water, camping in the vicinity of the mouth
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### 6.4.2 Proposed spatial zonation

In the absence of specific municipal zonations, the proposed zonation of the Sout River estuary is, at minimum, informed by the Western Cape Biodiversity Spatial Plan (SANBI, 2017), where the Sout River estuary is designated a primary estuarine Critical Biodiversity Area. In this regard, the objective would be to maintain the remaining, untransformed area in a near-natural state, with no further loss of natural habitat. Degraded areas should be rehabilitated.

To this end, the zonation is proposed to preserve the integrity of the estuary whilst providing for the ongoing operation of the saltworks and limited eco-tourism activities associated with the estuary (Figure 8).

#### 6.4.2.1 Commercial Zone – Saltworks

The zone conforms and encapsulates the boundaries of the existing salt works. This provides for ongoing operation of the saltworks and the economic role it plays in job creation. However, no further expansion of the saltworks or infrastructure that results in ponding/damming of water must be permitted, thereby limiting further degradation or loss of estuarine habitat and processes. Furthermore, non-functional and damaging infrastructure should be removed or suitably repaired/redesigned.

#### 6.4.2.2 Conservancy

Despite its highly transformed nature, the Sout River estuary is classified as a Critical Biodiversity Area, with various supporting ecological habitats, because it plays a critical role in providing very limited wetland-type habitat for estuarine and coastal birds along arid coast. Acknowledging the regional functional and biodiversity value of the system, it is proposed that the remainder of the EFZ be designated as a conservancy (entire EFZ, excluding the salt works).

A conservancy is “a voluntary agreement between two or more landowners to cooperate towards the conservation of the environment on their combined properties” (CapeNature, 2016). In this regard, both landowners and activities on their properties, e.g. Cawood Salts, need to work continuously toward the greater good of preserving the Sout River estuary, uplifting the health and biodiversity of the system, and preventing, minimising, and mitigating negative impacts.

As a conservancy, limited activities are encouraged in the EFZ, and these activities are directed toward accessing and appreciating nature (e.g. birdlife). The purpose of this zone is to conserve remaining estuarine habitat and manage and direct low impact use and interaction so as to minimise impacts on this sensitive coastal environment.

Allowable activities in these zones are to be managed as per

Table 11 below.

#### 6.4.2.3 Recreational Overlay Zone

The Sout River estuary is an attractive destination for 4x4 enthusiasts and campers. The Recreational Overlay Zone demarcates the area where 4x4 access and camping should be restricted to, and in line with specific controls (Table 11) as this zone overlaps with the Conservancy. The primary challenge facing the future RMA is to provide a quality experience for visitors to the West Coast while at the same time managing visitors in a manner that ensures that they do not compromise the coastal and estuarine resources that attracted them in the first place.

Formal development or construction activities in either of these zones are to be regulated according to the EIA Regulations and any future controls emanating from the Provincial determination of coastal management lines. No further development or transformation of the EFZ must be permitted.

#### 6.4.2.4 Buffer Zone

A 100 m buffer zone adjacent to the EFZ is included to mitigate any potential negative impacts of mining on both the EFZ and the salt works. This distance was determined using the Water Research Commission's desktop tool for the determination of preliminary aquatic impact buffer zone requirements (Macfarlane, 2016).



**Figure 8: Proposed spatial zonation of the Sout River estuary showing the Commercial, Conservancy and Recreational zones**

**Table 11: Zonation prescriptions for the Sout River estuary**

CONDITIONS OF USE	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITY	ENFORCEMENT
<b>1. Commercial Zone</b>			
<ul style="list-style-type: none"> <li>All operations relating to the Saltworks</li> <li>No further development within the EFZ</li> <li>No further modification to estuarine channel</li> <li>Vehicle access via designated roads only</li> <li>No picnicking</li> <li>No camping, erection of structures/shelters</li> <li>No clearing of indigenous vegetation for access, fires, or views</li> <li>No littering</li> </ul>	Municipal TPS, Bylaws,	Matzikama LM	Matzikama LM
<b>2. Conservancy</b>			
<ul style="list-style-type: none"> <li>Walking or bicycle access along designated paths</li> <li>Birdwatching</li> <li>No picnicking</li> <li>No camping, erection of structures/shelters</li> <li>No clearing of indigenous vegetation for access, fires, or views</li> <li>No littering</li> </ul>	Municipal TPS, Bylaws,	CapeNature	CapeNature
<b>3. Recreation Zone (overlay)</b>			
<ul style="list-style-type: none"> <li>Picnicking</li> <li>Birdwatching</li> <li>Walking or bicycle access along designated paths</li> <li>Vehicle access only designated routes</li> <li>Camping and self-catering accommodation</li> <li>No clearing of indigenous vegetation for access, fires or views</li> <li>No littering</li> <li>No erection of permanent structures/shelters</li> <li>No further development within the EFZ</li> </ul>	LUPA, Municipal TPS, Bylaws,	Matzikama LM	Matzikama LM
<b>4. Buffer Zone</b>			
<ul style="list-style-type: none"> <li>Vehicle access via designated roads only</li> <li>No picnicking</li> <li>No camping, erection of structures/shelters</li> <li>No clearing of indigenous vegetation for access, fires, or views</li> <li>No littering</li> <li>No erection of permanent structures/shelters</li> <li>No development</li> </ul>	LUPA, Municipal TPS, Bylaws,	Matzikama LM	Matzikama LM

### 6.4.3 Areas requiring rehabilitation

Key interventions required to achieve the Recommended Ecological Category (REC) of a D<sup>3</sup> include:

- Improvement of circulation (e.g. culverts in roads);
- Restoring connectivity with catchment, i.e. investigate if weir can be partially removed to allow connectivity with western arm of estuary; and
- Evaluate to what extent the current design and/or operations of the salt works can be improved to restore estuarine habitat and functionality of the upper reaches.

There are also numerous roads that form a busy network through and around the estuary. Several of these roads are unnecessary and are sources of habitat degradation and destruction. These roads should be closed and rehabilitated.

The priority areas are indicated in Figure 9 below.



**Figure 9: Priority areas requiring rehabilitation**

It is noteworthy, that the recommended ecological categories of the main rivers feeding into the Sout River estuary, the Sout, Klein Goerap and Groot Goerap are all Category B, and the groundwater resources for the same systems are Category A. These systems each possess wetland areas deemed to be in A/B condition (near natural condition) (DWA, 2012).

<sup>3</sup> However, it is noted that the 2018 NBA (SANBI 2019) suggests a Category E.



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## 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

The current state of resource monitoring on the Sout River estuary is unknown. Cawood Salts are reported to undertake monitoring of the EFZ in respect to its impact on their mining operation, e.g. Increase in number of birds noted at the public meeting held in August 2017<sup>4</sup>.

#### 7.1.2 Recommended Resource Monitoring Programmes

General baseline information for the Sout River estuary is lacking. The recommended minimum monitoring requirements to ascertain impacts of changes in freshwater flow to the estuary and/or any improvement or reductions therein are listed in Table 12. In respect to improving baseline information, the proposed monitoring requirements must also be implemented in the event of a breaching event, and quarterly for 2 years thereafter (apart from those items identified as requiring continuous monitoring). Recommended baseline monitoring requirements to improve the confidence of future EWR assessments are listed in

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<sup>4</sup> Minutes of stakeholder engagement meeting held on 2 August 2017, Cawood Salts

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Table 13.

### **7.1.3 Ecological Specifications**

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 Sout River estuary, a Category D. However, it is noted that the 2018 NBA (SANBI, 2019) suggests a Category E.

Thresholds of potential concern (TPC) are defined as measurable end points related to specific abiotic or biotic indicators that if reached (or when modelling predicts that such points will be reached) prompts management action. In essence, TPCs should provide early warning signals of potential non-compliance to ecological specification (i.e. not the point of 'no return'). The EcoSpecs, as well as the TPCs, representative of a Category D for the Sout River estuary, are presented in Table 14 (Appendix 2) (DWS, 2017b).

A basic monitoring programme should be established by the RMA for the Sout River estuary according to the Reserve Determination methods. The programme should seek to address the monitoring priorities as soon as possible.

## **7.2 Compliance Monitoring**

Compliance monitoring refers to the monitoring of the character and intensity of uses/activities and developments within an estuary/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.

The current state of compliance monitoring on the Sout River estuary is unknown and is presumably non-existent due to the remote location of the estuary and limited estuarine resources. In respect to the implementation of this EMP, compliance monitoring will be the responsibility of the Matzikama LM in respect to land-use/town planning/illegal activities (e.g. camping, dumping/littering), DALRRD in respect to agricultural best practices; and DWS for water abstractions. Compliance in respect to illegal driving in the coastal zone is the mandate of DEFF. Compliance monitoring and enforcement will be undertaken according to applicable legislation and policies and by means of law enforcement and compliance monitoring protocols.

## **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

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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.

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 NEMP (2013), 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.

A performance monitoring plan relative to the proposed management priorities is included as Table 12 at Appendix 3.



## 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 the 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 of efficient and effective estuarine management. Figure 10 displays the key role players that should be included in its management.

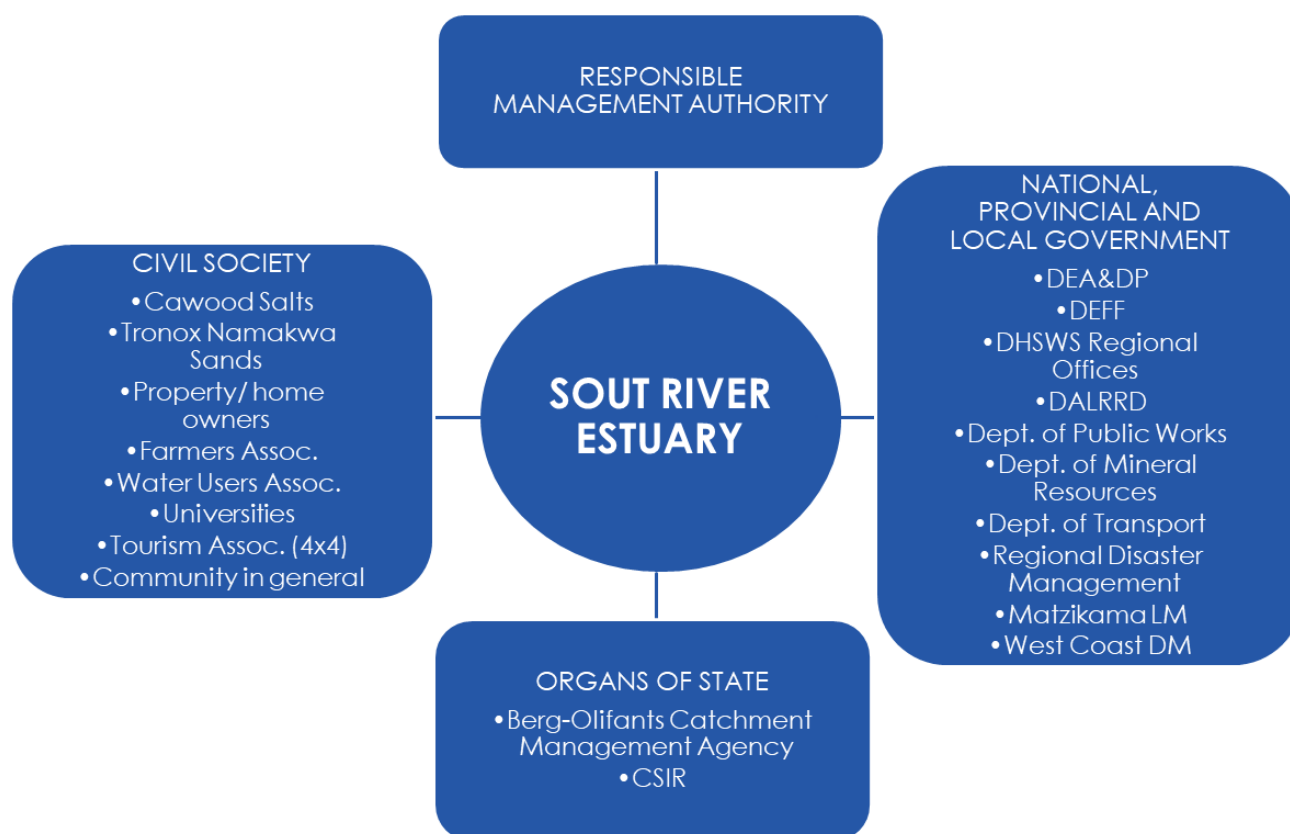


Figure 10: Key role players for the management of the Sout River estuarine system

### 8.2 Responsible Management Authority

While the 2013 NEMP identifies the Matzikama LM, or its assigned representative, as the RMA responsible for the co-ordination of the implementation of the Sout River EMP, **it is noted that proposed amendments to the NEMP allocate such responsibilities to the provincial**

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**environmental department unless agreement, or until agreement, is reached with the respective municipality to undertake the coordination of the implementation process. Ultimately, the role of the RMA must be designated through formal signed agreement.**

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 the DALRRD will be responsible for agriculture related issues. 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.

Effective implementation of this EMP requires the augmentation of capacity specifically within DEA&DP, with the recommended appointment of a District Estuarine Management Co-ordinator (EMC). This individual will play a critical co-ordinating role for all other implementing agencies.

Progress towards achieving the objectives set out in this EMP should be reviewed on an annual basis by the RMA and communicated to stakeholders and the 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 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, discussion of issues relating to the Sout estuarine system are proposed to be discussed at West Coast Municipal Coastal Committee (MCC) meetings.

Government departments are represented at this regional level by delegates mandated by the respective department to do so. Each government representative will be tasked to convey recommendations to his/her department and report back to the MCC 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.

Identified local members will play an invaluable role in providing on the ground, local insight (e.g. Cawood Salts personnel) and support to the various authorities as well as to the RMA.

### **8.4 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:

- The identified RMA (DEA&DP, Cape Nature or the Matzikama Local Municipality);

- The Matzikama Local Municipality; Responsible for issues relating to tourism, health and safety, land use management and the provision of municipal services;
- The West Coast 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, research and monitoring (e.g. DEA&DP, DoT&PW);
- Relevant National government departments, especially DEFF, DWS (via the regional office), DALRRD, Department of Mineral Resources, Department of Transport, Department of Science and Technology (DST); and
- Organs of State: BOfCMA.

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. 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:

- Western Cape Provincial Coastal Committee: Responsible for facilitating co-management and effective governance and provincial co-ordination of estuarine management; and
- The Western Cape Estuaries Task Team: Responsible for facilitating provincial co-ordination of estuarine management.

#### **8.4.1 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,

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## 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:

- The DWS be requested to consider reviewing the scoring of ecological health, specifically in respect to fish in this hypersaline system;
- Cawood Salts to redesign the current design of the salt works improving circulation and restoring connectivity with both the catchment and the sea;
- Consideration be given to participation in the CapeNature Biodiversity Stewardship Programme and/or the designation of a Special Management Area;
- Undertaking practical monitoring;
- Managing activities and specifically responding to illegal camping and beach driving; and
- The DEA&DP to consider the appointment of a Regional estuarine management co-ordinator/champion within either DEA&DP or CapeNature, to support the RMA.

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.

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## APPENDIX 1: RECOMMENDED MONITORING PROGRAMME

**Table 12: Recommended minimum requirements for long-term monitoring (Priority: Red = High; Orange = Medium, Yellow = Low) (DWS, 2017b)**

COMPONENT	MONITORING ACTION	TEMPORAL SCALE (FREQUENCY AND WHEN)	SPATIAL SCALE (NO. STATIONS)	PRIORITY
Hydro-dynamics	Record estuary water levels.	Continuous	In main water body	High
	Measure groundwater level.	Continuous	Near head of estuary	High
	Satellite photographs of estuary (30x 30 m).	Every 3 years	Entire estuary	High
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	Medium
	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	Low
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	Medium
	<i>In situ</i> salinity and temperature observations.	Continuous	In main water body (1 to 3 stations)	High
	Longitudinal salinity and temperature profiles (in situ) collected over a spring and neap tide during high and low tide at: <ul style="list-style-type: none"> <li>End of low flow season (i.e. period of maximum seawater intrusion).</li> <li>Peak of high flow season (i.e. period of maximum flushing by river water).</li> </ul>	Every year at end of dry season	Entire estuary (3-5 stations)	Low
	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)	Low
	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	Low
	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	Low
Microalgae	Record relative abundance of dominant phytoplankton groups, i.e. flagellates, dinoflagellates, diatoms and blue-green algae.	Summer survey every 3 years	Entire estuary	Low
	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	Medium
	Intertidal and subtidal benthic chlorophyll-a measurements.	Summer survey every 3 years	Entire estuary	Low



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	High
	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	Medium
	Note extent of macroalgal blooms, floating aquatic macrophytes and area occupied by invasive vegetation.	Summer survey every 3 years	Entire estuary	High
	Take measurements of depth to water table	Summer survey every 3 years	Upper reaches	Medium
Invertebrates	Record species and abundance of zooplankton, based on samples collected across the estuary. ( <i>Palaemon</i> population)	Summer survey every 3 years	Entire estuary (3-5 stations)	Medium
	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)	Medium
	Measures of sediment characteristics at each station.	Summer survey every 3 years	Entire estuary (3-5 stations)	Medium
Fish	Record species and abundance of fish, based on seine net sampling.	Summer survey every 3 years	Entire estuary (3-5 stations)	Medium
Birds	Undertake counts of all water associated birds, identified to species level.	Annual winter (Jul/Aug) and summer (Jan/Feb) surveys	Entire estuary	Medium

**Table 13: Recommended baseline monitoring requirements to improve the confidence of future EWR assessments (Priority: Red = High; Orange = Medium, Yellow = Low, White = Not relevant) (DWS, 2017b)**

COMPONENT	MONITORING ACTION	TEMPORAL SCALE (FREQUENCY AND WHEN)	SPATIAL SCALE (NO. STATIONS)	PRIORITY
Hydro-dynamics	Record estuary water levels.	Continuous	In main water body	Red
	Measure groundwater level.	Continuous	Near head of estuary	Red
	Satellite photographs of estuary (30x 30 m).	Once off	Entire estuary	Red
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.	Once off (or in the case of a flood)	Entire estuary	Orange
	Set sediment grab samples (at cross section profiles) for analysis of Particle Size Distribution (PSD) and origin (i.e. using microscopic observations).	Once off (with invert sampling)	Entire estuary	Yellow
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.	Breaching event, then quarterly for 2 years	Close proximity to head of estuary	Orange
	<i>In situ</i> salinity and temperature observations.	Continuous	In main water body (1 to 3 stations)	Red
	Longitudinal salinity and temperature profiles (in situ) collected over a spring and neap tide during high and low tide at: <ul style="list-style-type: none"> <li>End of low flow season (i.e. period of maximum seawater intrusion).</li> <li>Peak of high flow season (i.e. period of maximum flushing by river water).</li> </ul>	Breaching event, then quarterly for 2 years	Entire estuary (3-5 stations)	Yellow
	Water quality measurements (i.e. system variables, and nutrients) taken along the length of the estuary (surface and bottom samples).	Breaching event, then quarterly for 2 years	Entire estuary (3-5 stations)	Yellow
	Measurements of organic content and toxic substances (e.g. trace metals and hydrocarbons) in sediments along length of the estuary, where considered an issue.	Breaching event, then quarterly for 2 years	Focus on sheltered, depositional areas	Yellow
	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	Yellow
Microalgae	Record relative abundance of dominant phytoplankton groups, i.e. flagellates, dinoflagellates, diatoms and blue-green algae.	Breaching event, then quarterly for 2 years	Entire estuary	Yellow
	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.	Breaching event, then quarterly for 2 years	Entire estuary	Orange

COMPONENT	MONITORING ACTION	TEMPORAL SCALE (FREQUENCY AND WHEN)	SPATIAL SCALE (NO. STATIONS)	PRIORITY
	Intertidal and subtidal benthic chlorophyll-a measurements.	Breaching event, then quarterly for 2 years	Entire estuary	High
Macrophytes	Ground-truthed maps to document changes in macrophyte habitats over time. Document area covered by sensitive habitats i.e. submedged macrophytes.	Breaching event, then quarterly for 2 years	Entire estuary	High
	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.	Breaching event, then quarterly for 2 years	Entire estuary	Medium
	Note extent of macroalgal blooms, floating aquatic macrophytes and area occupied by invasive vegetation.	Breaching event, then quarterly for 2 years	Entire estuary	High
Invertebrates	Record species and abundance of zooplankton, based on samples collected across the estuary. ( <i>Palaemon</i> population)	Breaching event, then quarterly for 2 years	Entire estuary (3-5 stations)	Medium
	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.	Breaching event, then quarterly for 2 years	Entire estuary (3-5 stations)	Medium
	Measures of sediment characteristics at each station.	Breaching event, then quarterly for 2 years	Entire estuary (3-5 stations)	Medium
Fish	Record species and abundance of fish, based on seine net sampling.	Breaching event, then quarterly for 2 years	Entire estuary (3-5 stations)	High
Birds	Undertake counts of all water associated birds, identified to species level.	Breaching event, then quarterly for 2 years	Entire estuary	Medium

## APPENDIX 2: ECOLOGICAL SPECIFICATIONS

**Table 14: Ecological Specifications and Thresholds of Potential Concern for the Sout River estuary (Category D) (DWS, 2017b)**

PES:	E	PERC:	D/E Classification should set TEC= D long term target)
<p>Components that require interventions to achieve the PERC (and ultimately the REC):</p> <ul style="list-style-type: none"> <li>▪ <b>Flow, hydrodynamics, sediment processes and macrophytes:</b> Develop an Estuary Management to evaluate to what extent the current design and/or operations of the salt works can be improved to restore estuarine habitat and functionality of the upper reaches. In progress - the Western Cape Government has prioritised this system for a plan.</li> <li>▪ <b>Hydrodynamics:</b> Improve circulation (e.g. culverts in roads).</li> <li>▪ <b>Flow:</b> Restore connectivity with catchment, i.e. investigate if weir can be partially removed to allow connectivity with western arm of estuary.</li> </ul>			
<b>Flow</b>			
PES (PERC)	nMAR (MCM)	Reference groundwater discharge (Mm <sup>3</sup> /a)	Present groundwater discharge (Mm <sup>3</sup> /a)
D/E (↑)	0.7	1.24	1.13
<ul style="list-style-type: none"> <li>▪ Flows should not exceed natural and seasonal distribution should not be compromised. Current baseflows should be upheld into estuary to maintain present mouth state and salinity regime. The distribution patterns of the flood components differ by no more than 10% (in terms of magnitude, timing and variability) from that of the Present (2015).</li> <li>▪ Groundwater needs to be maintained at present levels.</li> <li>▪ Floods need to reach the estuary (at present significantly reduced by weir above estuary).</li> </ul>			
<b>Sediment processes</b>			
E	<ul style="list-style-type: none"> <li>▪ The flood regime maintains the sediment distribution patterns and aquatic habitat (instream physical habitat). The suspended sediment concentration from river inflow does not deviate by more than 20% of the present sediment load-discharge relationship (to be determined). The sedimentation and erosion patterns in the estuary do not differ significantly from present (<math>\pm 0.5</math> m) (to be determined).</li> <li>▪ Changes in sediment grain size distribution patterns similar to present. The median bed sediment diameter deviates by less than a factor of two from present levels (levels to be determined). The sand/mud distributions in middle and upper reaches do not change by more than 20% from Present State over a five year average.</li> </ul>		
<b>Hydrodynamics and Mouth state</b>			
E/F (↑)	Improved connectivity with the different water bodies and restored connectivity with the catchment through removal/modification of weir at the head of the estuary.		
<b>Water quality: Salinity</b>			
E (↑)	Upper reaches: < 120 psu (hyper salinity). Middle Reaches: < 80 psu (hyper salinity). Lower reaches: < 60 psu (hyper salinity).		
<b>Water quality: Other</b>			
D	<ul style="list-style-type: none"> <li>▪ DIN: Entire estuary, average &lt;0.1 mg/l.</li> <li>▪ DIP: Entire estuary, average &gt;0.01 mg/l.</li> <li>▪ DO: Entire estuary, average <math>\geq 6</math> mg/l.</li> <li>▪ Turbidity: Entire estuary, average &lt;10 NTU except during floods</li> </ul> Toxic substances: <ul style="list-style-type: none"> <li>▪ Substance concentrations in estuarine waters not to exceed targets as per SA Water Quality Guidelines for coastal marine waters (DWAf, 1995).</li> <li>▪ Substance concentrations in estuarine sediment not to exceed targets as per WIO Region guidelines (UNEP/Nairobi Convention Secretariat and CSIR, 2009).</li> </ul>		

<b>Microalgae</b>	
<b>E↑</b>	Maintain the distribution of different phytoplankton groups and low biomass in the lower reaches (<10 µg/l).
<b>Macrophytes (plants)</b>	
<b>E/F↑</b>	<ul style="list-style-type: none"> <li>▪ Maintain the distribution of current macrophyte habitats, (&lt;20% change in the area covered by different macrophyte habitats (accounts for natural changes due to the dynamic nature of estuaries).</li> <li>▪ Water column salinity not greater than 50 psu in the lower reaches to limit salt accumulation and dieback of salt marsh (<i>Sarcocornia pillansii</i>).</li> <li>▪ Prevent further disturbance and development in the salt marsh and floodplain habitat through salt works activities.</li> </ul>
<b>Invertebrates</b>	
<b>E↑</b>	<p>As sampled by plankton net, grab and dip nets/traps (as appropriate):</p> <ul style="list-style-type: none"> <li>▪ Uncysted Brine shrimp should be present in the system for 75% of the time.</li> </ul>
<b>Fish</b>	
<b>E/F↑</b>	Not applicable. Hyper saline system.
<b>Birds</b>	
<b>E↑</b>	<ul style="list-style-type: none"> <li>▪ Including flamingos, more than 10 species of waders and water birds that feed on brine shrimp should be present 75% of the time (during 40 – 150 psu and brine shrimp available).</li> <li>▪ The occurrence and cause of bird mortalities needs to be verified.</li> </ul>

PERC = Preliminary Ecological Reserve Category

## APPENDIX 3: RECOMMENDED PERFORMANCE MONITORING PLAN

**Table 15: Recommended Performance Monitoring Plan for the management of Sout River estuary**

MANAGEMENT OUTPUT	PERFORMANCE INDICATOR	TEMPORAL SCALE (frequency)	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITY
<b>1. ESTUARINE HEALTH AND FUNCTION</b>				
1.1 Secure adequate quantity and quality of freshwater input to improve and maintain ecosystem health and functioning	<ul style="list-style-type: none"> <li>Recommended reserve(s) signed off and implemented</li> <li>Abstraction and discharge points identified and monitored</li> <li>Water resource utilisation plan developed</li> <li>Alien invasive vegetation programme developed and implemented</li> <li>Natural mouth dynamics monitored</li> <li>State of the estuary monitored</li> <li>Prioritised RDM monitoring activities undertaken</li> <li>Agricultural best practice enforced</li> <li>Ecological condition improved from E to D category</li> </ul>	<ul style="list-style-type: none"> <li>Once a year</li> </ul>	NWA, CARA	DWS, DEFF, BOfCMA, RMA, Matzikama LM
1.2 Ensure estuary requirements are integrated into catchment processes to ensure healthy water quality	<ul style="list-style-type: none"> <li>Critical catchment and other maps updated</li> <li>Effective catchment management</li> <li>Good catchment water quality preserved</li> </ul>	<ul style="list-style-type: none"> <li>Once a year</li> </ul>	NWA, NWA, MSA, CARA, NEM:BA, NEM:PAA	DWS, BOfCMA, DEFF, Matzikama LM
1.3 Rehabilitate connectivity within the system	<ul style="list-style-type: none"> <li>Priority areas identified and rehabilitated and signage installed</li> <li>Methods to restore connectivity identified</li> <li>Estuarine habitat and functionality restored</li> </ul>	<ul style="list-style-type: none"> <li>Once a year</li> </ul>	NEMA, NWA, ICMA, WC TIA	RMA, DWS, DEFF, DoT, WC DPW
<b>2. BIODIVERSITY CONSERVATION</b>				
2.1 Ensure the conservation of representative estuarine habitats and indigenous species	<ul style="list-style-type: none"> <li>Special management area or conservancy adopted as well as custodianship on adjacent properties</li> <li>Spatial zonation plan implemented and enforced</li> </ul>	<ul style="list-style-type: none"> <li>Once a year</li> </ul>	ICMA, NEMA, MLRA, LUPA, NWA, MLRA, NEM:BA	CapeNature, RMA, DEFF, Matzikama LM,

MANAGEMENT OUTPUT	PERFORMANCE INDICATOR	TEMPORAL SCALE (frequency)	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITY
	<ul style="list-style-type: none"> <li>Ecological monitoring programme developed, and status of fish populations determined</li> </ul>			
<b>3. LAND USE AND INFRASTRUCTURE DEVELOPMENT PLANNING</b>				
3.1 Ensure appropriate and sustainable land use and coastal development in and around the Sout River estuary	<ul style="list-style-type: none"> <li>CML and its associated development controls implemented</li> <li>EMP included in IDP and SDF and EFZ and no-go areas incorporated to all relevant government department documents</li> </ul>	<ul style="list-style-type: none"> <li>Annually</li> </ul>	ICMA, LUPA	Matzikama LM, West Coast DM, DEA&DP and applicable authorities
3.2 Reduce the potential risks associated with climate change	<ul style="list-style-type: none"> <li>Areas and infrastructure at risk of flooding and erosion identified and included in regional disaster management plan, as well as extreme heat and drought risk.</li> </ul>	<ul style="list-style-type: none"> <li>Annually</li> </ul>	ICMA, DMA	Matzikama LM, West Coast DM,
<b>4. INSTITUTIONAL AND MANAGEMENT STRUCTURES</b>				
4.1 Ensure effective co-ordination of estuarine management responsibilities	<ul style="list-style-type: none"> <li>EMP adopted and incorporated into Matzikama LM SDF</li> <li>Regional Estuarine management function established in DEA&amp;DP</li> <li>Good communication and working relationship established with implementing agencies via West Coast MCC – missing stakeholders included</li> <li>Progress with actions reported</li> </ul>	<ul style="list-style-type: none"> <li>Quarterly</li> </ul>	ICMA, MSA, NEMA, LUPA, NWA	RMA, Matzikama LM, West Coast DM, applicable authorities
4.2 Define and enable co-operative governance	<ul style="list-style-type: none"> <li>Active collaboration of various institutions, private and civil stakeholders</li> <li>Individual agencies knowledgeable and with capacity and resources to carry out mandated actions</li> <li>Formal review of EMP every 5 years</li> </ul>	<ul style="list-style-type: none"> <li>Annually</li> </ul>	MSA, NWA, ICMA, NEMA, WC BRA, CARA	All applicable authorities



MANAGEMENT OUTPUT	PERFORMANCE INDICATOR	TEMPORAL SCALE (frequency)	RELEVANT LEGISLATION	RESPONSIBLE AUTHORITY
<b>5. SOCIO-ECONOMIC CONSIDERATIONS</b>				
5.1 Regulate recreational and other use of the estuary to reduce habitat degradation and disturbance	<ul style="list-style-type: none"> <li>• Spatial zonation adopted and incorporated into Matzikama LM SDF</li> <li>• Custodianship/stewardship from neighbouring landowners and users</li> <li>• Illegal access as well as waste management controlled, and signage installed</li> <li>• Sustainable livelihoods assessment undertaken and implemented, if deemed viable</li> </ul>	• Annually	ICMA, NEMA, NWA	RMA, Matzikama LM, West Coast DM
5.2 Regulate extractive use of estuarine resources	<ul style="list-style-type: none"> <li>• Spatial zonation plan implemented and enforced</li> <li>• Custodianship/stewardship from neighbouring landowners and users</li> </ul>	• Annually	MSA, LUPA, NEMA, ICMA, MLRA	DEFF, Matzikama LM, West Coast DM
<b>6. EDUCATION AND AWARENESS</b>				
6.1 Promote high levels of public awareness and appreciation of the value of estuaries	<ul style="list-style-type: none"> <li>• Education &amp; awareness programme developed and implemented</li> <li>• Educational and informative material indicating zonation and allowable activities (including signage, posters, and pamphlets) sourced</li> </ul>	• Every 3 years	ICMA	RMA, Matzikama LM, West Coast DM

## APPENDIX 4: PROJECT PLAN TEMPLATE

<b>ACTION</b>	Describe the action to be undertaken																																																											
<b>COMPLETION DATE</b>	Provide date of expected completion																																																											
<b>PERFORMANCE INDICATOR</b>																																																												
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	<table border="1"> <thead> <tr> <th rowspan="2">TASK</th> <th colspan="9">TIME (months)</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> </tr> </thead> <tbody> <tr> <td>1</td> <td style="background-color: #4F81BD;"></td> <td style="background-color: #4F81BD;"></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td></td> <td></td> <td style="background-color: #4F81BD;"></td> <td style="background-color: #4F81BD;"></td> <td style="background-color: #4F81BD;"></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td style="background-color: #4F81BD;"></td> <td style="background-color: #4F81BD;"></td> <td style="background-color: #4F81BD;"></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td style="background-color: #4F81BD;"></td> <td style="background-color: #4F81BD;"></td> </tr> </tbody> </table>	TASK	TIME (months)									1	2	3	4	5	6	7	8	9	1										2										3										4									
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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. <ul style="list-style-type: none"> <li>Define data and information to measure in order to monitor performance indicator/s</li> <li>Specify frequency at which data/information should be collected/monitored</li> <li>Where and when to report on progress</li> </ul>																																																											
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