CapeNature

Bot/Kleinmond Estuary Estuarine Management Plan (2023 to 2027)

January 2023

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C.A.P.E. Cape Action for People and the Environment

CapeNature

Western Cape Government Environmental Affairs & Development Planning

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Date:

January 2023

I, Anton Bredell, Minister of Local Government, Environmental Affairs and Development Planning hereby approve the Bot/Kleinmond Estuary Estuarine Management Plan for implementation.

Anton Bredell

Digitally signed by Anton Bredell
Date: 2023.06.23 10:48:04 +02'00'

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.

DOCUMENT USE

Estuaries are recognised as particularly sensitive and dynamic ecosystems, and therefore require above-average care in the planning and control of activities related to their use and management. For this reason, the National Environmental Management: Integrated Coastal Management Act (No. 24 of 2008, as amended by Act 36 of 2014) (ICMA), via the prescriptions of the 2013 National Estuarine Management Protocol (NEMP), requires Estuarine Management Plans (EMPs)to be prepared for estuaries in order to create informed platforms for efficient and coordinated estuarine management. The NEMP, promulgated in May 2013, sets out the minimum requirements for individual EMPs.

In 2013/2014, a review was conducted by the Department of Environmental Affairs: Oceans and Coasts (DEA, 2014a) on the existing management plans to ensure, *inter alia*, the alignment of these plans with the NEMP (2013).

This revision of the Bot/Kleinmond Estuarine Management Plan, including the Situation Assessment Report (SAR) and the management plan itself, is in response to the comments received during the review process only, to ensure compliance with the minimum requirements for EMPs as per the NEMP (2013). It therefore integrates existing content (from the original EMP) with the situation as of 2017/2018. In summary, the update entailed:

- Updating the terminology as per the NEMP (2013);
- Including the results of the Ecological Water Requirement study;
- Updating the legislative review with regards to the requirements of the ICMA and the NEMP (2013) in the SAR;
- Including a summary of the SAR;
- Providing a map of the geographical boundaries of the Estuarine Functional Zone;
- Prioritising management actions;
- Providing more detail in respect to the intended spatial zonation of the estuary;
- Including a resource monitoring plan as well as a performance monitoring plan towards achieving the EMP objectives; and
- Updating the description of institutional capacity and arrangements to manage elements of EMP provided as per the NEMP (2013).

The work of the original authors and input received from stakeholders remains largely unchanged, although certain editorial changes and factual updates will be evident. Historical information and data remain relevant and critically important for estuarine management in the long term and must be supplemented by new information when it becomes available. This revision does not represent, or replace, the full 5-year review process required to re-evaluate the applicability of the plan and to provide new information. This full review process is therefore still urgently required and should be part of a future revision.

In preparation for the final EMP approval process, the draft EMP was published for public comment from 28 January to 04 March 2022 (see appendix C : stakeholder consultation report). This was followed by a formal "Comment and Response" process which reviewed

and addressed all comments submitted. Minor edits were made to the EMP where appropriate. This document is the final Bot/Kleinmond River Estuary Estuarine Management Plan.

EXECUTIVE SUMMARY

Introduction

This document describes the plan for managing the Bot/Kleinmond estuarine system and associated wetlands, which was revised in 2016 in order to meet the minimum requirements of the NEMP (2013 amended in 2021). This is a unique estuarine lake system that has two mouths that are open to the sea, one that is opens adjacent to the Meerensee residential area and one that opens adjacent to town of Kleinmond. The EMP sets out the Vision and key Objectives for the Bot/Kleinmond estuarine system and identifies specific Management Objectives needed to meet these key objectives, and indicates the main actions or activities required in the next five years in order to achieve the overall vision.

Summary of Situation Assessment

A summary of the original Situation Assessment Report (SAR) is included and provides an overview of the estuarine system and its ecological condition. In summary, the estuary is the third largest estuarine system in the Cape Floristic Region and is known also as die Vlei. Hawstonvlei or Botriviersvlei, are connected to the Bot/Kleinmond estuary mouth via a young wetland known as Rooisand, so that they form a combined estuarine system, with water flowing in either direction depending on rainfall, between them. The diversity of habitat types within the system, and the expanse of the water body, make it unique in South Africa. The Bot River estuary is an important habitat for water birds and attracts considerable numbers of bird-watching tourists. It forms part of an Important Bird and Biodiversity Area (IBA) (BirdlifeSA publication). The tourism value of the estuary is considered to be underexploited due to the limited amount of facilities and access for visitors, and the seasonal nature of current visitor use. Large lifestyle developments exist on the banks of the estuary, e.g. Benguela Cove and Arabella Estate. The Bot Estuary is a declared RAMSAR site.

The Present Ecological State or PES of the Bot/Kleinmond estuarine system as determined through the Ecological Water Requirements Study (CSIR, 2011), was a Category C i.e. a moderately modified state. This state is characterised by a loss and/or change of natural habitat and biota but the basic ecosystem functions and processes remain predominantly unchanged. The major pressures contributing to the diminished health of the estuary are: little to no river inflow in summer, poor water quality, artificial breaching and over exploitation of fish. These impacts can be mitigated with very little effort. The Bot/Kleinmond estuarine system is included in the core set of estuaries that needs to be protected to meet biodiversity targets in South Africa. The National Estuarine Biodiversity Plan (Turpie et al., 2012) stipulates that 50% of the terrestrial marginal area be protected from development and excessive use, that a portion of the estuary be declared a no-take area, and that the estuary be managed to an improved state, with a Recommended Ecological Water Requirement Category of B (largely natural with few modifications). The recommended flow scenario is the Present day, which entails current flow reaching the estuary (MAR 72 $x10^6$ m^3) with an improvement in summer baseflows (i.e. 0.15 $x10^6$ m^3 per month in summer).

The Bot River estuary is an important habitat for water birds and attracts considerable numbers of bird-watching tourists with more than 118 species recorded. Notable is the large

number of red-knobbed coot *Fulicia cristata*, as many as 36,000 at times. Application for Ramsar status is on-going. Provision for bird sanctuary areas has been made in the estuary zonation plan relating to recreational use of the estuarine environment. Activities in and around the estuary include: Hiking, Canoeing, Kite surfing, Horse riding, Boating (motor and oars), Sailing, Birding, Water-skiing, Windsurfing, Swimming, Powerboating, Surfing, Fishing, and Wakeboarding.

Issues of global, national and regional significance are then detailed with additional information provided in respect to livelihoods and compliance as well as urban development. Water quality and flow, catchment management, tourism development, exploitation or natural value and recreation, social sustainability and monitoring and evaluation is discussed. The SAR concludes with a proposed framework as well as recommended management tools which include:

- A co-operative management structure;
- A compliance plan;
- Resource Directed Measures (RDM) (completed in 2011) and Resource Quality Objectives;
- A catchment-wide Riparian buffer;
- A conservation plan;
- A mouth management plan and Maintenance Management Plan approved;
- A community-based resource management programme focused at the fish resource (this is no longer applicable with regards to MLRA species since the advent of the DFFE Small Scale Fisheries Policy);
- A monitoring, evaluation and reporting programme; and
- Environmental Management Overlay Zones (replaces the proposed Spatial Conservation and Development Framework and the Coastal Planning Scheme).

Vision and Objectives

The vision statement for the long-term future state of the estuary is proposed as follows:

> "***The Bot/Kleinmond estuarine system and associated wetlands form a unique, biologically diverse and productive ecosystem. It is one of South Africa's most important nursery areas for the marine fish that sustain our fisheries. The tranquil quality of this natural environment makes it a popular recreation place for local families, fishers and nature-lovers and a sought-after destination for eco-tourists. Management of the estuaries takes place in partnership with the local community and all spheres of government***".

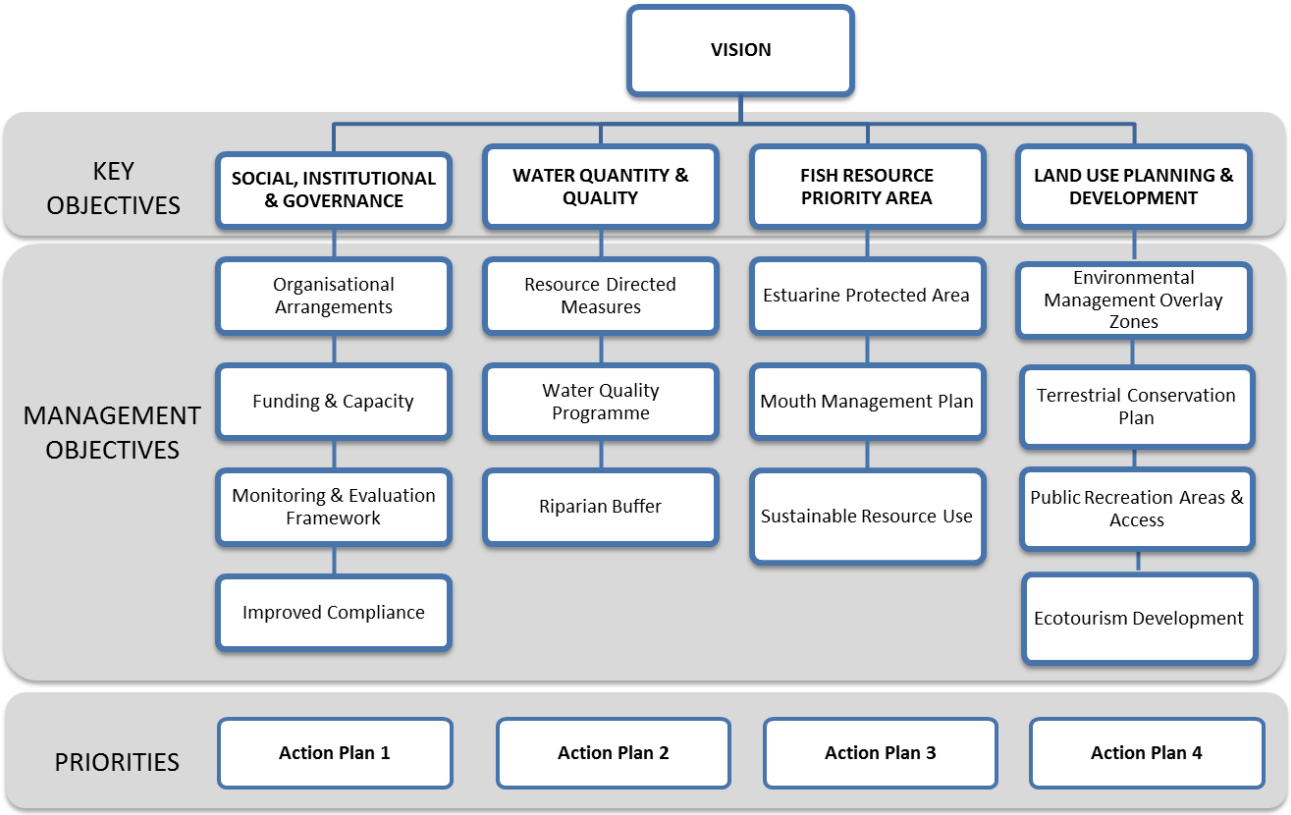
The vision for the Bot/Kleinmond estuarine system can be achieved through four key objectives, representing different groups of issues that need to be addressed. These key objectives are:

- **Social, institutional & governance** : Participants in EMP implementation are engaged and capacitated;

- **Water quantity & quality**: Estuarine health is improved through effective management of water quality and provision of adequate water supply;
- **Fish resource priority area**: Critical nursery function is preserved to safeguard marine fish populations; and
- **Land use & development planning**: Estuarine health is prioritised in land use management practices.

Management Objectives

While drafting the SAR and in consultation with I&APs, various co-ordinated Management Objectives were identified as the 'tools' that would be needed to address the causal factors of issues that are impacting on the productivity of the system. These Management Objectives are summarised below.



Recommended Management Priorities

Action plans then give effect to the management objectives which are summarised below. Each plan corresponds to a key objective and contains applicable management actions, supporting regulations, responsible institution(s), and required resources, if such information is available. The various actions are prioritised in respect to timing of implementation.

	Key objectives	Management objectives	
1	**Social, institutional & governance**	**Establish Organisational Arrangements (Bot Estuary Advisory Forum)**	An effective and sustainable organisational structure for co-ordinating management activities focused on the Bot/Kleinmond estuarine system has been established
		Secure Funding & Capacity	All participating institutions have made provision in their MTEFs for the necessary funding and developed capacity required for implementation of the EMP, and further funds are committed for implementation of the subsequent EMP

		Develop a Monitoring & Evaluation Framework	Estuarine health and implementation of the EMP is being monitored in accordance with a detailed Monitoring and Evaluation (M&E) framework linked to CapeNature Governance Tool
		Improve Compliance	Reported incidents of non-compliance with regulations and bylaws relating to pollution, water use, marine living resources, land use, and recreation activities on and alongside the estuarine water bodies, has decreased by 50%
2	**Water Quantity and Quality**	**Implement Resource Directed Measures**	Water quality and use in the Bot/Kleinmond estuarine system is managed in accordance with RDM, as described in the National Water Act (1998) and monitored to be inline with the RQOs
		Implement a Water Quality Programme	There is a measurable improvement in water quality in the Bot/Kleinmond estuarine system, in accordance with the Resource Quality Objectives
		Establish a Riparian Buffer	A Riparian Buffer has been established on all estuarine frontages on the Bot/Kleinmond estuarine system (Coastal Management Line)
3	**Fish resource priority area**	**Establish an Estuarine Protected Area**	Designated sanctuary zones, which support the nursery function of the Bot/Kleinmond estuarine system, provide protection for marine living resources against exploitation and disturbance
		Adopt a Mouth Management Plan	A mouth management plan and Maintenance Management Plan which prioritises the nursery function of the Bot River estuary, has been adopted
		Ensure Sustainable Resource Use	Extraction of marine living resources of the Bot/Kleinmond estuarine system is managed in a sustainable manner
4	**Land use & development planning**	**Implement the Coastal Protection Environmental Management Overlay Zone (EMOZ)**	A Coastal Protection EMOZ relating to the Bot/Kleinmond estuarine system has been implemented by OSM
		Terrestrial Conservation Zone	A plan for identifying and declaring terrestrial conservation-worthy areas adjacent to estuary or in catchmen, has been adopted and is being actioned.
		Provide Public Recreation Areas & Access	A plan for improving access and developing Public Recreation Areas has been adopted and is being actioned
		Promote Eco-tourism Development	New estuarine-based locally-owned ecotourism enterprises are established and operating

Spatial Zonation

Four distinct zones are identified in the spatial zonation plan:

Sanctuary Zones – where recreational activities are limited to those which involve 'no take, no wake' – are intended to protect nursery habitats and provide refugia for fish, birds and invertebrates, and reduce disturbance of sediment in shallow areas and erosion of banks. The upper reach of the Bot River estuary is regarded as the primary refuge area for marine juvenile fish. Low impact activities such as paddling and sailing are supported.

General recreation, including boating and recreational fishing, is supported in **Recreation Zone 1** in the central area of Bot River estuary, but not bait collecting which is restricted to

Recreation Zone 2 in the mouth areas of the Bot/Kleinmond estuarine system. This is in order to limit disturbance to bird habitats on the Rooisand shores.

High-speed boating and water-skiing is provided for in **Recreation Zone 3** – a circuit of 5km in the middle of the central recreational zone of the Bot River estuary, defined by floating buoys. A speed limit of 10 km/hour is proposed in other recreation zones for safety reasons and in order to reduce disturbance of sediments in shallow areas and bank erosion caused by wake waves etc. inboard power boats and jet skis are prohibited from the system entirely.

A kitesurfing and parasailing zone needs to be considered but to date these are prohibited activities throughout the system because of their alleged disturbance to birds. Similarly, all forms of netting and fish trapping are prohibited, except for throw nets and cast nets (restricted to bait collection in Zone 3) in line with national regulations.

Establishing an Estuarine Protected Area will require consultation with authorities, further refining and developing the zoning proposals, establishing the beacons, and communicating the new zoning delineations and regulations to estuary users.

It is essential that this EMP is regarded as a strategic plan that can guide the detailing of management actions and identification of implementing agents. Therefore, it does not specify the required resources (human and financial) for proper management of the estuary. However, it does 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.

Institutional Arrangements

The NEMP (2013) identifies CapeNature as the RMA, responsible for the development and co-ordination of the implementation of the Bot/Kleinmond EMP given that the estuary is included in the Provincial Protected Area Expansion Strategy. A large portion of the southern bank falls within the Rooisand (Botrivier) Nature Reserve, is already administered by CapeNature. However, implementation of the EMP can be effected through a range of different forums and agencies. The OSM will thus play a major supporting role to CapeNature, and may need to be formalised through a signed Memorandum of Understanding between these entities.

BREF is the existing, formally constituted institutional platform that was established in 1993 and formally structured in 2008, to co-ordinate and advise on estuarine management decisions. The BREF is managed by CapeNature, while the Overstrand Municipality acts in a supporting role in administering bylaws and the associated law enforcement. Membership is restricted to representatives of organisations and community sectors. This extends to compulsory membership for relevant government organisations, and voluntary membership for NGOs, affected local communities or community sectors, and affected landowners.

The successful implementation of the Bot/Kleinmond EMP may be seen as also dependent on the contribution of a number of governmental role players, including:

- Western Cape Government departments: Responsible for legislative support, including compliance, funding, research and monitoring, as well as education and awareness;
- Municipalities, including Overstrand Local Municipality, and Overberg District Municipality: Responsible for fulfilling key municipal roles as well as the provision of management, technical and legislative support, and funding;
- Relevant National Government departments, especially Environmental Affairs, Water and Sanitation (via the regional office), Environment, Forestry & Fisheries, as well as Agriculture, Land Reform and Rural Development;
- Organs of State, such as the Breede-Gouritz Catchment Management Agency (BGCMA) which undertakes *inter alia*, regional water resource monitoring, and CapeNature, who is responsible for general conservation in the region, including the Rooisand (Botrivier) Nature Reserve, biological monitoring, compliance management and facilitating rehabilitation.

The National Department of Environmental Affairs is generally responsible for national standardisation of estuarine management and approval of provincially-led estuarine management plans. Direct involvement in individual estuaries, such as the Bot/Kleinmond system, will occur via existing forums for intergovernmental coordination. These forums will have the management of the various estuarine systems on their agenda from time to time.

- **Western Cape Provincial Coastal Committee:** Responsible for facilitating co-management and effective governance and provincial co-ordination of estuarine management; and
- **Overberg District Municipal Coastal Committee**: Responsible for facilitating co-management and effective governance.

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ACRONYMS & ABBREVIATIONS

APP	Annual Performance Plan
BGCMA	Breede Gouritz Catchment Management Agency
BREF	Bot River Estuary Forum (or Advisory Committee)
C.A.P.E. (EP)	Cape Action for the People and the Environment: Estuaries Programme
CARA	Conservation of Agricultural Resources Act (Act 43 of 1983)
CFR	Cape Floristic Region
CML	Coastal Management Line
CMP	Coastal Management Programme
CPZ	Coastal Protection Zone
DFFE	Department of Forestry, Fisheries and Environment
DALRRD	Department of Agriculture, Land Reform and Rural Development
DEADP	Western Cape Department of Environmental Affairs & Development Planning
DEA / DEAT	Department of Environmental Affairs (formerly Department of Environmental Affairs & Tourism, DEAT)
DEA:O&C	Department of Environmental Affairs: Oceans & Coasts Branch (formerly Marine & Coastal Management, MCM)
DM	District Municipality
DWS / DWAF	Department of Water & Sanitation (formerly Department of Water Affairs & Forestry, DWAF)
EAF	Estuary Advisory Forum
EFZ	Estuarine Functional Zone
EIA	Environmental Impact Assessment
EMP	Estuarine Management Plan
EWR	Ecological Water Requirements
HWM	High Water Mark
ICMA	Integrated Coastal Management Act (Act No. 24 of 2008)
I&AP	Interested & Affected Party
IDP	Integrated Development Plan
LED	Local Economic Development
LM	Local Municipality
LUMS	Land Use Management System
LUPA	Land Use Planning Act (Act 3 of 2014)
MAR	Mean Annual Runoff
MEC	Minister of Executive Committee
MLRA	Marine Living Resources Act (Act No.18 of 1998)
MPA	Marine Protected Area
MSA	Municipal Systems Act (Act No. 32 of 2000)
MSL	Mean Sea Level
MTEF	Medium Term Expenditure Framework
MOU	Memorandum of Understanding
M&E	Monitoring and Evaluation (programme)
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)
NEMP	National Estuarine Management Protocol 2013
NGO	Non-governmental Organization
NR	Nature Reserve
NWA	National Water Act (Act No.36 of 1998)
OSM	Overstrand Local Municipality
ORV	Off-Road Vehicle
RDM	Resource Directed Measures
RMA	Responsible Management Authority
RQO	Resource Quality Objectives
SA	South Africa
SAR	Situation Assessment Report
SDF	Spatial Development Framework
Stns.	Stations
SZP	Spatial Zonation Plan
TOR	Terms of Reference
WCPAES	Western Cape Protected Area Expansion Strategy
WWF	World Wildlife Fund
WUA	Water User Association

1 INTRODUCTION

1.1 Preamble

This document describes the plan for managing the Bot/Kleinmond estuarine system and associated wetlands. The first-generation Estuary Management Plan (EMP) was produced under the auspices of the Cape Action Plan for the Environment (C.A.P.E.) Estuaries Programme, which aimed to ensure the conservation and sustainable utilisation of the estuarine biodiversity in the Cape Floristic Region (CFR). The development of the Bot/Kleinmond Estuary EMP was one of the projects in the CFR that contributed to the formulation of the 2013 National Environmental Management Protocol (NEMP), promulgated under the National Environmental Management: Integrated Coastal Management Act (Act No. 24 of 2008, as amended 2014 (ICMA).

The initial EMP for the Bot/Kleinmond estuarine system, and its accompanying Situation Assessment Report (SAR) which is a background document to this Plan, have subsequently been revised (this document) in order to meet the minimum requirements of the NEMP (2021). This EMP must be read in conjunction with the SAR.

Climate change and the associated impacts needs to be continually evaluated in terms of the implementation of this estuarine management plan and impacts on the estuary can be catchment based.

Figure 1: The Bot/Kleinmond estuarine system

1.2 Summary of Legal Framework

Chapter 4 of the ICMA, aims to facilitate the efficient and coordinated management of all estuaries, in accordance with:

a) The NEMP (Section 33) approved by the Ministers responsible for the environment and water affairs; and
b) Estuarine management plans for individual estuaries (Section 34).

The NEMP, promulgated in 2013 (and amended in 2021), provides a national policy for estuarine management and guides the development of individual EMPs. It must be ensured that the EMPs are aligned with the NEMP (2021) and the National Coastal Management Programme (CMP) (DEA, 2014b). The NEMP (2021) lays out the following:

a) The strategic vision and objectives for achieving effective integrated management of estuaries in South Africa;
b) The standards for the management of estuaries;
c) The procedures regarding how estuaries must be managed and how the management responsibilities are to be exercised by different organs of state and other parties;
d) The minimum requirements for EMPs;
e) Who must prepare EMPs and the process to be followed in doing so; and

f) The process for reviewing EMPs to ensure that they comply with the requirements of the ICMA.

One of the pillars of successful integrated coastal (including estuarine) management is the establishment of effective institutional arrangements to underpin both cooperative government and cooperative governance. Cooperative governance is a system that allows government and civil society to communicate and contribute to shared responsibility in respect of coastal management objectives and must be well-organized and widely representative of all coastal stakeholders. The ICMA details the institutional arrangements that will contribute to cooperative coastal management in South Africa. These arrangements are made at national, provincial and municipal government levels, and the embodiment of cooperative coastal governance is vested in what will be known as coastal committees. The ICMA provides for the permissive, i.e. if so required, establishment of municipal coastal committees, but at a national and provincial level however, the Minister and MECs of coastal provinces are directed to establish national and provincial coastal committees, respectively. Provincial coastal committees must be established within one year of the commencement of the ICMA.

The National Coastal Committee (the MINTEC Working Group 7) is established by the Minister, and its powers determined by notice in the Government Gazette. It is supported administratively by the National Department of Forestry, Fisheries and Environmental Affairs (DFFE). The Premier of each coastal province must identify a lead agency (organ of state) that is responsible for the coordination, monitoring and implementation of the provincial coastal management programme, monitoring the state of the environment in the coastal zone, and identifying relevant trends and priority issues. The lead agency for coastal management is directly responsible to the MEC. Each metropolitan, district or local municipality which has jurisdiction over the coastal zone may establish a municipal coastal committee. The establishment of Municipal Coastal Committees is discretionary.

The lowest tier of institutional arrangements for estuarine management comprises the Responsible Management Authority (RMA) and the estuary advisory forums. The role of the estuary advisory forum is to act as the hub which links all stakeholders, including both organs of state and civil society, to facilitate cooperative management and effective governance in terms of the EMPs, as well as facilitate and monitor implementation of an EMP.

1.3 Mandate and responsibilities of the Responsible Management Authority

The NEMP (2021) identifies CapeNature as the management authority responsible for developing and co-ordinating implementation of the Bot/Kleinmond Estuary EMP since the estuarine system is included in the Western Cape Protected Area Expansion Strategy (WCPAES) and because Rooisand Nature Reserve borders on the estuary (Figure 2). This mandate however, will require support from the Overstrand Local Municipality (OSM).

The RMA, once confirmed, is responsible for overall co-ordination of the actions of other implementing agencies, and not the implementation actions themselves. Section 7.3 of the NEMP (2021) 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)…"

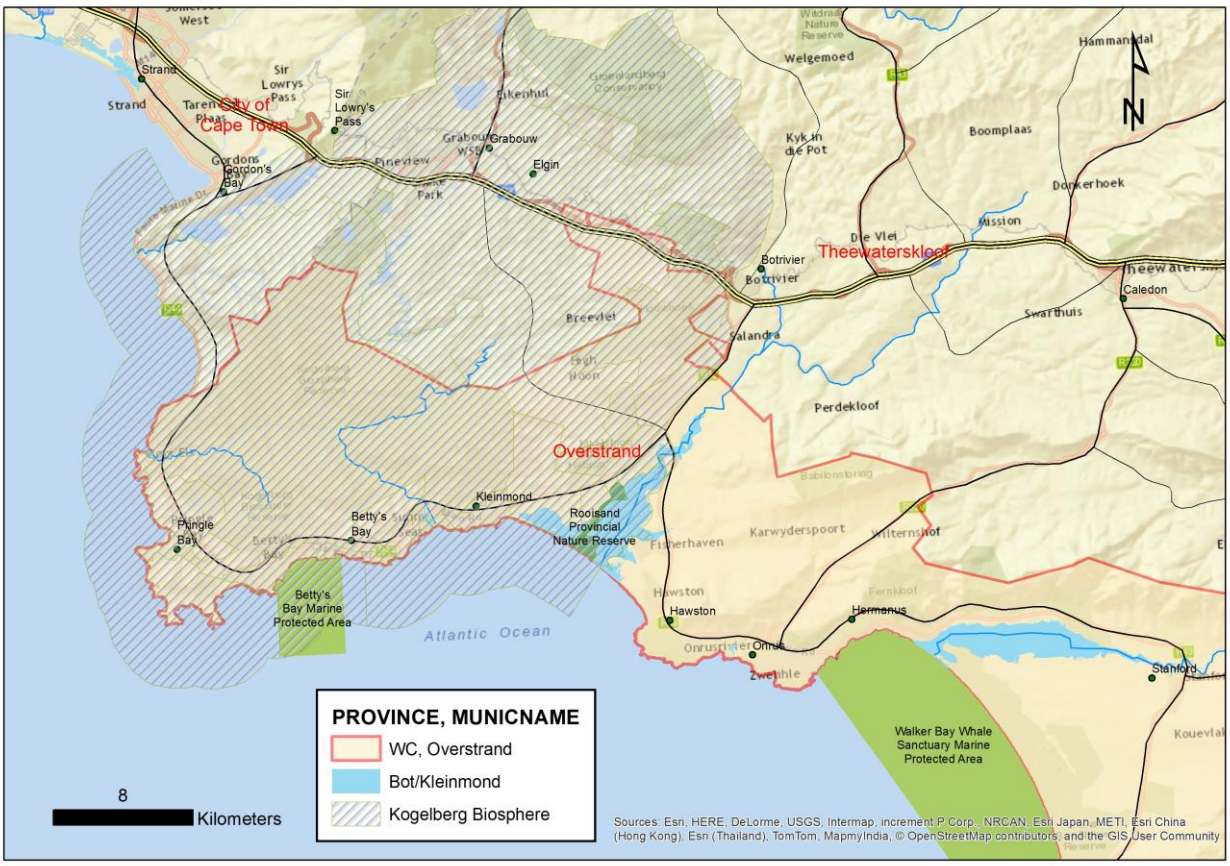

Figure 2: Location of the Bot/Kleinmond estuarine system and neighbouring Rooisand Nature Reserve within Overstrand Local Municipality

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

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

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

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

Coordination of the implementation actions by CapeNature and its strategic partners Overstrand Municipality (OSM), Overberg District Municipality (ODM), Western Cape Provincial Government, Department of Water and Sanitation (DWS), Department of Forestry, Fisheries and Environmental Affairs (DFFE)), will be supported by the existing forum, the Bot River Estuary Forum (BREF), representing all key stakeholder groups on the estuary.

1.4 Purpose and Scope of the Bot/Kleinmond Estuary Estuarine Management Plan

Drawing on the SAR prepared for the Bot/Kleinmond estuarine system during the period August to September 2008, and inputs from interested and affected parties (I&APs) culminating in the final draft SAR (iRAP, 2009a), the Bot/Kleinmond Estuary EMP sets out the Vision and key Objectives for the Bot/Kleinmond estuarine system. It also identifies specific

Management Objectives needed to meet these key objectives, and indicates the main actions or activities required in the next five years in order to achieve the overall vision.

A set of management priorities were identified for the estuary, which generally represent sectors of governance (e.g. conservation, water regulation, etc.), and contain specific management objectives. Each management objective is proposed to be implemented through a set of management actions and will result in a number of deliverables. A plan of action or implementation is provided for each area of priority.

This EMP is a strategic planning document, and as such does not provide detailed, routine planning for the management of the estuary. This detail should be captured by the RMA, or its assigned representative, in its annual budget, Plan of Operations, Integrated Development Plan (IDP), Annual Performance Plan (APP), etc. (as applicable) with the management plan forming the platform for more fine-scale planning. CapeNature has developed a Governance Tool to integrate actions, monitoring and reporting on all management objectives. Furthermore, the ICMA provides for a report to be submitted to the DFFE every year in respect to implementation once an EMP has been signed off and approved.

The EMP should also be recognized as a dynamic document, whereby certain components could be revised as important new information becomes available and management priorities change. Adaptive management should be continually pursued through a process of annually reviewing the progress made in achieving the management objectives. Finally, the management plan should be subject to a comprehensive revision on a five-year cycle, as required by the NEMP (2021). A process of monitoring, evaluation and review, and planning for the following 5-year cycle is built into this plan.

1.5 Estuarine Management Plan structure

The structure of this EMP is detailed as follows:

- **Section 2** provides a summary of the SAR – thereby providing context to the Vision and key objectives;
- **Section 3** sets out the Vision and Key Objectives for the EMP. They collectively describe the desired future state at the end of the five-year period and provide the overarching logical framework for the action plans;
- **Section 4** provides a description of the Management Objectives;
- **Section 5** provides the Recommended Management Priorities, i.e. the required actions and activities to be undertaken in terms of implementing the EMP;
- **Section 6** presents the proposed Spatial Zonation of the estuary, which will be used as the basis for further consultation with stakeholders; and
- **Section 7** provides a guideline for implementation of the EMP, and includes a description of the key role players and the required institutional arrangements.

2 SUMMARY OF SITUATION ASSESSMENT

2.1 Overview and Ecological Condition

The development of management plans for estuaries in the Cape Floristic Region was an initiative co-ordinated by the C.A.P.E. Estuaries Programme, hosted by CapeNature and supported by a number of government line departments, including the then Water Affairs (now Water & Sanitation), and the then Environmental Affairs and Tourism: Marine and Coastal Management (now Department Environmental Affairs: Oceans & Coasts). The preparation of an EMP for the Bot/Kleinmond estuarine system was co-funded by the Overstrand Municipality. The SAR presents the findings of the first phase of the project.

The estuary of the Bot River, known also as die Vlei, Hawstonvlei or Botriviersvlei, is the third largest in the Cape Floristic bioregion. The SAR is premised on the view that the Bot River estuary, Kleinmond system, and intermediate wetlands of Rooisand and Lamloch Swamp, must be managed as an inter- related system on the basis that, at the current time, water flows between them. There is evidence to suggest that the two systems were once a single system, hence the composite term Bot/Kleinmond estuarine system. The diversity of habitat types within the system, and the expanse of the water body, makes it unique in South Africa.

The health of an estuary is affected by activities on the land that surrounds it and in the upper catchments of the rivers that feed into it. The assessment must therefore include these areas and activities. Its aim is to provide a foundation for an integrated management plan that addresses not only the biophysical aspects of estuarine management but also the drivers of the threats to estuarine health, which include social and economic issues.

The Bot / Kleinmond estuarine system is located in the Overberg District of the Western Cape Province of South Africa. The upper catchments – G40E and G40F – of the Bot River and its tributaries extend into the Theewaterskloof Municipality while the estuary and coastal quaternary catchment – G40G – is almost entirely contained within the Overstrand Municipality.

The estuarine lake system lies between 34°18'30"-34°22'30"S and 19°04'-19°09'E on the south-western coast of South Africa about 110 kilometres from Cape Town. The system is a relatively shallow triangular estuarine lake, 7km long and about 2km wide. The mean departmenth is about MSL -1.5m (below mean sea level). The Bot River estuary is normally breached at Meerensee (previously Sonesta), creating a deep tidal mouth, between 80 and 110m wide and MSL -2.0 to -2.5m deep. The mouth stays open for two to four months after a breaching. Outflow during a breaching varies between 254 m^3/s and 409 m^3/s. The water level in the estuary varies from about MSL +2.7m shortly before a breaching to about MSL 0.0m after a breaching. This drastic change in water levels and exposure of the marginal areas, resulting from an artificial breaching, exposes the ecosystem to extreme conditions. After a breaching event, sand banks are exposed and sea-water intrusion increases salinities throughout the estuary.

The Ecological Water Requirements study (CSIR, 2011) for the Bot River estuary estimated the Estuarine Health Index score for the estuary in its current state to be 71, which translated

to a Present Ecological Status (PES) of C, which is classed as a 'moderately modified system'. While basic ecosystem functions and processes remain predominantly unchanged, there has been a loss and/or change of natural habitat and biota. The major drivers of change in the system were:

- A reduction in river inflow (especially the lack of summer baseflows);
- Increased nutrient load from the surrounding developments and catchment (poor water quality);
- Over-exploitation of fish (including illegal gillnetting) which reduced the system's nursery function;
- Increased mouth closure causing inundation of supratidal areas and decrease recruitment from the marine environment;
- Artificial breaching of the Kleinmond inlet, which drain waters from the Bot Estuary at high water levels; and
- Artificial breaching of the Bot changing the seasonality of breaching and breaching levels.

It was noted that the above impacts can be mitigated with very little effort. Of special concern was the increase in closed mouth conditions that caused an increase in the abundance of reed beds, submerged macrophtyes and macroalgal blooms. There has been a significant change in the community composition of invertebrates and fish as a result of the closed mouth conditions, changes in salinity and fishing pressure.

Present Ecological Health Status for the Bot/Kleinmond estuarine system (CSIR, 2011)

ESTUARINE COMPONENT	SCORE	
HABITAT ASSESSMENT		
Hydrology	62	FAIR
Hydrodynamics & mouth condition	63	FAIR
Water quality	66	FAIR
Physical habitat alteration	90	GOOD
HABITAT SCORE	**70**	**FAIR**
BIOLOGICAL ASSESSMENT		
Microalgae	65	FAIR
Macrophytes	87	GOOD
Invertebrates	80	GOOD
Fish	50	FAIR
Birds	80	GOOD
BIOLOGICAL SCORE	**72**	**FAIR**
ESTUARINE HEALTH SCORE	**71**	
PRESENT ECOLOGICAL STATE	**C**	

The Biodiversity Importance score of the Bot River estuary on a national scale was calculated as 98 (Turpie & Clark 2007), resulting in the estuary being ranked eighth overall (Turpie et al., 2002). A similar study on the prioritising of estuaries based on their importance for fish, ranked the system 24th in the country (Maree, Whitfield & Quinn, 2003) in press). In the C.A.P.E. project, the Bot/Kleinmond system was estimated to be among the top ten

most important estuaries in the Western Cape Province in terms of biodiversity, and in dire need of protection (Prochazka & Griffiths, 2000).

Through the EWR study, the Functional Importance of the estuary on a regional scale was estimated to be 90, since the estuary is an important nursery for estuarine and marine fish (CSIR, 2011). The Estuary Importance Score (EIS) was calculated as 94, signifying that the estuary is of 'high importance' (CSIR, 2011). The RQOs were approved by DWS in 2020.

The estuary is included in the core set of estuaries that need to be protected to meet biodiversity targets in South Africa (Turpie and Clark, 2007; Turpie, et al., 2012). The estuary biodiversity plan stipulates that 50% of the terrestrial marginal area be protected from development and excessive use, a portion be protected (ie. no-take sanctuary area) and that the Recommended Ecological Water Requirement Category be an A or B.

Based on the recommended health status for a protected area and the ease with which this can be achieved for the Bot River estuary, the Recommended Ecological Category for the estuary is its Best Attainable State of a B-category. Of the ecological flow scenarios evaluated to attain this state, the preferred scenario is the Present day which entails current flow reaching the estuary (MAR 72 $x10^6$ m^3) with an improvement in summer baseflows (i.e. 0.15 $x10^6$ m^3 per month in summer).

The Bot River estuary is an important habitat for water birds and attracts considerable numbers of bird-watching tourists with more than 118 species recorded. Notable is the large number of red-knobbed coot *Fulicia cristata*, as many as 36,000 at times. Application for Ramsar status is on-going, but has not been successful to date due to the lack of formal protection of avian habitats. It should however, be considered as part of the protected area planning process going forward. Provision for bird sanctuary areas has been made in the proposed amendments to the municipal by-laws relating to recreational use of the estuarine environment.

Large numbers of fish of 41 species occur in the estuary, of which white steenbras, leervis and elf are the most important to anglers. Vin respect toually all the fish are estuarine or marine dependent, or use the estuary as a nursery. During periods of low salinities (associated with extended period of mouth closure) alien fish species such as carp, kurper and largemouth bass enter the estuary. Noteworthy is the klipvis, *Clinus spatulatus*, which is endemic to the Bot/Kleinmond estuarine system. Almost all the marine fish depend on a deep, tidal mouth for recruitment; only the southern mullet *Liza richardsoni* can recruit via the overflow channel.

There is a small herd of about 20 free-roaming horses that live at Rooisand and Lamloch. They were originally farm horses that were set free in the area about 40 years ago and have adapted to living in marshy conditions. An assessment of their condition and habits (van der Merwe, 2006) concludes that they are healthy, although in-bred and pose no threat to the environment as long as their numbers do not increase beyond 30-odd. Game farms have also been set up along the banks of the estuary in this same area.

The catchment is characterised by a mix of formal conservation areas and farmland, and includes the towns of Caledon and Botrivier. Much of the catchment and estuary (see

Figure 2) are located within the Kogelberg Biosphere Reserve. There is a small area that is formally protected for conservation purposes on the western bank of the Bot River estuary, Rooisand Nature Reserve (NR). The site is a declared RAMSAR site.

Urban development areas are located on the coastal frontage of Kleinmond, and on the east bank of the Bot River estuary at Fisherhaven and Hawston – the western part of Greater Hermanus. Land use transformation on both sides of the estuarine system demonstrates a trend to move away from agriculture and low- key resorts towards residential 'lifestyle' estates and tourism facilities, the most visible of which is Arabella. The proposed urban edge for Greater Hermanus, as shown on the municipal Spatial Development Framework (SDF), extends to the eastern edge of the Bot River estuary. Besides extractive uses, the system is used for recreational purposes including sailing, windsurfing and birdwatching.

At the time of the 2011 Census, 11 856 persons were counted in the Wards surrounding the estuary. Published planning documents used for the compilation of the original Situation Assessment refer to the in-migration of "low skilled" Black Africans from the Eastern Cape as a reason for rapid growth in the population of the district over the past few years. From a socio-economic perspective, it is interesting to note that almost half of the jobs created in the Overberg District, between 2001 and 2006, were in the Overstrand municipal area. However, a large percentage of households in the Overstrand Municipality (almost 11%) earn no income. Drug-related crime is also a problem in the area. Overstrand reports unemployment at 27%, and illiteracy (over 14 years) to be 19% in 2016. The unemployment rate fell from 2016 where it was at 19.1% to the current where it is sitting at 14.8% (2020/21). The need for skills training and job creation is acknowledged in the IDP, and programmes are underway and being developed to address unemployment.

The town of Hermanus is considered to have high development potential and high human need due mainly to economic change, commercial services and regional vitality. Tourism and recreation make up the economic base of the town. However, besides the limiting availability of fresh water, growth is constrained by inadequate access roads and limited scope for the lateral expansion of the town. Hawston (partnered with Fisherhaven in Ward 8), on the other hand, is identified as having low human need yet medium to high development potential focusing on fishing and residential. "Town investment" is supported. Kleinmond is identified as low need with low to medium development potential. The economic base focuses on retirement and recreation, with minimal investment supported. Although potential and need are low, investment will still take place, particularly focusing on social investment. Both the Overstrand SDF and the Western Cape Province (WCP) SDF view the Hawston / Fisherhaven Corridor as a strong focal area within the Overstrand municipal development planning arena for infrastructure investment. Two of the issues recorded for attention in the Overberg district are the need to mediate between tourism /resort development and protection of coastal ecology, and urban sprawl between Hermanus and Kleinmond, much of which is adjacent to or near the Bot / Kleinmond system. Strategies proposed by the WCP SDF for dealing with these issues include the investigation of a new transport and urban development corridor for Hermanus – Fisherhaven / Benguela Cove, and densification of existing urban settlements and strictly controlling development outside of the Urban Edge as a means to managing pressure on coastal resources.

With the declining fish stocks in the estuary resulting from an increasingly freshwater based ecology as well as overfishing, the need for alternative livelihood development has been identified, particularly for subsistence fishers[1]. Limited economic opportunities exist at present, and creative thinking is required to expand opportunities at the estuary for generating incomes, in particular for the residents of Hawston and Kleinmond. It is anticipated that the proposed Hawston Abalone Farm could create as many as 100 jobs. The same number of jobs could be created through identified opportunities related to the estuary, for example, field guides (horse trails, canoeing, birding, hiking, boating), ferry staff (Benguela to Arabella), alien clearing, general maintenance of facilities and security personnel, amongst others.

The envisaged focused investment by the public and private sectors in the Hermanus / Fisherhaven corridor will also create many temporary and permanent jobs for skilled and unskilled workers. However, many of the people living in Hawston are descendants of families of fishers that go back generations, to when the town was founded in 1859. Some fishers assert that making a living out of 'Die Vlei' is in their blood. The idea of being employed as a gardener or builder is not consistent with their cultural heritage. The EMP needs to identify strategies for development of estuarine-based sustainable livelihoods that represent viable alternatives for the fishers.

The Hawston community has strong feelings about their 'historical rights' to fish in 'die Vlei'. They are resentful of the fact that they have had gill netting applications refused by the then MCM (now the mandate of Department of Agriculture, Forestry and Fisheries) and perceive conservationists to be marginalising them from conducting traditional practices in the Vlei. An attitude of "*if they don't give us permits to fish legally, then they are forcing us to fish illegally*" prevails. DFFE is investigating a night fishing ban on all estuaries in South Africa.

As with most of the province's estuaries, the Bot River estuary is used extensively for recreational purposes, and has huge local and regional value in this regard. Activities in and around the estuary include: hiking, canoeing, kite surfing, horse riding, boating (motor and oars), sailing, birding, water-skiing, windsurfing, swimming, powerboating, surfing, fishing, and wakeboarding.

In the surrounding area, commercial enterprises include mainly those based on tourism, property development and sport (golf and horse trails). Agricultural and agri-business activities take place upstream of the R43 road bridge where there is also the Bot River Brick Works and associated quarry. Sand mining activities take place close to the brick works on the R43 as well as on the western bank near the Rooisand NR. Major property developments include the golf estate of Arabella, and the wine estate of Benguela Cove. Limited overnight accommodation (lodges, B&Bs and self-catering facilities) is available at Middelvlei and Fisherhaven with some located closer to the R43/R44 intersection.

[1] The term 'subsistence' is used loosely to include traditional, artisanal and/or subsistence fishers

Illegal or non-compliant activities reported to the consultants during the course of the 2009 Situation Assessment included:

- Illegal netting of fish, particularly at night, and fishing and bait collecting without permits;
- Motorboat users not adhering to promulgated use zones, speed regulations and regulated times of use;
- Dumping of solid waste, leaching of sewage from Hawston Waste Water Treatment Works (accidentally, due to power failures, or through negligence), littering, pollution through run-off (fertilisers, pesticides);
- Illegal camping by Hawston residents between Fisherhaven and Middelvlei. Permission is sought from the Overstrand Municipality and is usually granted with conditions. According to reports, these conditions are not complied with;
- Illegal driving on sand dunes and the beach (quad bikes and 4x4 vehicles);
- Alleged blocking of public access;
- Illegal fires on beach and in dune areas;
- Unsanctioned breaching of the estuary; and
- Vandalism of public toilet facilities.

2.2 Mouth Management

The Bot estuarine lake is fed by two rivers, the Bot and the Afdaks. The Lamloch River feeds into the Kleinmond side of the system. The Bot and Kleinmond mouths are connected via a natural overflow channel through the Lamloch swamps, at a water level of mean sea level (MSL) +1.7 m. When the system is breached at the Kleinmond mouth, the Bot estuarine lake area loses water at about 310,000 m³ a day or approximately 11cm a week. Breaching of the Kleinmond mouth – whether naturally or artificially induced - can drain up to one metre of water from the Bot, which is a critical (add my comments from executive summary) loss in terms of future potential breaching. If frequent breaching does not occur at Kleinmond, the Bot would possibly breach more regularly. The constant loss of water has led to longer periods between breaching and to the present-day ecology reflecting a more freshwater defined system.

Mouth management dominates the discourse on estuarine management at the Bot/Kleinmond Estuary. It is a bone of contention between parties who hold different views on whether or not, and how, the Bot River estuary should be artificially breached. At present, it is breached artificially according to approved breaching criteria which form part of the approved mouth Maintenance Management Plan (MMP). In the last 60 years, the system has breached naturally three times.

The expertise and data to formulate a MMP (formerly known as the breaching policy) was available historically but what was absent was a clear and consensual decision on what the MMP should aim to achieve. A review of the MMP was undertaken in 2009. This needed to take into account the findings and objectives of the EMP, *inter alia*, and the increasing importance of the nursery value of the Bot/Kleinmond estuarine system. In the context of a global decline in fish stocks, the irreplaceability of the Bot/Kleinmond estuarine system's nursery function adds weight to the business case for managing the estuary as a resource-

orientated service area in the interests of the national economy and global food security (See minutes of Bot/Kleinmond estuarine system Mouth Management Workshop and approved MMP).

The view that the system was naturally transforming to a freshwater lake has been countered by a body of research that indicates that the rareness of natural breaching occurrences is the result of human interventions – reduced flow of water from the catchments, artificial breaching of the Kleinmond mouth and, in earlier times, the stabilisation of the Middelvlei dune field to the east of the mouth. More frequent natural opening would support a greater stability of the ecosystem than infrequent opening and would reduce the impact of gill-netting on stocks of marine fish.

Views on mouth management are influenced by economic interests. Considerable investment has been made in property development in the upper reaches of the lagoon, and high water levels are favoured for recreational purposes and scenic value. More frequent opening of the mouth increases biodiversity and optimises the nursery function of the estuary, thereby serving regional commercial fisheries' interests. More frequent opening is also supported by local residents from Hawston, the community that formerly managed the estuarine fishery, because it results in replenishment of marine fish stocks in the estuary.

2.3 Issues of Global, National and Regional Significance

Some aspects of the Bot/Kleinmond estuarine system are of interest only to local residents, investors, managers and recreational users, whilst others have a regional, national and even worldwide significance.

- The Bot/Kleinmond estuarine system together represent 40-50% of the estuarine nursery habitats required to support marine fish stocks in the area between Cape Point and Breede River. The value of the Bot's nursery function to the fisheries industry – estimated at R22- to R55 million – is significantly higher than the economic value of the estuarine-based exploitation of marine living resources. Fisheries around the world are collapsing because stocks have been exploited beyond sustainable levels. The nursery environment provided by the extensive sheltered waters of the Bot River estuary is an irreplaceable regional asset. Its value will continue to grow in potential as the economics of scarcity respond to the global collapse of fisheries and species extinctions.
- Loss of biodiversity is a global concern resulting from the dramatic increase in population over the last few decades. All over the world, coastal marshes such as found in the Bot/Kleinmond estuarine system are being transformed by development so that they no longer support the range of plants and animals that would normally be found there. Many species are under threat of extinction. The Bot/Kleinmond estuarine system supports a large population of water birds – 108 species have been recorded – and there are a number of endangered species present, including white pelican, Caspian Tern, arum frog, micro-frog, and the endemic klipvis. The reasons for the decline in biodiversity at the Bot/Kleinmond are that natural habitats have been transformed into residential and cultivated lands, salinity levels of the estuary fluctuate between fresh- and salt-water extremes, silt builds up and alters the normal

workings of the system, the introduction of alien invasive vegetation and fish species such as carp, kurper and largemouth bass causes a depletion of indigenous species, and a lack of public awareness and resources makes it difficult to eradicate them. Given the extent of scientific and traditional knowledge of the Bot/Kleinmond system, it is considered possible that management interventions can reverse the decline and thus contribute to the global effort of conserving biodiversity.

- South African policy on coastal development (DEAT, 2000) established the principle that coastal waters, which includes coastal wetlands such as the Bot/Kleinmond estuarine system, belong to all the people of South Africa and that their right to access and benefit from the resource takes precedence over private interests. This is formalised in the ICMA.
- Hermanus has been identified in the WCP's Spatial Development Framework, with good reason, as a town that should grow. Due to topographic constraints and transportation links, arguably the most suitable direction for it to grow in is the Fisherhaven / Hawston area. Provincial spatial planning policy also provides guidelines for avoiding urban sprawl by containing development within a defined urban edge. The application of this, and policies regarding the development of residential estates and resorts, must be rigorously applied in the estuarine catchment to safeguard the value of the natural heritage which is the foundation of the local economy. The undeveloped land between Hawston and Fisherhaven represents an opportunity for higher density development that would serve to defuse the pressure for urban sprawl and optimise the Municipality's investment in infrastructural improvements. This would need to be discussed with the Overstrand Planning section and confirmed.
- There is a duty of care to conserve not only the natural heritage but, also, sites of cultural heritage significance and cultural landscapes, cultural diversity and living heritage. The coastal zone is rich in remnants from pre-colonial times, including shell middens. The residents of Hawston have strong links to the Vlei and have depended on its resources for 150 years. Fishers consider themselves the custodians of traditional knowledge on the management of the mouth and the fishery resource. The SDF identifies the significance of the Blue Flag beach and estuary at Kleinmond as a cultural landscape based on its historical / recreational role. These are examples of heritage elements that need to be conserved so that they can be accessible to residents, non-residents and future generations.

At the local level, mouth management has tended to overshadow other issues requiring attention. The EMP needs to provide an integrated and balanced plan for addressing these. Amongst other things, it is important to address the high rate of unemployment and the need for skills development in the Greater Hermanus and Kleinmond areas.

2.4 Livelihoods & Compliance

Fishing is an activity that represents a valuable source of food protein to the estimated 78% of Hawston household who earn less than the subsistence income of R1,600 per month. As is happening all over the world, restrictions on individual rights of access to marine resources have been introduced to give fish stocks the opportunity to recover from over-exploitation. In the Bot River estuary, declining fish stocks have resulted not only from overfishing but also

the impact of an increasingly freshwater dominated ecosystem. The number of licenses issued for commercial fishing in the estuary have reduced steadily over the years and currently there are none. Communities who were previously dependent on these resources are severely affected, economically and socially. Non-compliance with regulations aimed at protecting the resource is widespread: subsistence fishers admit to fishing illegally for commercial purposes, and operate an unlicensed gill-net fishery in the estuary.

There is an urgent need for alternative livelihood options. Urban development will generate economic development opportunities in construction and business sectors. However, many of the affected people are descendants of families of fishers that go back generations to when the town was founded in 1859. Being employed as a gardener or builder is not consistent with their cultural heritage. Sustainable estuarine-based livelihood alternatives are required.

2.5 Urban Development

Urban development must be contained within an urban core in terms of provincial spatial planning policy. The findings of this assessment indicate that the Fisherhaven / Hawston area is suitable for urban expansion provided that disturbance of sensitive coastal areas is avoided, an open-space system / ecological corridor approach is adopted for the purpose of protecting critically endangered vegetation and areas of hydrological sensitivity, and solid and liquid wastes are scrupulously managed to prevent contamination of the estuary, associated wetlands and natural drainage systems. The current contribution of the estuary to the real estate sector is estimated to be between R25- and R40 million. To maintain this value, it is important to maintain a balance between natural and built areas around the estuary. The Regional Estuaries Conservation Plan proposes a target of 50% of the Bot/Kleinmond margin be protected from development and excessive use (Turpie & Clark 2007).

The coast is particularly vulnerable to climate change. Greater intensity and frequency of storms, resulting in high seas and flooding, is anticipated. Development frameworks have to respond by directing new investment away from high risk areas. The presence of pre-colonial heritage sites and cultural landscapes must also be considered in the selection of land for development.

Westward expansion of the urban edge of Greater Hermanus over the Middelvlei dune field appears ill-advised. The Paddavlei Eco Group (PEG), a subgroup of the Hawston Development Association (HDA), along with other organisations that include the Overstrand Municipality, CapeNature and the National Department of Forestry, Fisheries and Environmental Affairs (DFFE) propose to rehabilitate Paddavlei. The Paddavlei project aims to restore vegetation and faunal biodiversity through alien vegetation management, community participation programmes and improvements to the municipal infrastructure (i.e. stormwater and waste water) to reduce the negative impacts of pollution on the system. The project also aims to restore the intrinsic heritage value of the Paddavlei system for the benefit of local communities.

2.6 Water Quality & Flow

Water quality is relatively good in the Bot River estuary at the current time, a situation ascribed to the vigilance of BREF but, in order to maintain the situation and achieve a Class A or B water requirement, as proposed in the regional Estuaries Conservation Plan (Turpie & Clark 2007), the Overstrand Municipality needs to address shortfalls in sewerage reticulation and treatment infrastructure and remain vigilant on the disposal of solid waste. This is particularly relevant to the Kleinmond portion of the system where, historically, the estuary was sometimes artificially breached to maintain water quality to acceptable standards for recreational use. The Overstrand SDF specifies that extension of the piped sewer system is a pre-requisite to any new development. This needs to be rigorously observed to maintain estuarine health. Besides the water quality aspect, Resource Directed Measures (RDM), particularly the development and implementation of the Ecological Water Requirements (or 'Reserve') for the estuary, which balances water use needs against the water needed to support a healthy estuary, must be prioritised to guarantee an adequate flow during high rainfall periods. This is important for, amongst other things, giving the cue that is needed in the marine environment for recruitment of fish into the estuary.

2.7 Catchment Management

Extensive tracts of land within the estuarine margins are overrun by alien invasive vegetation. This situation extends into the upper catchments. Approximately 40% of the Bot River's 907 km^2 catchment is used for agricultural cultivation. Some 56% of the catchment area represents historic vegetation habitats that are classified as Critically Endangered. 16% is under formal protection. Maintenance of a Riparian Buffer, and the establishment of a network of ecological corridors to connect the river corridor and areas of endangered vegetation, is required to achieve national biodiversity conservation targets and secure the health of the rivers and estuaries. Vigilance regarding upstream leachate and discharges into the river, from industry and from solid and liquid waste collection sites requires inter-municipality and inter-government co-operation.

2.8 Tourism Development, Exploitation of Natural Heritage Value, & Recreation

The Bot River estuary, with its 13.6 km^2 expanse of water (when full), is a popular destination for bird-watchers and a wide range of water sport enthusiasts. Activities include skiing, sailing, paddling and recreational angling. Evidence of social conflict or severe negative environmental impacts relating to recreational use of the water body was not encountered. A proposed amendment to the statutory recreational use zones falls far short of achieving the Regional Estuaries Conservation Plan's target of a 50% Estuarine Protected Area encompassing at least 33% of each of the estuarine habitat types (Turpie & Clark 2007).

The tourism value of the estuary is currently valued at R40-60 million per year (Turpie & Clark 2007). The potential is under-exploited due to a lack of facilities and year-round attractions. There are only three public points of access to the Bot River estuary and only one of these offers facilities of any kind. The lagoon at Kleinmond is popular for swimming and small water-craft; the beach has Blue Flag status and is identified in the Overstrand SDF as a cultural landscape. The proposed development of facilities at this site requires a design

approach that is mindful of these considerations and considers environmental, social, visual, and heritage impacts.

2.9 Social Sustainability

The huge diversity in the wealth of residents and property owners in the Bot/Kleinmond area is indicated by the disparity between the estimated R25-40 million annual contribution of properties in the area to the real estate sector, and the monthly earnings of the large majority of residents, which is less than R1,600 per month. This diversity brings with it all the associated social ills: an 'us and them' polarity, mistrust, defensiveness, diverse and sometimes conflicting values, and a perceived lack of equality, amongst others. Attitudes to conservation tend to follow income profile, with cash-poor people placing a higher emphasis on use of the estuary's resources and amenities than those who are financially self-reliant and tend to prioritise conservation over access and use or who enjoy a higher level of access by vin respect toue of their riparian property location.

Cultural and natural heritage conservation presents opportunities for integrating social sustainability into ecosystem management. This can be achieved by recognising and accommodating the diversity of cultural heritage sites, traditions and environmental interests in the area and considering, in context, the worldwide social and economic crises of fishing communities that have lost their identities as a result of the global crisis of declining fish stocks. The traditional fishers have an untapped wealth of knowledge of the biophysical environment and fish resource management. Environmentalists have knowledge of what is happening at a global scale. Knowledge sharing can potentially provide a vehicle for building relationships that cross cultural and class divides.

Local environmentalists, fishers and other interested and affected parties represent a huge resource of human energy that has been and can be directed towards managing the estuary's natural assets and the protection thereof. Their common ground is their passion for the estuary / die Vlei. The key to the success of the EMP is the identification and adoption of a set of objectives that provides a channel for all parties to exercise their particular interest. Thereafter, during the implementation phase of the EMP, it will be achieved through the on-going maintenance of stakeholder support and the involvement of a facilitative/co-ordinating agency.

2.10 Monitoring & Evaluation

Implementation of the EMP needs to include an on-going and expanded programme of monitoring and evaluation. The existing institutional structure for estuary management, known as BREF, has the advantage of being an existing constituted body with significant buy-in and commitment from a range of I&APs. The BREF will support the RMA in an advisory capacity. A RAMSAR METT was completed for the site in 2018.

2.11 Framework

Implementation strategy of the EMP must support its integration within the broader institutional management framework, inter alia (managed in terms of the CapeNature Governance Tool):

- The National Estuarine Biodiversity Plan maintains that a portion of the estuarine water body is managed as a protected area, and 50% of the margin should be protected from development and excessive use;
- A Marine Protected Area or Special Management Area is under consideration in the marine component of the Kogelberg Biosphere Reserve, extending to the mouth of the Bot. One of the overarching programme's targets is to restore at least half of the over-exploited and depleted fish stocks to sustainably managed levels by 2020 and maintain the status of all sustainably exploited stocks. The area between the Bot and Palmiet estuaries is proposed as a managed but unrestricted area – fishing and other forms of harvesting will be permitted. The proposal represents an opportunity to create a marine-estuarine link between the MPA and the estuary;
- The ICMA provides the legal basis for adoption of the EMP and for introduction of Coastal Public Property and Coastal Protection Zones which, by definition, include the estuary and a margin of at least one kilometre in non-urban areas (unless otherwise determined through a coastal management line process);
- The Bot River is identified in the Overstrand SDF as a coast-to-mountain ecological corridor, and the shoreline and dune environment between Kleinmond and Hawston as a coastal corridor;
- The C.A.P.E. Stewardship program has identified the Lamloch swamps between Kleinmond and Arabella as a priority biodiversity corridor within the Kogelberg Biosphere Reserve and is currently in the process of investigating this initiative;
- The Bot River estuary has been identified by BirdlifeSA as Bird and Biodiversity Area (IBA) and an application to acquire Ramsar status is being prepared; and
- The WCP SDF identifies Greater Hermanus as a town with high growth potential and proposes Fisherhaven / Hawston as the most suitable location for development to support the growth.
- The estuary is a declared RAMSAR site

2.12 Recommended Management Tools

The full range of framework alignments, issues and opportunities present in the Bot/Kleinmond estuarine environment can be managed through adoption of a selection of management tools, responsibility of which should be determined during implementation, namely:

- A co-operative management structure;
- A compliance plan;
- RDM (completed in 2011);
- A catchment-wide Riparian Buffer;
- A conservation plan;
- A mouth maintenance management plan;

- A community-based resource management programme focused around the fish resource (this is no longer applicable since advent of the DFFE Small Scale Fisheries Policy);
- A monitoring, evaluation and reporting programme;
- Governance Tool; and
- Environmental Management Overlay Zones (replaces the proposed Spatial Conservation and Development Framework and the Coastal Planning Scheme).

The EMP provides action plans for the development of these tools to give effect to the vision and objectives that are to be adopted in consultation with stakeholders. The CapeNature Governance Tool will be used to implement this framework.

The SAR is the output of the first phase of the EMP development project. Formulation of the draft Management Plan was based on the findings and recommendations of SAR, as recorded in the report and amended by comments received from readers and will be guided by a vision and objectives to be agreed in consultation with I&APs during the objective-setting phase of the project.

3 VISION & OBJECTIVES

3.1 Vision Statement

The vision for an estuary must be aligned with the vision and strategic objectives of the NEMP (2013) and the greater 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***".

A vision statement must also express the collective view of stakeholders for the long-term future state of the estuary. Based on the contributions of I&APs at the meeting on 16 October 2008, the vision for the Bot/Kleinmond estuarine system is as follows:

"***The Bot/Kleinmond estuarine system and associated wetlands form a unique, biologically diverse and productive ecosystem. It is one of South Africa's most important nursery areas for the marine fish that sustain our fisheries. The tranquil quality of this natural environment makes it a popular recreation place for local families, fishers and nature-lovers and a sought-after destination for eco-tourists. Management of the estuaries takes place in partnership with the local community and all spheres of government***".

3.2 Key Objectives

While the vision is an inspirational, higher-level statement of strategic intent, strategic or overarching objectives answer the question: "*How will you know when you have achieved the Vision and by when?*"

The vision for the Bot/Kleinmond estuarine system can be achieved through four key objectives (Table 1), representing different 'issue packages' that need to be addressed. These key objectives are categorised as:

- Social, institutional and governance;
- Water flow and quality;
- Fish resource priority area; and
- Land use and development planning.

Table 1: Key objectives proposed for the Bot/Kleinmond estuarine system

KEY OBJECTIVES	
Social, institutional & governance	Participants in EMP implementation are engaged and capacitated
Water flow & quality	Estuarine health is improved through effective management of water quality and provision of adequate water supply
Fish resource priority area	Critical nursery function is preserved to safeguard marine fish populations
Land use and development planning	Estuarine health is prioritised in land use management practices

4 MANAGEMENT OBJECTIVES

While drafting the SAR and in consultation with I&APs, 15 co-ordinated Management Objectives were identified as the 'tools' that would be needed to address the causal factors of issues that are impacting on the productivity of the system. These Management Objectives are summarised in Figure 3 and described as specific outcomes below. The process to achieving these objectives requires specific activities that are captured in the action plans provided in Section 5.

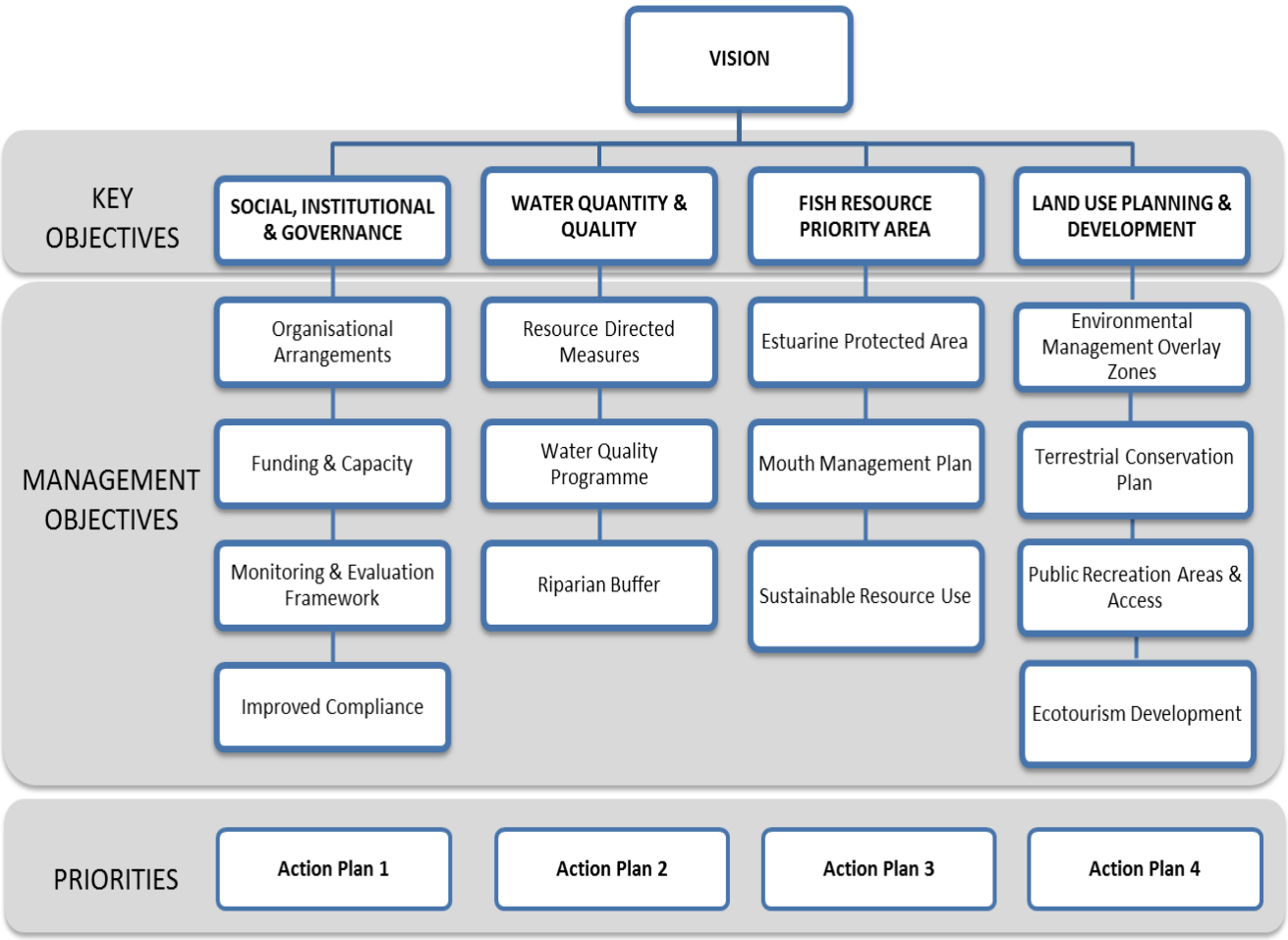

Figure 3: Structure of the Bot/Kleinmond Estuary EMP indicating detailed Management Objectives to achieve Key Objectives and the Vision (to be tracked by the CapeNature Governance Tool)

4.1 Social, Institutional & Governance

Identified social, institutional and governance management objectives and their specific outcomes are detailed as:

- **Management Objective 1.1:** ***Establish organisational arrangements*** - An effective and sustainable organisational structure for co-ordinating management activities focused on the Bot/Kleinmond estuarine system has been established;
- **Management Objective 1.2:** ***Secure funding and capacity*** - All participating institutions have made provision in their Medium Term Expenditure Frameworks (MTEF) for the necessary funding and developed capacity required for implementation of the EMP, and further funds are committed for implementation of the subsequent EMP;
- **Management Objective 1.3:** ***Develop a Monitoring and Evaluation programme*** **-** Estuarine health and implementation of the EMP is being monitored in accordance with a detailed Monitoring and Evaluation (M&E) framework; and
- **Management objective 1.4:** ***Improved compliance*** - Reported incidents of non-compliance with regulations and bylaws relating to pollution, water use, marine living resources, land use, and recreation activities on and alongside the estuarine water bodies, has decreased by 50%.

4.2 Water Quantity and Quality

Identified water quantity and quality management objectives and their specific outcomes are detailed as:

- **Management Objective 2.1: *Implement Resource Directed Measures*** - Water quality and use in the Bot/Kleinmond estuarine system is managed in accordance with RDM, as described in the National Water Act (1998) and in line with RQOs:
- **Management Objective 2.2: *Implement a water quality programme*** - There is a measurable improvement in water quality in the Bot/Kleinmond estuarine system, in accordance with the Resource Quality Objectives; and
- **Management Objective 2.3: *Establish a Riparian Buffer*** - A Riparian Buffer has been established on all estuarine frontages on the Bot/Kleinmond estuarine system.

4.3 Fish Resource Priority Area

Identified fish resource priority area management objectives and their specific outcomes are detailed as:

- **Management Objective 3.1: *Establish an Estuarine Protected Area*** - Designated sanctuary zones, which support the nursery function of the Bot/Kleinmond estuarine system, provide protect for marine living resources against exploitation and disturbance. The assembly of mechanisms to secure their formal protection is underway;
- **Management Objective 3.2: *Adopt a Mouth Maintenance Management Plan*** - A mouth maintenance management plan (MMP), which prioritises the nursery function of the Bot/Kleinmond estuarine system, has been adopted and implemented; and
- **Management Objective 3.3: *Ensure sustainable resource use*** - Extraction of marine living resources of the Bot/Kleinmond estuarine system is managed in a sustainable manner.

4.4 Land Use and Development Planning

Identified land use and development planning management objectives and their specific outcomes are detailed as:

- **Management Objective 4.1: *Implement the Coastal Protection Environmental Management Overlay Zone (EMOZ)* -** A Coastal Protection EMOZ relating to the Bot/Kleinmond estuarine system has been implemented. The EMOZ will address land-use and development management and a coastal planning scheme. The Coastal Protection EMOZ has been adopted and the regulations have been promulgated in terms of the Municipal Zoning Scheme. The Coastal Management Line process must be considered.
- **Management Objective 4.2: Develop a terrestrial conservation plan** - A plan for identifying and declaring terrestrial conservation-worthy areas adjacent to estuary and in catchment, has been adopted and is being actioned.

- **Management Objective 4.3:** ***Provide public recreation areas and improved access*** **-** A plan for improving access and developing the Public Recreation Areas has been adopted and is being actioned.
- **Management Objective 4.4:** ***Promote eco-tourism development*** **-** New estuarine-based locally-owned ecotourism enterprises are established and operating.

5 RECOMMENDED MANAGEMENT PRIORITIES

The action plans discussed hereunder, give effect to the 15 management objectives introduced in Section 4 and the spatial zonation of the system detailed in Section 6, by prioritising management interventions, or actions, that are required to ensure their realisation. The action plans also provide information on the applicable legislation who is responsible for the action.

5.1 Social, Institutional & Governance

5.1.1 Objective 1.1: Organisational Arrangements

The Bot/Kleinmond estuarine system is an exception in South Africa where estuaries have historically received little management attention. This has been addressed in the ICMA under which the NEMP (2021) was developed and allocates responsibility for co-ordinating this to DFFE through the Oceans and Coast branch.

In line with the NEMP (2021), it is proposed that the community-based estuary forum (the BREF) continues to play an advisory role in the management of the Bot/Kleinmond estuarine system. Organisational arrangements therefore involve facilitating the formal reconstitution of the Estuary *Advisory* Forum for the Bot/Kleinmond estuarine system, as a co-operative body of participating institutions, experts and people with local knowledge. The RMA will be responsible for convening and chairing official meetings of the forum.

5.1.2 Objective 1.2: Funding & Capacity

Because there was previously no formal mandate for estuarine management, funds for related projects were not readily available and people were not familiar with what is involved in estuarine management. Low levels of capacity are particularly noticeable in units responsible for enforcing by-laws and regulations that are designed to protect estuarine health and resources.

Funds need to be secured for implementation of the actions and projects identified in the EMP and, for the next cycle of implementation in order to ensure a seamless transition. Provision is also made for attendance at training courses in estuarine management and enforcement.

5.1.3 Objective 1.3: Monitoring & Evaluation Programme

A new rigour to monitoring and evaluating the impacts of projects has been introduced in South Africa since acquiring donor funding from sources, such as the World Bank and European Union. Donors want to know that the project is bringing about the desired changes. However, the monitoring and evaluation needs of a project like this, which requires the collection of a range of scientific data, extend beyond simply monitoring project progress. In many instances, the data is already being collected by a range of different organisations and needs to be collected and reported on by CapeNature.

The action plan for the Monitoring and Evaluation Programme (Table 2) involves designing a system, facilitating agreement on targets and methods for monitoring, collection, and storage of information, managing a team of monitors, and preparing and circulating quarterly reports, among other things. It also makes provision for annual interim evaluations and a final evaluation of the impact of the First Generation EMP, to ensure that lessons learnt can be built into the planning for the next cycle of implementation. The CapeNature Governance Tool, RAMSAR METT will be used to monitor, track and report progress.

5.1.4 Objective 1.4: Improve Compliance

The action plan for improved compliance (Table 2) is a strategy that combines improved enforcement and prosecution with an approach that seeks to also address the causal factors of non-compliance by building an ethic of accountability and shared responsibility for the health of the estuary. The programme will seek to build on existing initiatives and tap into the opportunities presented by other EMP strategies, such as improved capacity for enforcement (Table 2). Combined operations will be planned and implemented by the RMA in order to address capacity problems, e.g. Phakisa operations

Table 2: Management Actions for Social, Institutional & Governance

Management Actions	Legislation	Deliverables/ Indicators	Timing	Responsible Agent(s)
MANAGEMENT OBJECTIVE 1.1: An effective and sustainable organisational structure for co-ordinating management activity focused on the Bot/Kleinmond estuarine system has been established.				
i) Establish Estuaries Management (EM) office/responsibility within the RMA	ICMA, NEMP	EM office/function established, Regional co-ordinator appointed	2023	RMA / CapeNature
ii) RMA to adopt EMP and disseminate EMP to all departments and relevant agencies / institutions		EMP adopted, through signed agreement of relevant departments; Confirmed roles & responsibilities of participating department and agencies	2023	RMA / CapeNature
iii) Reconstitute a functional Estuary *Advisory* Forum that meets quarterly		Number and representativeness of IAPs attending meetings of the Estuary Advisory Forum Meetings minuted	Quarterly	RMA / CapeNature
iv) Secure funding for 5 year review of EMP		Financial plan in place	2027	RMA / CapeNature
MANAGEMENT OBJECTIVE 1.2: All participating institutions have made provision in their MTEFs for the funds and developed capacity required for implementation of the EMP, and further funds are committed for implementation of the subsequent EMP.				
i) Confirm funding from all institutions for implementation of all agreed EMP projects and develop funding models in cases where government funding does not exist.	ICMA, NEMP	Funds committed for EMP activities and projects	2023 onwards	RMA/All
ii) Develop capacity for estuarine management through attendance of officials and citizens at training courses		Attendance at training courses; Trainees' application of enhanced estuarine management capacity	2023 onwards	RMA / CapeNature, Participating institutions + NGOs

iii) Develop capacity of enforcement officials and peace officers through attendance at training courses		Attendance at training courses; Increased enforcement capacity; Deployment of additional officers	2023 including combined operations	RMA / CapeNature/DFFE Participating institutions + NGOs
iv) Confirm long-term financial plan for implementation of EMP		Long term financial plan dedicated to estuarine management in place	2023	RMA / CapeNature All Departments
MANAGEMENT OBJECTIVE 1.3: Estuarine health and implementation of the EMP is being monitored in accordance with a detailed Monitoring and Evaluation (M&E) framework				
i) Design M&E framework (RAMSAR METT and Governance Tool)	ICMA, NEMP	M&E developed EMP performance/ effectiveness evaluated	2023	RMA / CapeNature
ii) Agreement on targets and methods for monitoring[2], collection and storage of information, evaluation and reporting			2023/24	RMA / CapeNature
iii) Establish an integrated monitoring system which co-ordinates existing monitoring initiatives and creates opportunities for integration of community-based resource management and jobs for underemployed members of local communities.		Effective ecological monitoring system in place Number of community based monitoring projects e.g. CWAC Increased employment – number of local members employed	2023/24	RMA / CapeNature, DFFE other key partners
iv) Assist in recruiting and training a team of monitors for ecological monitoring for Resource Quality Objectives (RQO).	ICMA, NEMP, NWA	Number of monitors trained Data collection and database management	2023	RMA / CapeNature DWS CMA
v) Compile and distribute quarterly reports and annual report card		Quarterly and annual reports compiled Submitted to DFFE every year	2023 ongoing	RMA / CapeNature /

[2] For the purpose of monitoring estuarine health, water quality samples need to be processed at an accredited marine laboratory in order to correct analysis of nutrients.

vi) Undertake external evaluation of implementation of the First-generation EMP. Ensure that learning is carried forward into the next cycle of planning (Governance Tool to capture this)	ICMA, NEMP	EMP performance/ effectiveness evaluated	2023	RMA / CapeNature
MANAGEMENT OBJECTIVE 1.4: Reported incidents of non-compliance with regulations and bylaws relating to pollution, water use, marine living resources, land use, and recreation activities on and alongside the estuarine water bodies, have decreased by 50%.				
i) Establish and maintain a hotline and an incident record for public reporting of non-compliant behaviour.	ICMA, NEMP, NEM:PAA, Municipal by-laws (boating, etc.)	Hotline established Number of contraventions Number of successful prosecutions	2023	RMA / CapeNature DFFE SAPS OSM
ii) Establish a rapid response network among enforcement officers and self-regulation champions for all types of targeted contraventions.		Roleplayers identified Networks established Communication protocol established Standard Operating Procedures/ Protocol established	2023	RMA / CapeNature DFFE SAPS OSM
iii) Design and implement a programme aimed at raising public awareness and building a shared understanding of the issues that threaten estuarine health and productivity		Awareness programme developed and implemented on an ongoing basis Interpretative signage erected at strategic points OSM-linked estuaries website operational	2023 and 2024	RMA/ CapeNature, BREF OSM (public launch site)
iv) Design and distribute a quarterly information pamphlet or presenttions to promote an understanding of the impacts of human activities on estuarine ecosystem functioning		Informative material compiled Pamphlets disseminated at strategic points	2023, 4 x per annum	RMA/ CapeNature with support from BREF, OSM, conservancies etc.

5.2 Water Quantity & Quality

5.2.1 Objective 2.1: Resource Directed Measures

Concern is mounting nationally about the limited natural supply of fresh water relative to the demand of the growing human population. It has been recognised that the over-abstraction of water from rivers for human use leaves insufficient water to support ecosystems in downstream environments such as estuaries. The National Water Act (1998) requires that water use is managed with due regard to the ecological reserve that is needed to sustain affected ecosystems. The system for calculating and managing water use is referred to as Resource Directed Measures (RDM). DWS is funding the roll-out of RDM studies across the country on a prioritised basis.

The current reduction of freshwater flow into the Bot/Kleinmond estuarine system, ascribed to a combination of human abstraction and water-thirsty alien vegetation in the catchment, is estimated at 25% of MAR. It is regarded as one of the factors contributing to infrequent natural breaching. At the time of drafting the First Generation EMP, there was no Water User Association set up for the Kleinmond area. The established dune system (stabilised by alien vegetation) at the mouth adjacent to Meerensee also contributes to the need for artificial breaching.

An Ecological Water Requirement study for the Bot/Kleinmond estuarine system was completed in 2011 (CSIR, 2011), establishing the ecological reserve required for healthy ecosystem functioning and a programme for associated monitoring (linked to Monitoring and Evaluation Programme), establishment of Water User Associations where these do not already exist, and then managing the issuing of water use licenses. The strategy includes an OSM-based initiative to promote economy of water use, particularly relevant in coastal settlements where there is a seasonal influx of visitors.

5.2.2 Objective 2.2: Water Quality Programme

Estuaries and the sea are the receiving environments for water that has made its way through the catchment, picking up substances from above or below ground on its way. Things like fertiliser, pesticides, and *E.coli* bacteria, nitrogen and phosphates from human sewage, are potentially harmful once they enter the estuary and can lead to fish kills. While water quality in the Bot/Kleinmond estuarine system is considered to be relatively good, there are undocumented reports of anoxic zones and die-back of vegetation in the head of the lagoon that is indicative of nutrient enrichment. This however could also be caused by dropping water levels due to evaporation. Sewerage pump stations, normally located at low points next to water courses, are not all equipped with standby generators to cope with power cuts. Some properties are reliant on *in situ* treatment or conservancy tanks. The tariff structure for servicing conservancy tanks is based on a call-out charge, leading people to avoid it for as long as possible – sometimes too long. Agricultural industries upstream discharge waste products into the river.

A rapid response strategy should be established and implemented for pollution follow-up, revision of the tariff system for conservancy tanks, and ensuring that budgets are allocated for upgrading infrastructure. In addition, a catchment-wide strategy is required for

addressing upstream impacts on the quality of freshwater inflow. This is outside the scope of the EMP but the CapeNature needs to liaise with the LandCare programme to promote water-wise irrigation practises, reduce erosion, sedimentation and the use of fertilisers, herbicides and pesticides, and with Breede-Gourtiz Catchment Management Agency (BGCMA) to manage the discharge of effluents from agricultural industries into rivers upstream from the estuary. Water quality will also be improved through implementation of the Riparian Buffer strategy (Table 3).

5.2.3 Objective 2.3: Riparian Buffer

The National Water Act defines a riparian habitat as "*commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas*". Riparian areas perform a variety of functions that are of value to society – they store water and help reduce floods, they improve water quality by trapping sediment and nutrients, and they provide shelter and food for birds and other animals, and are particularly useful in agricultural areas dependent on pollinators.

The Bot/Kleinmond SAR identified the need for a Riparian Buffer or 'reserve' as a device for filtering contaminated run-off (treated effluent / leachate, fertilisers, pesticides) and for enhancing scenic value (by screening of cultivated areas, and buildings if possible, within the constraints of naturally occurring local vegetation types and the desire for vistas or viewsheds). Such a buffer needs to be continuous along the banks of the estuary and, more importantly, ideally extend up the feeder watercourses. It should also include as much riparian vegetation and wetland habitat as possible, rather than be defined by an arbitrary distance from the main waterbody.

While the Bot/Kleinmond estuarine system is incorporated in the draft Coastal Management Line (CML) and EMOZ under Coastal Protection and the Protected Area Buffer zones, there is little indication of contiguous protection and management of all activities along the shoreline.

Thus, a Riparian Buffer, that precludes transformation of riparian habitat should be delineated and established as a tool for land use management in the context where flood lines are not available. Given the need to include as much sensitive habitat as possible, it should be defined by identifiable EFZ components, such as reedbeds or riparian vegetation areas. However, in the absence of surveyed information on such biophysical sensitivities or where such vegetation has been removed or damaged by human activities, a line linked to the 5 m amsl contour line can be applied as a proxy for the riparian zone, with the understanding that this line needs to be refined in the near future.

This riparian buffer zone must be protected through means of development regulation, such as the municipal zoning scheme (i.e. zoned as Open Space or recognised in an Environmental Overlay Zone) or declared as a nature reserve.

Table 3: Management Actions for Water Quantity & Quality

Management Actions	Legislation	Deliverables/ Indicators	Timing	Responsible Agent(s)
MANAGEMENT OBJECTIVE 2.1: Water quality and use in the Bot/Kleinmond estuarine system is managed in accordance with Resource Directed Measures (RDM), as described in the National Water Act (1998).				
i) Ensure DWS RDM Directorate signs off on reserve (No new licenses for surface water abstraction in the catchment)	NWA	Ecological reserve and Resource quality objectives gazetted Baseflow is restored and protected	2023-2024	BGCMA/DWS/RMA
ii) Evaluate and establish Water User Associations where not already in existence		Number of WUA established	2024	BGCMA/RMA
iii) Implement Reserve including: • Issuing of water use licenses based on Reserve; • Assemble a team for ecological monitoring for RQOs, build capacity for reliable monitoring, liaise with Overstrand EM Office regarding reporting systems; • Monitoring and enforcement of license conditions; • Evaluation of Reserve in 5 years' time		All water use is licensed and according to Reserve No new licenses for surface water abstraction in the catchment Ecological monitoring is in place Number of illegal operations and prosecutions Baseflow is restored	Ongoing	BGCMA
iv) Develop water use awareness through the preparation of material to promote water demand management.		Informative material compiled and disseminated through appropriate media	2023	BGCMA, DWS, RMA
MANAGEMENT OBJECTIVE 2.2: There is a measurable improvement in water quality in the Bot/Kleinmond estuarine system, in accordance with the Resource Quality Objectives.				
i) Develop and implement a water quality monitoring programme, taking RQOs into account, to identify pollution 'hotspots'	NWA, ICMA, NEMP	Water quality monitoring programme established Database of water quality variables maintained Quarterly reporting	2023 and 2024 set up	RMA, BGCMA, DWS BREF

		Problem areas identified and monitored		
ii) Design and establish a rapid response deployment strategy triggered by water quality indicators in order to implement appropriate responses / remedial / enforcement actions	NWA	Types of pollution identified Appropriate mitigation/remedial measures implemented Reduced pollution incidents and/or related impacts	2023, ongoing	RMA, ODM, OSM, DEA&DP, DWS, other key partners
iii) Revise the tariff system for emptying conservancy tanks to promote regular and timeous emptying.	MSA	Options for new tariff structure investigated Agreement on new tariff Decision conveyed to stakeholders	2023, 2024	OSM
iv) Identify medium-term projects for upgrading waste water treatment works, upgrading and expanding sewer reticulation infrastructure, including the installation of standby-generators at all pump stations in the Bot/Kleinmond estuarine catchment. Secure the inclusion of the projects in the IDP and MTEF.	MSA, NWA	Projects identified and prioritised Expenditure calculated Financial plan	ongoing	OSM with support from OMD and Theewaterskloof Municipality
v) Ongoing liaison to promote best practice in the catchment in agriculture and agricultural industries.	CARA, NWA	Relationship with farmers' association established Meetings with farmers' associations convened Meetings minuted	2023, on-going	OSM, DFFE LandCare, BGCMA RMA
MANAGEMENT OBJECTIVE 2.3: A Riparian Buffer has been established on all estuarine frontages on the Bot/Kleinmond estuarine system				
i) Delineate the spatial extent of estuarine and riparian areas in the estuarine catchment (including main stem and tributaries) through a desktop study, verified in the field.	ICMA, NWA, CARA	All estuarine, wetland and riparian areas mapped GIS dataset and maps available	Winter period 2023	RMA/ CapeNature
ii) Develop a policy and management guidelines for the riparian buffer in the Overstrand Municipality, include these in EMOZ (verify with OSM)	ICMA, MSA	Policy on riparian buffer developed Guidelines developed and incorporated into EMOZ and municipal bylaws	2023	OSM

iii) Facilitate adoption and application of the riparian buffer by the OSM Municipal Council and riparian land owners leading to custodianship and rehabilitation of riparian buffer	ICMA, NWA	Meetings with officials and riparian land owners convened Meetings minuted Degraded areas rehabilitated Integrity of margins improved	2023	RMA/ CapeNature, DFFE, OSM, BREF
iv) Liaise with the Working for Water programme regarding the control of invasive alien vegetation in catchments of the Bot/Kleinmond estuarine system: • Establish the extent of the invasive alien infestation for the entire catchment; • Source additional funding for clearing; • Prioritise ecologically sensitive areas (e.g. Lamloch swamps) and heavily infested areas (increase flow); • Develop coordinated clearing programme indicating responsible parties and long term commitment; • Ensure follow-up clearing. • Enforcement action	CARA NEMA (AIS)	Detailed maps of invasive vegetation produced Priority areas identified Appropriate methods of control determined IAPs eradication programme implemented Ongoing maintenance Engagement with landowners Increased area of IAPs removed	2023	RMA, DFFE: WfW

5.3 Fish Resource Priority Area

5.3.1 Objective 3.1: Estuarine Protected Area

Many marine fish species are born at sea but spend their juvenile years in the sheltered environments of estuaries, returning to sea after two to five years to spawn. Estuaries thus perform an important nursery function for marine fish and the Botvlei, with its expansive shallow areas, is one of the largest estuarine lake nursery areas along the southern coastline between Cape Point and Breede River. In South Africa, scientists and managers are currently looking at how to expand the Marine Protected Area (MPA) network to ensure that the full range of habitats required in species' life cycles are included

The establishment of sanctuary zones to support the nursery function in the Bot/Kleinmond estuarine system could be achieved through amendment of the regulations that currently govern recreational use. An alternative is the inclusion of the estuary in the MPA under consideration, either through extension of the Kogelberg Biosphere Reserve, or an extension of just the MPA. Further investigation is needed to assess the options. A Provincial Nature Reserve or Protected Environment are also options.

Consultation is required for establishing targets for conservation and EMP spatial zonation proposals, the *de facto* establishment of sanctuary areas through consensus and self-regulation, and the assessment of mechanisms to secure their formal protection and managerial support.

5.3.2 Objective 3.2: Mouth Maintenance Management Plan

The dynamics and management of the mouth of the Bot River estuary has been contested and extensively studied over the last few decades. The conclusion of the Situation Assessment was that the value of the nursery function justifies the case for managing the estuary as a resource-orientated service area in the interests of the national economy and global food security. Stakeholders at the meeting on 16 October 2008 were asked their views on the 'purpose' of the Bot/Kleinmond estuarine system; nursery function received significant support, along with biodiversity conservation and recreation. It is considered appropriate, therefore, that the MMP should adopt the nursery function as its priority objective and support other considerations as far as is possible without jeopardising the nursery function.

Management of the estuary to date has been led by CapeNature supported by the Overstrand Municipality and an estuary advisory committee.

The 2018 Maintenance Management Plan must be updated and considered for adoption by RMA as a matter of urgency.

5.3.3 Objective 3.3: Sustainable Resource Use

Hawston was established to the east of the estuary in 1859 and was traditionally a fishing community. Concerns about the health of national fish stocks resulted in the withdrawal of commercial fishing licenses and, most recently, the closure of the abalone fishery. Restrictions have had a significant impact on this community, and its equivalent at

Kleinmond, many whose members subsist on less than R1,600 per household per month (2011 census data). It is common knowledge that an illegal gillnet fishery was operating in the Bot River estuary for an extended period, impacting heavily on the stocks of line fish and on the nursery function. This type of fishery has consistently been shown to be inappropriate and unsustainable in estuaries and is thus strongly discouraged in estuaries. Evidently, ongoing harvesting/extraction of any kind must be strictly controlled to ensure the sustained supply of marine living resources in future. This is regulated under the Marine Living Resources Act and its associated policies, namely the DFFE Policy for Small Scale Fisheries (SSF) Sector (June 2012, GN 474).

While SSF communities have been identified by DFFE along the entire coastline, including the Kogelberg to Walker Bay area, no small-scale communities have been identified around the Bot Kleinmond system (S. Lamberth, *pers. comm.*[3]). Operation of a commercial 'subsistence' fishery within the system is thus prohibited.

[3] Dr. S. Lamberth, Department of Agriculture, Forestry and Fisheries Management, 18 January, 2019.

Table 4: Management Actions for Fish Resource Priority Area

Management Actions	Legislation	Deliverables/ Indicators	Timing	Responsible Agent(s)
MANAGEMENT OBJECTIVE 3.1: Designated sanctuary zone(s), which support the nursery function of the Bot/Kleinmond estuarine system, provide protection for marine living resources against exploitation and disturbance.				
i) Facilitate a public participation process to agree on the targets for conservation, the spatial zonation and the resource and recreational use guidelines.	NEM:PAA ICMA, NEMP	Target species and habitats identified Spatial extent defined Specific guidelines developed	2023 2024	CapeNature
ii) Legalise and implement spatial zonation plan		Municipal bylaws updated and published	2023, 12 months	CapeNature, OSM
iii) Disseminate spatial zonation plan and guidelines to estuarine users, land owners and visitors.		Interpretative signage erected at strategic points Pamphlets distributed Emails distributed to I&APs	2023	CapeNature, OSM BREF
iv) Assemble inputs for legal establishment of an Estuarine Protected Area		Data acquired and analysed Motivation prepared and submitted	2023 ongoing	CapeNature
MANAGEMENT OBJECTIVE 3.2: A mouth management plan, which prioritises the nursery function of the Bot/Kleinmond estuarine system, has been adopted.				
i) Adopt and implement revised Maintenance Management Plan (MMP) for the Bot/Kleinmond estuarine system, including a M&E plan.	NEMA, ICMA, NEMP	MMP approved and adopted EA obtained if necessary Breaching only under specified conditions Pre- & post- breach monitoring undertaken according to M&E plan	2023	RMA/ CapeNature, OSM
ii) Prepare a scientific evaluation of the current MMP including a report on the learning that can be applied for future prioritisation of the nursery function.		Evaluation undertaken Scientific & ecological consequences & trends, successes & shortcomings documented	2023	RMA/ CapeNature, DFFE
iii) Ongoing monitoring and evaluation to support adaptive management and implementation of the plan.		Quarterly reports and monitoring reports & annual report compiled	Ongoing	RMA/ CapeNature

MANAGEMENT OBJECTIVE 3.3: Extraction of marine living resources of the Bot/Kleinmond estuarine system is managed in a sustainable manner.				
i) Enforce compliance with spatial zonation plan and associated regulations governing estuarine usage	MLRA, MSA	Scheduled & ad hoc patrols undertaken Additional compliance officers & honorary rangers deployed Combined operations	2023 ongoing	DFFE CapeNature, OSM and Phakisa
ii) Regulate extractive resource use activities through the deployment of human resources for compliance and enforcement in respect to MLRA	MLRA	Trained & knowledgeable personnel deployed Number of personnel Number of patrols Monthly counts of number of harvesters/fishers and users Number of permit holders On going training of staff	2023 ongoing	
iii) Any new fishing initiatives must be in accordance with official DFFE policies, existing input and output controls including Total Allowable Effort (TAE) levels for commercial and small-scale commercial line and net fisheries	MLRA	Liaison with DFFE Approval from DFFE	Ongoing	

5.4 Land Use Planning & Development

5.4.1 Objective 4.1: Environmental Management Overlay Zones

The EMOZ will address land-use and development management and a coastal planning scheme. The Coastal Protection Environmental Overlay Zone has been adopted and the regulations have been promulgated in terms of the Municipal Zoning Scheme. The purpose of this Overlay is to:

- Manage the integrity of coastal ecosystems, ecosystem services, coastal dynamic processes and biodiversity within Coastal Reserves;
- Manage public access for the enhancement of social, economic and recreational opportunities within the coastal environment;
- Manage the character, sense of place and aesthetic value of coastal property; and
- Institute appropriate controls for the protection of people, property, and economic activities within the coastal environment.

5.4.2 Objective 4.2: Terrestrial Conservation Plan

The delineation of areas around the estuary proposed for protection from development has been generated through a desktop study using available data. All formally proclaimed protected areas, including Mountain Catchment Areas, make up the category 'Conservation 1'. Another category – 'Conservation 2' – was generated by locating areas of critically endangered vegetation, high priority wetland habitats, untransformed areas of high-value / high-sensitivity vegetation, and dynamic coastal process areas, and linking them via drainage lines to core conservation and mountain areas, and the riparian coast-to-mountain corridor.

An investigation into the presence/absence of peatlands should be undertaken in the proposed conservation corridors.

Whilst some of these areas may be suitable for formal protection as nature reserves, many of them are more suited to being managed as biodiversity priority corridors on privately owned land or the municipal open space system. Table 5 involves fine-scale mapping of sensitive areas, fine-tuning spatial proposals for conservation, and then identifying the best options for securing conservation of these areas depending on whether they are urban or rural, state-owned or private. Mechanisms such as an urban open-space system and Stewardship arrangements would be considered. Plans for actioning the preferred options, and land use guidelines, will be drafted and implemented.

The Western Cape Protected Areas Expansion Strategy is the tool that is used to prioritize areas for declaration of new protected areas.

5.4.3 Objective 4.3: Public Recreation Areas Development and Access

Local stakeholders have reported dissatisfaction regarding public recreation areas in the Botvlei area, including inadequate access, inadequate facilities, poor management of existing facilities, environmental abuse and vandalism. The South African festive season is characterised by a massive influx of people to the coastal areas throughout the nation,

which peaks on New Year's Day in proportions that challenge town and city managers even in the most well-resourced metropolitan areas.

At present there are two recreation areas with facilities that are available: at the Kleinmond mouth and at Fisherhaven, in the backwater area next to the yacht and boat club. The negative environmental impacts of toilet facilities at the Kleinmond mouth, and the bridge at the mouth, were identified in the C.A.P.E. Estuaries Programme's Regional Conservation Plan as targets for rehabilitation. The amenity at Fisherhaven is derived mainly from the slipway and parking lot and, although there is provision for swimming, it is not suitable for family recreation. Short-term camping over the festive season at Middelvlei State Ground has been plagued with problems involving damaging environmental impacts, access rights and the unmonitored, isolated access route. Access to the eastern shore of the mouth of the Bot River estuary is semi-privatised. Access at Rooisand is also via an unmonitored, isolated route which at times has been blocked in an effort to prevent illegal launching. The Rooisand and Lamloch wetlands are sensitive environments that do not support vehicular access.

The recommended public access points (a requirement of the ICMA) have been identified at the mouth of the Bot River (eastern shore), Middelvlei State Ground, Fisherhaven, Rooisand (for eco-tourism purposes) and the Kleinmond estuary mouth area (western shore). The potential extent of the recreational precincts (existing areas at Kleinmond and Fisherhaven) could be upgraded, as well as a new one developed, extending along the existing road leading to Middelvlei State Ground.

Development of this controversial site potentially provides the incentive for the OSM to address a number of problematic management issues and provides a vehicle for the estuarine community to 'take the bull by the horns' with respect to the proposals for westward expansion of the Greater Hermanus urban area. Access to the estuarine frontage is gained via an isolated gravel road through an area infested with alien vegetation which is frequently the target of illegal dumping. The State Ground has become the fall-back option for families who uphold a festive season tradition of camping at the shore. There are no facilities and no 'structural framework' to support these activities and uncontrolled fires, use of Off Road Vehicles (ORVs) in dune areas and undisposed waste are the outcome. The development of a facility to support activities in this isolated location is not regarded as a sustainable option due to the high maintenance costs that would be incurred to provide security and guard the facility against vandalism. Previously, the OSM SDF, a vast area including this, and the Middelvlei coastal dunes, was identified for westward expansion of Greater Hermanus. Residents of the estuarine margins are opposed to urban expansion within the margins. The Middelvlei coastal dunes (former dynamic dunefields that were stabilised in the early part of the twentieth century) were identified in the EMP assessment as unsuitable for development. The assessment also noted the maintenance of an area of open space between the settlements of Fisherhaven and Hawston on land which appears to be suitable for development (more suitable than the dunes, for instance). All of these factors hold a potential solution to the problems of access and recreational facilities and the need for urban development: the creation of a residential-recreational precinct, with supporting commercial and social facilities, creating a monitored route to the shoreline where permanent facilities are provided for day-trippers, and short-term camping is

supported during festive times. With a well-managed consultative planning process, good design, and attention to existing water and waste treatment shortcomings, this strategy holds the potential to provide a long-term sustainable solution to many of the social and environmental problems evident in this part of the study area, as well as providing opportunities for economic development.

Table 5 outlines a process for engaging stakeholders in the selection and definition of two estuary-based recreational precincts for development and developing these through public-private partnerships. The developments potentially provide scope for increase access, job creation and local enterprise development.

5.4.4 Objective 4.4: Eco-tourism Development

The SAR found that tourism in the Bot/Kleinmond estuarine system is seasonal and largely underexploited. Residents are concerned that the system does not have the capacity to carry large numbers of tourists. The OSM promotes tourism as a vehicle for economic development in the coastal area, based on the natural heritage attraction. Responsible eco-tourism development strategies seek to create opportunities for tourists to enjoy the natural and cultural heritage of a place without imposing negative impacts and ensuring that local communities benefit from the development through the introduction of sustainable livelihood opportunities.

The Bot/Kleinmond coastal area holds many opportunities for such development, ranging from guided hikes and canoe trails to the telling of stories of cultural histories and traditions rooted in the fishing activities of local communities. Some experience has been gained in the area and lessons can be drawn from local projects, such as Hawston Abalone Village. Links can be forged between local entrepreneurs and private developers engaged.

Local communities should be involved in identifying and defining opportunities for nature-based and cultural tourism, enlisting the assistance of eco-tourism experts in developing and promoting these, and then implementing these proposals through partnerships between local entrepreneurs and the OSM LED office.

Table 5: Management Actions for Land Use & Development Planning

Management Actions	Legislation	Deliverables / Indicators	Timing	Responsible Agent(s)
MANAGEMENT OBJECTIVE 4.1: A Coastal Protection EMOZ relating to the Bot/Kleinmond estuarine system has been implemented, as provided for in the ICMA.				
i) Obtain any necessary approvals from regulators.	LUPA, MSA, ICMA	Approvals obtained	2023 2024	OSM CapeNature
ii) Identify any prerequisites for enforcement, including any training (EMI) or mentoring. Prepare an implementation plan for training/mentoring.	MSA, NEMA, NEM:PAA	Needs analysis undertaken Appropriate training courses & mentorship identified Implementation plan developed	2023 ongoing	
iii) Oversight of the integration of the EMOZ into municipal Land Use Management System	MSA	Meetings minuted	2023 2024	
MANAGEMENT OBJECTIVE 4.2: A plan for assembling terrestrial conservation-worthy areas has been adopted and is being actioned.				
i) Fine-scale mapping of sensitive areas (habitats, vegetation, dynamic coastal processes, drainage corridors, aquifer recharging), field survey verification	NEM:BA, NEM:PAA, ICMA, NWA	Extent of sensitive areas Detailed mapping produced State of the Environment known	2023 2024	CapeNature, OSM, DEADP
ii) Revisit and fine-tune spatial representation of corridors and priority areas for conservation				CapeNature, OSM
iii) Identify all state-, municipality- and privately owned land parcels that are suitable for inclusion in the conservation area network	NEM:PAA,	Land parcels identified and prioritised	2023	CapeNature, OSM
iv) Develop a municipal conservation plan aimed at achieving zoning of all suitable municipal-owned land parcels as "Open Space I" or "Open Space III"	MSA	Municipal conservation plan developed Increase in land conserved Improved state of the environment	2023	OSM, CapeNature
v) Develop a management action plan for expanding and consolidating the formal terrestrial conservation area network – a protected area plan	NEM:PAA	Increase in land under formal protection Protected Area Plan developed and approved	2023 2024	CapeNature

vi) Assess and develop Conservation Stewardship proposals for privately-owned land	NEM:PAA	Stewardship programme initiated Stewardship agreements signed	2023 2024	CapeNature, landowners
vii) Develop and implement guidelines for land use and management in biodiversity priority areas and corridors (Ramsar phase II implemented)	NEM:PAA, MSA	Guidelines developed and incorporated into EMOZ municipal bylaws Preservation of sensitive areas	2023 2024	CapeNature, OSM, landowners DALRRD
MANAGEMENT OBJECTIVE 4.3: A plan for improving access and developing Public Recreation Areas has been adopted and is being actioned				
i) Identify prime access points and appropriate type of access and facilities required	ICMA	Coastal access audit undertaken Assessment of need and desirability of historical, current and proposed access undertaken	2023	OSM, CapeNature DEA&DP
ii) Provide and maintain controlled access in line with the provincial strategy		Access maintained, and amenity provided (where appropriate) Database of access (location, asset register, condition etc.) maintained Budget allocated for on-going scheduled maintenance	ongoing	OSM, CapeNature DEA&DP
iii) Develop project objectives, broad spatial parameters and Terms of Reference (ToR) for each new development precinct in line municipal SDF	LUPA, MSA	Town planning meeting convened Objectives and spatial parameters determined ToR compiled	2023 2024	OSM, CapeNature
iv) Compile Public Recreation Area Development Plans for two precincts	MSA, NEMA, LUPA	Development plans compiled Plans approved	2023 2024	OSM, CapeNature
v) Undertake EIA process to obtain necessary development approval (including rezoning if necessary)	NEMA	EIA completed Environmental Authorisation granted Recreation areas constructed	2023 2024	OSM, CapeNature
MANAGEMENT OBJECTIVE 4.4: New estuarine-based locally-owned ecotourism enterprises are established and operating.				
i) Identify and analyse tourism development opportunities	MSA	Study undertaken Funding obtained for roll-out of results	2023 to 2025	RMA/OSM LED office
ii) Develop ecotourism packages, promote, call for proposals, and negotiate with developer-operators		Commercial opportunities supported Number of tourism concessions awarded	2023 to 2025	RMA/OSM LED office

		Number of jobs		
iii) Develop necessary infrastructure and access points/routes, with appropriate approval	MSA, NEMA, ICMA	Needs analysis undertaken Funding secured and projects detailed Necessary approvals obtained Amenities constructed or installed	2023 to 2025	DEA&DP, DFFE,OSM, RMA
iv) Market Bot/Kleinmond as an ecotourism destination using available tourism products	MSA	Liaison with tourism assoc. Marketing plan developed and implemented OSM-linked estuaries website operational	ongoing	Local (OSM)+ District (ODM) Tourism office RMA

6 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 (SZP) provides a means of geographically transposing the aims of the management objectives, where applicable, and is informed by the following (DEA, 2015):

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

6.2 Geographical Boundaries - 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*".

For the purposes of determining the RDM under the National Water Act, DWS defines the geographical boundaries of an estuary as follows; "*the seaward boundary is the estuary mouth and the upper boundary the full extent of tidal influence or saline intrusion, whichever is furthest upstream, with the five meter above mean sea level (MSL) contour defined as the lateral boundaries*."

The Estuarine Functional Zone (EFZ) is defined by the 2014 Environmental Impact Assessment (EIA) Regulations (GN 985) 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…*". The NEMP acknowledges the EFZ as the geographical boundary of estuaries in South Africa. In practice, it is found that the 5 m topographic contour approximates the EFZ for most estuaries in South Africa. It is consequently commonly used to delineate the EFZ in the absence of specific biophysical assessments.

The EFZ of the Bot/Kleinmond estuarine system is depicted below in Figure 4.

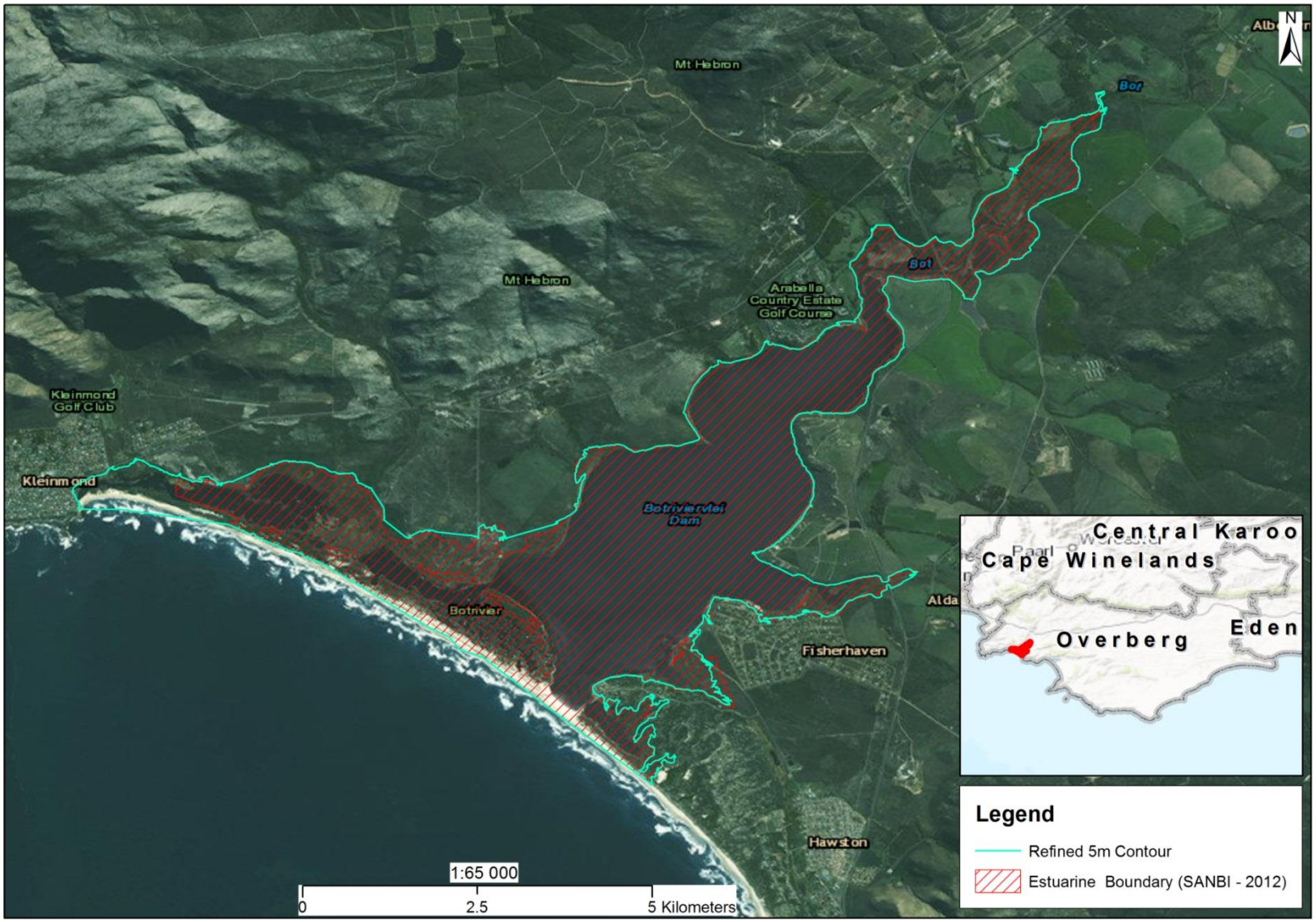

Figure 4: Map of the geographical boundaries of the Bot/Kleinmond estuarine system according to the 5m contour, defining the estuarine functional zone

6.3 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 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. This is determined as part of the Coastal Management Line process (CML).

The Provincial MEC, in consultation with the Local Municipalities, is required to refine and formally adopt the CPZ. A process is currently underway to formally establish a CPZ for the Western Cape Coastline. In accordance with provisional delineation of the CPZ for estuaries in the Overberg, as per draft delineations recommended in the Coastal Set-back / Management Lines for the Overberg District project (WCG, 2015), the CPZ is informed by a coastal risks zone approximated by the **5 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 Bot Kleinmond estuarine system are illustrated in Figure 5.

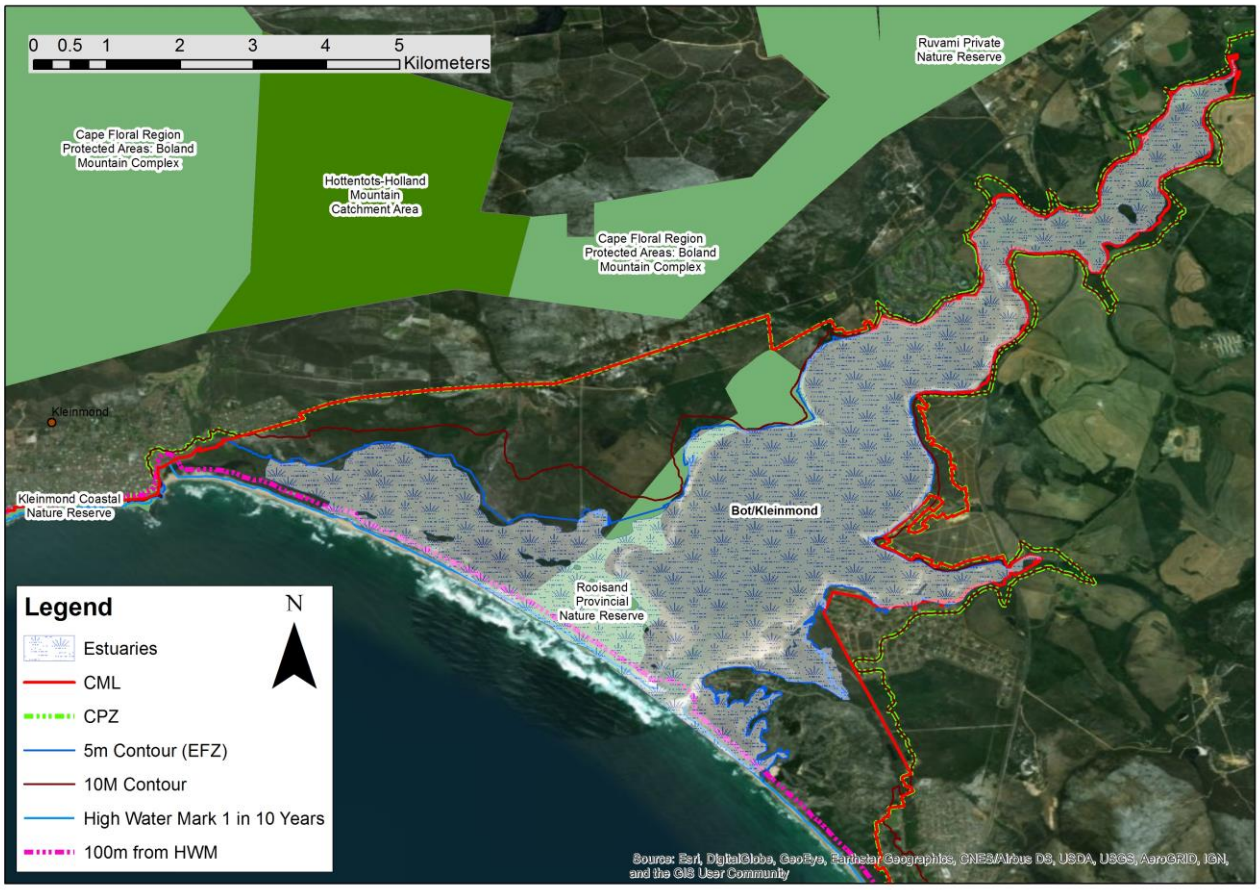

Figure 5: Coastal boundaries of the Bot Kleinmond estuarine system and risk projections (WCG, 2015)

6.4 Environmental Impact Assessment regulatory line

In respect of the EIA regulatory scheme, an additional line called the Development Set-Back Line (DSL) needs to be differentiated as it relates to the 'development set-back' referred to in the EIA regulations[4] 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-back is found in the so-called EIA Listing Notices that list a range of activities that require different levels of environmental impact assessment and the issuing of an environmental authorisation prior to being undertaken.

Typically, an activity would be listed in the form of a range of thresholds which, if exceeded, trigger the need for an environmental impact assessment in the form of a Basic Assessment

[4] The Environmental Impact Assessment Regulations, 2014, published under Government Notice No. 982 in Gazette No. 3822 of 4 December 2014, in terms of sections 24(5) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998)

or full-blown 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 Department of Environmental Affairs.

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-back lines 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.

6.5 Spatial Zonation Plan

The zonation in the Bot/Kleinmond estuarine system is in draft format (Figure 7). **One of the priority actions for the implementation of the EMP is the refinement and finalisation of the zonation by all parties.** The current zoning proposal, developed through stakeholder engagements forming part of the original EMP compilation process, is shown in Table 6. This zonation provides for four activity zones:

Table 6: Proposed Zones for the Bot/Kleinmond estuarine system

Zone		Ha	%
Sanctuary Zones	No-take no-wake	730	48%
Recreation Zone 1	General recreation	606	40%
Recreation Zone 2	Bait collection	167	11%
Recreation Zone 3	Ski circuit	15	1%
Total		1,517	100%

Sanctuary Zones – where recreational activities are limited to those which involve 'no take, no wake' – are intended to protect nursery habitats and provide refugia for fish, birds and invertebrates, and reduce disturbance of sediment in shallow areas and erosion of banks. The upper reach of the Bot River estuary is regarded as the primary refuge area for marine juvenile fish. Low impact activities such as paddling and sailing are supported.

General recreation, including boating and recreational fishing, is supported in **Recreation Zone 1** in the central area of Bot River estuary, but not bait collecting, which is restricted to **Recreation Zone 2** in the mouth areas of the Bot/Kleinmond estuarine system. This is to limit disturbance to bird habitats on the Rooisand shores.

High-speed boating and water-skiing is provided for in **Recreation Zone 3** – a circuit of 5 km in the middle of the central recreational zone of the Bot River estuary, defined by floating buoys. A speed limit of 10 km/hour is proposed in other recreation zones for safety reasons and in order to reduce disturbance of sediments in shallow areas and bank erosion caused by wake waves. Jet boats and jet skis are prohibited from the system entirely Kitesurfing, and parasailing are prohibited activities throughout the system because of their disturbance to birds. All forms of netting and fish trapping are prohibited, except for throw nets and cast nets (restricted to bait collection in Zone 2) in line with relevant regulations.

Further details of the extent, intention and supported / non-supported uses of the estuary zones are provided in the guidelines in Table 7.

However, it should be noted that certain amendments to the current zoning, aimed at better protection of sensitive faunal habitat and improved recreational access are being discussed by local stakeholders. These include (refer to Figure 6):

Area 1:	Buffer to Rooisand Nature reserve, no watercraft propelled by engines
Area 2:	Buffer to bird habitat, no boating allowed
Area 3:	Recreational access
Area 4:	Alleviate congestion at slipway, add to general boating zone

NOTE: The initial spatial zonation plan (Figure 7) for the Bot/Kleinmond estuarine system was established through public & stakeholder participation.

It is imperative that future revisions of the Bot/Kleinmond EMP incorporate the boundaries of the EFZ, CML and Environmental Management Overlay Zones (EMOZ) as well as all types of recreational activities based on assessments of carrying capacities and co-use conflicts.

Figure 6: Proposed zoning amendments

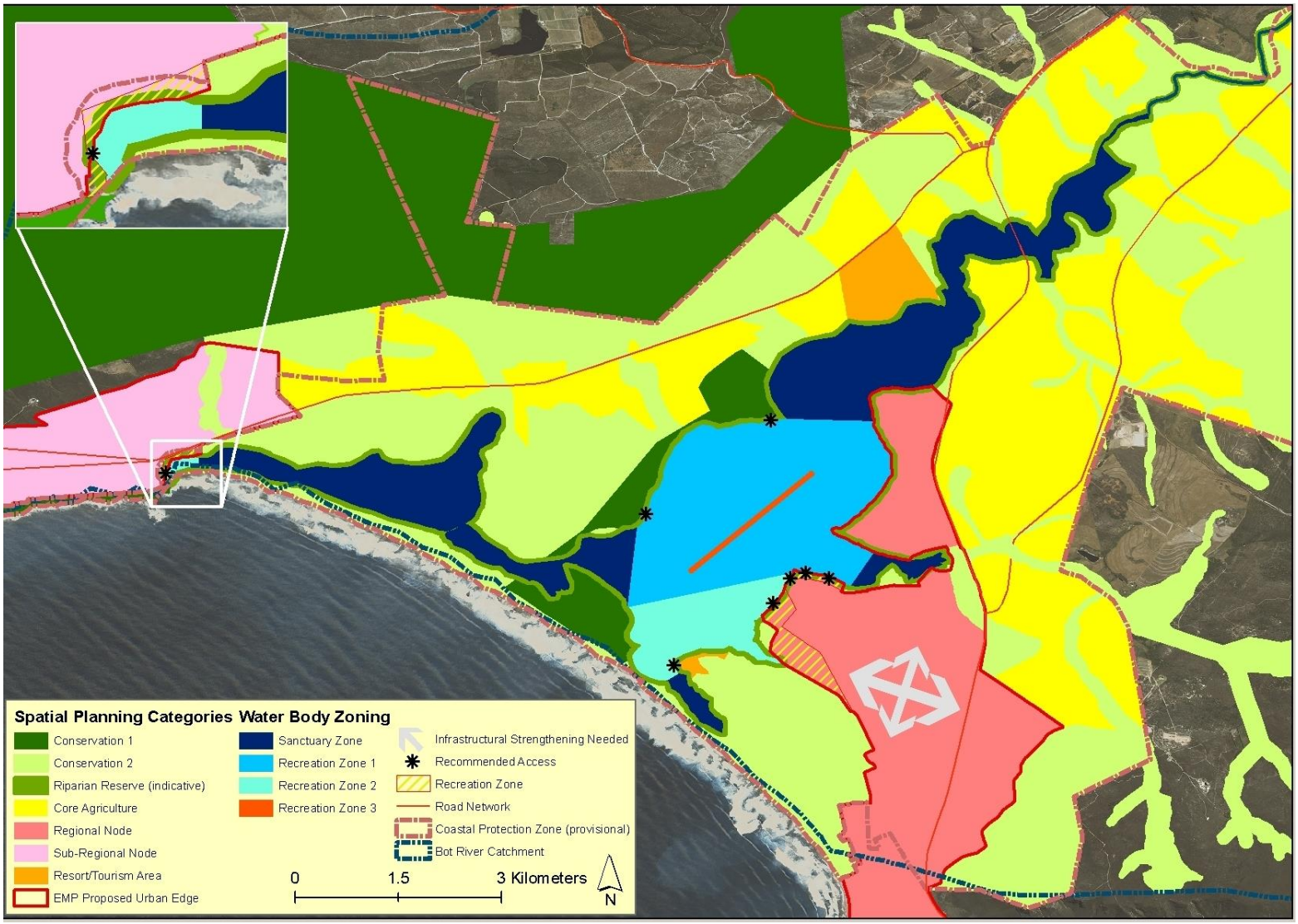

Figure 7: Original proposed spatial zonation for the Bot Kleinmond estuarine system (iRAP, 2009)

Table 7: Guidelines for Estuarine Management according to the Spatial Zonation Plan

DESCRIPTION / LOCATION	SPECIFIC INTENT	ESTUARINE MANAGEMENT GUIDELINES	LEGISLATION / POLICY / PLANS/ GUIDELINES	ENFORCING AGENT
ESTUARINE SANCTUARY ZONE - (WATER BODY)				
SANCTUARY ZONES Upper reaches of the Bot lagoon, north of existing Beacon no.1, extending to within 60 metres of the R43 road bridge. Backwater areas: at Afdaks River inlet (Areas 4E and 4F), east of the footbridge at Middelvlei (Area 4D) and west of existing Beacon no.2. Rooisand and Lamloch wetlands. Kleinmond River estuary east of the lightweight footbridge (2nd bridge from mouth).	a) *In situ* conservation of biodiversity, aiming to attain the minimum target for conservation of 33% of all estuarine habitats, as established in the Conservation Plan for Temperate South African Estuaries (Turpie & Clark, 2007); b) Sanctuary area for birds, fish and invertebrates, and the protection of habitats; b) Monitoring undisturbed ecosystems and undertaking non-destructive research; c) Environmental education; d) Low impact, non-motorised recreational uses.	**Supported uses and activities:** Canoes, kayaks, paddle skis, row boats, sail boats and other low impact non-motorised craft. Bird watching, hiking, swimming, non-destructive scientific research. Licensed guided catch-and-release enterprises. Release of concessions to be managed in compliance with open and transparent procurement processes. Rehabilitation of disturbed portions of the Riparian Buffer. **Non-supported uses and activities:** No bait collecting. No killing or removal of fish, invertebrates or plants at any time by any means except permitted scientific research. No motorised boats. No jet boats. No jet skis. No kite surfing. No para-sailing. No planting, and no harvesting of plant material (with the exception of rehabilitation activity relating to invasive alien vegetation). Riparian Buffer: No removal of indigenous vegetation, no planting of any material (except where rehabilitation is underway), no fertilisers or pesticides. No aquaculture. No sand mining. **Infrastructure and municipal services:** No bridges, causeways, new jetties, boardwalks. No launching. No wharfs or edge hardening.	**NEM: PAA** **ICMA** **National Biodiversity Plan (Turpie et al., 2012)** **MLRA Regulations** **Health Act / Water quality guidelines**	**CapeNature** **DFFE** **Overberg DM** **OSM**

DESCRIPTION / LOCATION	SPECIFIC INTENT	ESTUARINE MANAGEMENT GUIDELINES	LEGISLATION / POLICY / PLANS/ GUIDELINES	ENFORCING AGENT
ESTUARINE RECREATION ZONE 1 – (WATER BODY)				
GENERAL USE AREA Central zone between Beacons No.1 and 2, excluding backwater areas at Afdaks inlet and Rooisand NR. Upper reaches of the estuary, in the vicinity of the R43 road bridge and above.	a) Low impact recreational uses; b) Recreational line- fishing; c) Sailing; d) Protection of bird habitats on western shores from disturbance.	**Supported uses and activities:** Line fishing from the shore or from a boat or craft in compliance with MLRA regulations, permitting system and bag limits. Canoes, kayaks, paddle skis, rowing boats, sail craft, motorised boats – speed limit 10 km/h, subject to periodic review of guidelines, by-laws and public notices aimed at ensuring safety and security of all users. Bird watching, hiking, swimming, non-destructive scientific research. Rehabilitation of disturbed portions of the Riparian Buffer. **Non-supported uses and activities:** No capturing or removal of fish during mouth breaching events. No bait collecting. No cast- or throw-netting. No capturing of linefish species with cast nets, seine nets, gill nets, traps, gaffs or spears. Riparian Buffer: No removal of indigenous vegetation, no planting of any material (except where rehabilitation is underway), no fertilisers or pesticides. No jet boats. No jet skis. No kite surfing. No para-sailing. No motorised boats exceeding the speed limit of 10 km/h. No skiing. No aquaculture. No sand mining. **Infrastructure and municipal services:** No new bridges or causeways.	**MLRA Regulations** **Health Act / Water quality guidelines** **ICMA (Coastal Public Property)** **ORV Regulations (licensing of launch sites)** **EIA regulations (structures below high water mark, activities within 100m of high water mark).**	**DFFE / CapeNature** **Overberg DM** **OSM**

DESCRIPTION / LOCATION	SPECIFIC INTENT	ESTUARINE MANAGEMENT GUIDELINES	LEGISLATION / POLICY / PLANS/ GUIDELINES	ENFORCING AGENT
		No launch sites, new jetties, wharfs or edge hardening on western shores of the Central zone. In other areas, launch sites, jetties, boardwalks, wharfs and edge hardening, subject to compliance with relevant legislation Cleaning services to address water-borne waste at public recreational nodes.		
ESTUARINE RECREATION ZONE 2 - (WATER BODY)				
BAIT COLLECTING AREA South of new beacons – no's. 3.1 and 6.1 – being the lower reaches of the Bot River estuary (mouth area). Kleinmond River estuary west of the lightweight footbridge (2nd bridge from mouth).	a) Low impact recreational uses; b) Bait collection and recreational line- fishing; c) Sailing. d) Sustainable use of estuarine resources for livelihood strategies and job creation purposes.	**Supported uses and activities:** Line fishing from the shore or from a boat or craft in compliance with MLRA regulations, permitting system and bag limits. Use of cast- or throw-nets, release of any linefish species. Bait collecting, subject to periodic review, in compliance with MLRA regulations, permitting system and bag limits. Collection of mud prawn, sand prawn, bloodworm, pencil bait and tapeworm restricted to daylight hours, using legal implements. Canoes, kayaks, paddle skis, rowing boats, sail craft, motorised boats – speed limit 10 km/h, subject to periodic review of guidelines, by-laws and public notices aimed at ensuring safety and security of all users. Bird watching, hiking, swimming, non-destructive scientific research. Sustainable levels of harvesting of plant material from estuarine habitats to support job creating enterprises and livelihood strategies. Rehabilitation of disturbed portions of the Riparian Buffer. **Non-supported uses and activities:** No capturing or removal of fish during mouth breaching events.	**MLRA Regulations** **Health Act / Water quality guidelines** **ICMA (Coastal Public Property)** **ORV Regulations (licensing of launch sites)** **EIA regulations (structures below high water mark, activities within 100m of high water mark).** **NEMA** **NEM: ICMA**	**DFFE / CapeNature** **Overberg DM** **OSM** **DEA&DP**

DESCRIPTION / LOCATION	SPECIFIC INTENT	ESTUARINE MANAGEMENT GUIDELINES	LEGISLATION / POLICY / PLANS/ GUIDELINES	ENFORCING AGENT
		No capturing of linefish species with cast nets, seine nets, gill nets, traps, gaffs or spears. Riparian Buffer: No removal of indigenous vegetation, no planting of any material (except where rehabilitation is underway), no fertilisers or pesticides. No jet boats. No jet skis. No kite surfing. No para-sailing. No motorised boats exceeding the speed limit of 10 km/h. No skiing. No aquaculture. No sand mining. **Infrastructure and municipal services:** No new bridges or causeways. Existing footbridge at Kleinmond River estuary (closest to the mouth) causing obstruction to water flow to be removed. Design of a replacement structure subject to environmental authorisation. No launch sites, jetties, boardwalks, wharfs or edge hardening on western shores of Bot River estuary. In other areas, launch sites, jetties, wharfs and edge hardening, subject to compliance with relevant legislation. Cleaning services to address water-borne waste at public recreational nodes.		

DESCRIPTION / LOCATION	SPECIFIC INTENT	ESTUARINE MANAGEMENT GUIDELINES	LEGISLATION / POLICY / PLANS/ GUIDELINES	ENFORCING AGENT
ESTUARINE RECREATION ZONE 3 - (WATER BODY)				
SKI ZONE 80-metre-wide ski circuit approximately 2.3km long (each leg) located on centre axis of central zone (Recreation Zone 1).	a) Accommodate water sport activity that provides amenity for residents and tourists. b) Adaptive management of recreational activities to stay within physical and social carrying capacity using spatial and temporal sub-zones and permitting system. c) Minimise impacts of wake-producing activities on shoreline habitats.	**Supported uses and activities:** Motorised boats, subject to periodic review of guidelines, by-laws and public notices aimed at ensuring safety and security of all users. Skiing. Non-destructive scientific research. **Non-supported uses and activities:** Swimming or fishing from a boat or craft during times of high-speed boating activity. Use of non-motorised craft in this zone during times of high-speed boating activity. No capturing or removal of fish during mouth breaching events. No bait collecting. No cast- or throw-netting. No capturing of linefish species with cast nets, seine nets, gill nets, traps, gaffs or spears. No jet boats. No jet skis. No kite surfing. No para-sailing. No aquaculture. No sand mining. **Infrastructure and municipal services:** Installation and maintenance of floating buoys to demarcate ski circuit.	**Health Act / Water quality guidelines / safety guidelines**	**Overberg DM** **OSM** **SAMSA**

7 IMPLEMENTATION

7.1 Institutional Arrangements

It is essential that this EMP is regarded as a strategic plan that can guide the detailing of management actions and identification of implementing agents. Therefore, it does not specify the required resources (human and financial) required for proper management of the estuary. However, it does 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. The CapeNature Governance Tool will be used to integrate and track all management objectives and associated actions.

7.1.1 Key Role Players

Co-management and effective governance has been identified as a vital aspect to the efficient and effective management of the Bot/Kleinmond estuarine system. Figure 8 displays the key role players that should be included in its management.

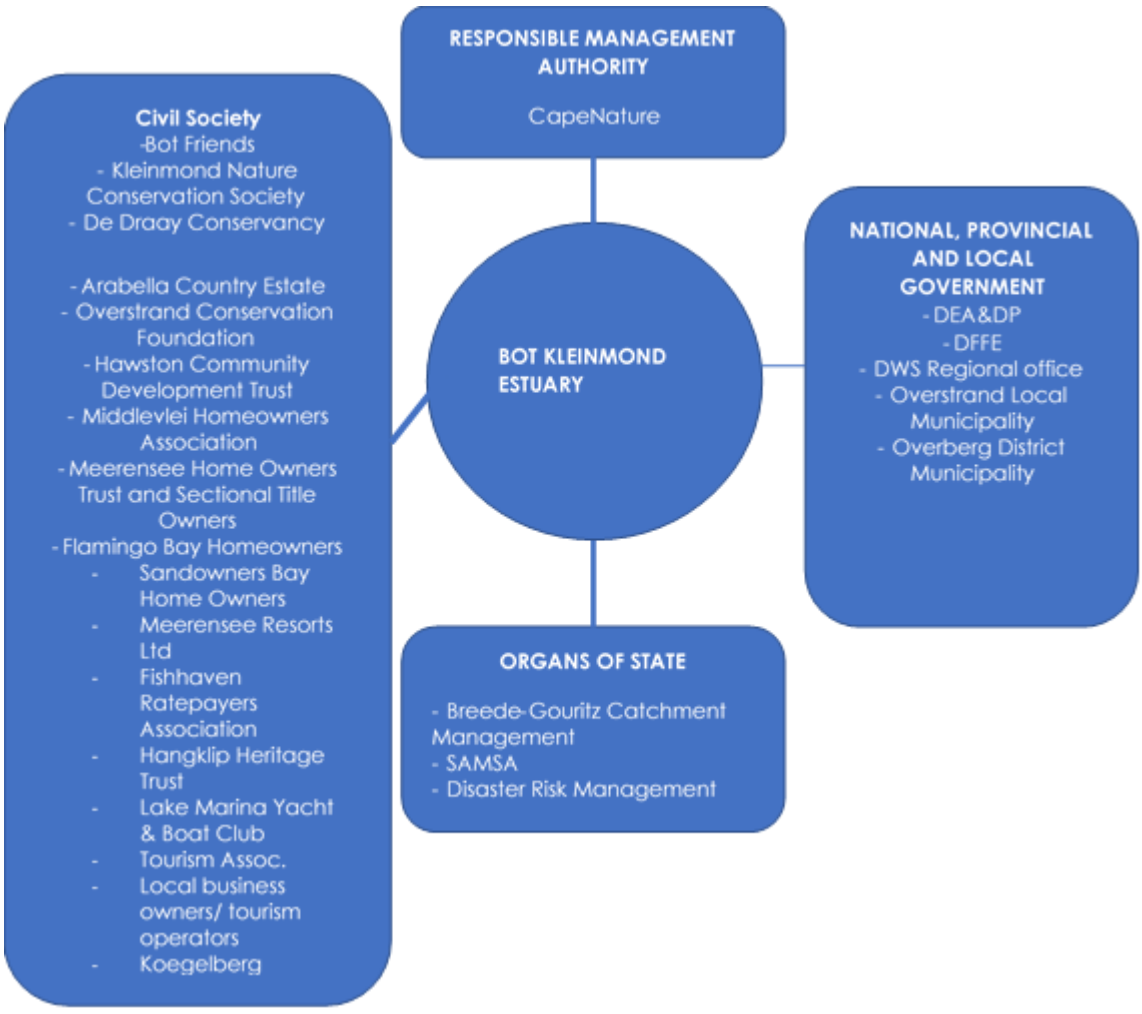

Figure 8: Key role players for the management of the Bot/Kleinmond estuarine system where CapeNature is the RMA

7.1.2 Responsible Management Authority

The NEMP (2021) identifies CapeNature as the Responsible Management Authority (RMA), responsible for the development and co-ordination of the implementation of the Bot/Kleinmond EMP given that the estuary is included in the WCPAES. A large portion of the southern bank falls within the Rooisand (Botrivier) Nature Reserve, is already administered by CapeNature. However, implementation of the EMP can be affected through a range of different forums and agencies. The OSM will continue to play a major supporting role to CapeNature, and this collaboration may need to be formalised through a signed Memorandum of Understanding. The RMA would hold the responsibility of chairing and facilitating the Estuary Advisory Forum meetings.

Attainment of formal protected area status, through the WC PAES, will necessitate a dedicated on-site CapeNature office with a number of adequately trained personnel to address estuary-related matters at the local level. This will need be addressed internally by CapeNature in respect to institutional capacity and budget requirement.

7.1.3 Bot River Estuary Advisory Committee / Bot River Estuary Forum (BREF)

7.1.3.1 Background

The Bot River Estuary Advisory Committee or Bot River Estuary Forum (BREF) is the existing, formally constituted institutional vehicle that was established in 1993 to co-ordinate estuarine management decisions. The BREF is managed by CapeNature, while the Overstrand Municipality acts in a supporting role in administering bylaws and law enforcement.

The mission of the BREF is: "*The co-operative management of the Bot River Estuary, associated wetlands and coastal strip as an ecological unit and on a scientific and sustainable basis*."

Objectives include:

- Support the drafting of a management plan;
- promotion of sustainable land-use practices;
- protection through education;
- policing and enforcement;
- monitoring;
- the consolidation of land for conservation purposes; and
- the commissioning of research.

Membership is restricted to representatives of organisations and community sectors. This extends to compulsory membership for relevant government organisations, and voluntary membership for NGOs, affected local communities or community sectors, and affected landowners.

The membership list for 2005 shows a total of seven compulsory member organisations, with potentially 13 representatives, and voluntary membership comprising riparian landowners (potentially 8 representatives) and environmental interest groups (potentially 14 representatives).

Riparian landowners are listed as: Farm Rooistrand, Arabella Country Estate, Benguela Cove, Meerensee. Environmental interest group organisations are listed as: Friends of the Bot River Estuary and Environs (Botfriends), Lake Marina Yacht and Boat Club, KOBIO (Kogelbergbiosphere), Fisherhaven Ratepayers Association, Hawston Fishing Community (represented by different registered groups), Kleinmond Nature Conservation Society and De Draay Conservancy.

Local environmental NGOs note that BREF has been effective under very difficult circumstances, in which very little informed local government activity has been applied to the management of the Bot estuary and its natural surroundings. The relatively good condition of the Bot Vlei is largely ascribed to the activities of BREF and Botfriends, without whose involvement and lobbying of various authorities over a long period of time, it is felt that the Botvlei would in all probability be a very much less healthy body of water than it is at present.

7.1.3.2 Way forward

According to the NEMP (2021), the role of the BREF is interpreted as providing an advisory service to the RMA on issues specific to the management and implementation of the EMP (see EAF guidelines adopted by DEA&DP in 2020), as well as being the hub that links all stakeholders, which serves to foster stakeholder engagement and to facilitate the implementation of the project plans identified.

The broader community, will be able to voice concerns and raise issues via the Forum. This includes Ratepayers' Associations, NGO's, community groups, conservancies, etc., and representatives from surrounding industry and agriculture. Local members will play an invaluable role in providing on the ground, local insight and support to the authorities. Any representatives are obliged to raise issues identified by their constituents and to provide feedback to the constituents. Importantly, the Forum will not represent or supplant the individual positions of its members unless specifically mandated to do so.

More specifically, the BREF should consist of the following:

1. A chairperson representing the RMA who will take the lead in co-ordinating the forum;
2. Government Representatives of the major management sectors/areas with executive powers in terms of respective legislation:
    a. Conservation & Living Resources;
    b. Land-use and infrastructure development;
    c. Water quantity and quality; and
    d. Social (and cultural) issues.
3. Representatives of all the above remaining institutions and interest groups. Existing institutions such as CMAs, WUAs or catchment forums and conservancies may be used

instead of establishing a new separate forum, but these would need to be expanded to include representatives from all interest groups.

The BREF serves to keep all stakeholders informed of the progress and effectiveness of the EMP, identifies areas of concern and makes management recommendations that may need to be incorporated into the EMP, liaises with government departments, through the RMA, to ensure they fulfil their legal obligations and interacts with tertiary & research institutions to help coordinate research programmes. The BREF and its members may also be directly involved with monitoring programmes by collecting data (physical measurements or visual observations) and can act as the eyes and ears for law enforcement authorities. The BREF is thereby instrumental in facilitating the implementation of the action plans.

7.1.4 Government Departments and Organs of State

The successful implementation of the Bot/Kleinmond EMP may be seen as also dependent on the contribution of a number of governmental role players, including:

- **Western Cape Government departments**: Responsible for legislative support, including compliance, funding, research and monitoring, as well as education and awareness;
- **Municipalities, including Overstrand Local Municipality, and Overberg District Municipality**: Responsible for fulfilling key municipal roles as well as the provision of management, technical and legislative support, and funding;
- Relevant **National Government departments,** especially Water and Sanitation (via the regional office), Forestry, Fisheries and Environmental Affairs, as well as Agriculture, Land Reform and Rural Development;
- **Organs of State,** such as the Breede-Gouritz Catchment Management Agency (BGCMA) which undertakes *inter alia*, water resource monitoring, and CapeNature, who is responsible for general conservation in the region, including the Rooisand (Botrivier) Nature Reserve, biological monitoring, compliance management and facilitating rehabilitation.

The National Department of Environmental Affairs is generally responsible for national standardisation of estuarine management and approval of provincially-led estuarine management plans. Direct involvement in individual estuaries, such as the Bot/Kleinmond system, will occur via existing forums for intergovernmental coordination. These forums will have the management of the various estuarine systems on their agenda from time to time.

- **Western Cape Provincial Coastal Committee**: Responsible for facilitating co-management and effective governance and provincial co-ordination of estuarine management; and
- **Overberg District Municipal Coastal Committee**: Responsible for facilitating co-management and effective governance.

A crucial element towards achieving the vision and objectives of this plan, 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.

7.2 MONITORING AND EVALUATION

7.2.1 Resource Monitoring

Resource monitoring programmes can be sub-divided (Taljaard *et al.* 2003) into:

Baseline surveys (or studies) the purpose of which is to collect data and information to characterise and understand the ecosystem functioning of a specific system. The baseline studies that are carried out for an Ecological Water Requirements ('Reserve') study at a comprehensive level are suitable for long-term monitoring of estuaries. If the Ecological Reserve study is carried out at a rapid or intermediate level, additional 'baseline' work is required to produce sufficient baseline data for long-term monitoring.

Long-term (or compliance) monitoring programmes to assess (or audit) whether management objectives are being achieved. The purpose of long-term monitoring programmes, in this context, is to assess (or audit) whether the Ecological Specifications (defined as part of the Ecological Reserve determination process) are being complied with after implementation of the Reserve. In addition, these programmes can also be used to improve and refine the Ecological Reserve measures (including Ecological Specifications / Resource Quality Objectives), through an iterative process (Taljaard *et al*. 2003). Although baseline studies and long-term monitoring programmes have different purposes, it is extremely important that long-term monitoring programmes follow on from similarly structured baseline studies (Taljaard *et al*. 2003).

Recommendations for the monitoring of the Bot/Kleinmond estuary's biophysical processes has been based on: 1) current data collection methods, 2) the baseline data requirements for the RDM methods for estuaries addressing the Ecological Reserve (Version 2) (DWAF, 2008) and 3) the guidelines and procedures to design resource monitoring programmes for estuaries as part of the Ecological Reserve Determination process for estuaries (Taljaard *et al.* 2003).

The resource monitoring programmes for the Bot River estuary are provided in the Appendix 1.

7.2.1.1 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 Bot/Kleinmond system, a Category B.

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 B for the Bot/Kleinmond estuarine system (CSIR, 2011), are presented in Table 10 (Appendix 2).

7.2.2 Review and Evaluation

This EMP should be reviewed and updated on a five-yearly basis to ensure that objectives and targets are being achieved. The review will involve revisiting the Situation Assessment to determine the progress or changes that have come about as a result of the EMP in terms of the objectives that were originally set as well as any changes in legislation or policies, and followed by revisions or refinement of the objectives and where necessary, aspects of the management actions plans or monitoring protocol.

An audit should be undertaken alongside the review to determine and grade the success and failures with the implementation of the management plan according to the specified performance indicators (Appendix 3). Both the review and audit would ultimately be the responsibility of RMA, supported by the BREF. A RAMSAR METT was undertaken in 2018.

8 RECOMMENDATIONS AND CONCLUSION

It is recommended that the aspects of the EMP listed below be implemented as a matter of priority within the **first year** (i.e. **HIGH PRIORITY**). All other aspects listed in the action plans are by default then considered MEDIUM or LOW priority.

- Establish regional Estuaries Management office or Job Description within RMA;
- Facilitate adoption of the EMP by the RMA;
- Confirm funding for implementation of all agreed EMP projects;
- Develop funding models in cases where government funding does not exist;
- Develop estuarine management capacity;
- Develop enforcement capacity, specifically controlling illegal fishing;
- Adoption and implementation of the 2018 MMP;
- Design Monitoring & Evaluation framework;
- Facilitate agreement on targets and methods for monitoring, collection and storage; of information, evaluation and reporting; and
- Implement the updated mouth maintenance management plan, as a matter of urgency.
- Liaise with Working for Water for the effective control of invasive alien vegetation in and around the estuarine system.

Furthermore,

- The EMP highlights that the boundaries of the spatial zonation for activities in and around the estuary have not been finalised. It is therefore critical that the zonation

be addressed by CapeNature in the next EMP review in order to produce a map that will depict the final agreed zonation.

- Future revisions of the zonation plan should also consider flexible recreational use areas as well as peak user days regulations.

In conclusion, the draft EMP presents an integrated and holistic approach to addressing not just the impacts but also the social and economic drivers that affect estuarine health. Most of these are problems that cannot be solved overnight, or opportunities that cannot be realised in a day. The actions proposed in this EMP will be the first steps of a long-term process designed to secure ongoing and sustainable improvements to the current situation.

9 REFERENCES

CSIR 2011. Rapid assessment of the Ecological Water Requirements for the Bot Estuary. Report No. CSIR/NRE/CO/ER/2011/0035/B.

CSIR, 2018. Bot/Kleinmond Estuary Mouth Management Plan. Report prepared by the CSIR for the Western Cape Government, Department of Environmental Affairs & Development Planning. CSIR Report no. CSIR/NRE/ECOS/ER/2017/0039/A.

DEA (2014a). National Estuarine Management Protocol. Review of Existing Estuarine Management Plans 2007-2014. Department of Environmental Affairs, Cape Town.

DEA (2014b). The National Coastal Management Programme. Department of Environmental Affairs, Cape Town.

DEA (2015). Guidelines for the Development and Implementation of Estuarine Management Plans in terms of the National Estuarine Management Protocol. Department of Environmental Affairs, Cape Town.

DEAT (2000). White Paper for Sustainable Coastal Development. Department of Environmental Affairs and Tourism, Chief Directorate Marine and Coastal Management.

DWAF (2008). Water resource protection and assessment policy implementation process. Resource directed measures for protection of water resources: Methodology. Department of Water Affairs and Forestry, Pretoria.

iRAP Consulting (2009a). Estuary Management Plan for the Bot / Kleinmond Estuarine System Overberg Region, Western Cape. Part 1: Situation Assessment Report. Prepared for Western Cape Nature Conservation Board.

iRAP Consulting (2009b). Estuary Management Plan 2009 – 2014: First Generation EMP for the Bot / Kleinmond Estuarine System Overberg Region, Western Cape. Prepared for Western Cape Nature Conservation Board.

Maree, R. C., Whitfield, A. K. and Quinn, N. (2003) Prioritisation of South African estuaries based on their potential importance to estuarine-associated fish species. Technical Report. Water Research Commission. WRC Report No TT 2003/03. Pretoria: Water Research Commission. Available from: http://eprints.uwe.ac.uk/10169.

Prochazka, K and Griffiths, C. 2000. Cape Action Plan for the Environment: Final report of the estuarine component. Zoology Department and Marine Biology Research Institute, University of Cape Town. Prepared for WWF-SA.

Taljaard, S., Van Niekerk, L., Huizinga, P. & Joubert, W. 2003. Resource Monitoring Procedures for Estuaries. For application in the Ecological Reserve Determination and Implementation Process. Water Research Commission Report no. 1308/1/03. Pretoria.

Turpie, J.K., Adams, J.B., Joubert, A., Harrison, T.D., Colloty, B.M., Maree, R.C., Whitfield, A.K., Wooldridge, T.H., Lamberth, S.J., Taljaard, S. & van Niekerk, L., (2002). Assessment of the conservation priority status of South African estuaries for use in management and water allocation. *Water SA*, 28, 191-203.

Turpie JK & Clark B (2007). The health status, conservation importance, and economic value of Temperate South African estuaries and development of a regional conservation plan. Draft Report. Anchor Environmental Consultants CC, University of Cape Town.

Turpie, J.K., Wilson, G. & Van Niekerk, L. (2012). National Biodiversity Assessment 2011: National Estuary Biodiversity Plan for South Africa. Anchor Environmental Consultants Report No AEC2012/01, Cape Town. Report produced for the Council for Scientific and Industrial Research and the South African National Biodiversity Institute.

WCG (2015). Coastal Management (Set-back) Lines for the Overberg District, 31 March 2015. Western Cape Government Environmental Affairs and Development Planning.

APPENDIX 1: RECOMMENDED RESOURCE PROGRAMMES

Table 8: Additional baseline data required to fill data gaps, increase confidence of Reserve and to set baseline for long-term monitoring in Bot River estuary (CSIR, 2011)

Ecological Component	Monitoring action	Temporal scale (frequency and when)	Spatial scale (no. Stations)
Birds	Undertake counts of all water associated birds. All birds should be identified to species level and total number of each counted.	Jun/Jul, Sep/Oct, Dec/Jan Note: mid-summer and mid-winter counts are already covered by CWAC. Need to add a spring count	Full estuary count, with estuary to be divided into at least the four zones defined in this study.
Invertebrates	Collection of zooplankton samples	Response to low salinity values in the estuary and state of the mouth.	When the mouth is open and again a few months later after the mouth has closed and salinity values have declined to low values (<10).
	Benthic samples from sandy and muddy substrata as well as from the submerged vegetation in the lower estuary.	Response to low salinity values in the estuary and state of the mouth.	When the mouth is open and again a few months later after the mouth has closed and salinity values have declined to low values (<10).

	Collection of macrocrustacea from marginal vegetation sites, as well as in the submerged macrophyte beds.			Response to low salinity values in the estuary and state of the mouth.	When the mouth is open and again a few months later after the mouth has closed and salinity values have declined to low values (<10).
Macrophytes	Aerial photographs of the estuary (ideally 1:5000 scale) reflecting the present state, as well as the Reference condition (if available) Available orthophoto maps			B&W aerial photographs for 1938, 1961 and 1973. Colour aerial photographs for 1981. Google Earth images for 2009 Oblique photo from Dr. T. Bornman taken 23/5/2006.	Not possible to map patches of reeds and sedges nor salt marsh accurately in littoral zone due to poor quality of aerial photos.
	Number of macrophyte habitat types, identification and total number of macrophyte species, number of rare or endangered species or those with limited populations documented during a field visit.			Some data from Koop 1982.	No areas for salt marsh nor macroalgae available.
	Permanent transects: - Measurements of percentage plant cover along an elevation gradient - Measurements of salinity, water level, sediment moisture content and turbidity			None available.	Unnecessary data for this estuary as it has no large salt marsh areas.
	Investigate the presence of peatlands	Within of 1 year of implementation	Entire estuarine functional zone		
Microalgae	Chlorophyll *a* measurements taken at 5 stations at the surface, 0.5 m and 1 m departmenths. Cell counts of dominant phytoplankton groups i.e. flagellate, dinoflagellates, diatoms and blue-green algae. Measurements must be taken coinciding with typically high and low flow conditions.			Some biomass and productivity data available from Bally *et al*. 1985	Data availability and understanding of phytoplankton

			in the estuary is very poor.
	Intertidal and subtidal benthic chlorophyll *a* measurements taken at 5 stations (at least). Epipelic diatoms need to be collected for identification. These measurements must to be taken coinciding with a typical high and low flow condition (in temporarily closed estuaries measurements must include open as well as closed mouth conditions).	Some biomass and productivity data available from Bally *et al*. 1985	Data availability and understanding of benthic microalgae in the estuary is very poor.
	Simultaneous measurements of flow, light, salinity, temperature, nutrients and substrate type (for benthic microalgae) need to be taken at the sampling stations during both the phytoplankton and benthic microalgal surveys.	Some data available in Bally *et al*. 1985	Very poor data base for links between abiotic data and biotic response.
Water quality	Collect data on conductivity, temperature, suspended matter/turbidity, dissolved oxygen, pH, inorganic nutrients (and organic content) in river inflow	At least Monthly	G4H014Q01 at Roode Heuvel Recommend that sampling point be added to DWA WQ monitoring network closer to head of estuary, 11 km from mouth
	Collect data on pesticides/herbicides in river inflow (better quantify river inputs)	Fortnightly over a six month period when pesticides/herbicides are applied, spanning a high flow season	Head of estuary 11 km from mouth
	Water quality measurements of seawater (No additional measurements required - consult available literature on marine water quality in the area).	-	-
	Collect salinity, temperature, suspended matter/turbidity/Secchi departmenth, dissolved oxygen, pH, inorganic nutrients in estuary	At least once-off surveys during each of the 4 abiotic states	Grid of stations across estuary, including stations near

			Arabella Estate and in Rooisand (~ 15 stations- Figure 10.1))
	Baseline data set for trace metal and pesticides/herbicides accumulation in sediments (also requires organic content and sediment grain size data from interpretation)	Once, at end of low flow period	Focus on sheltered, depositional areas
	Daily sampling of suspended sediment/turbidity (and organic matter) in river inflow - Required to quantify actual suspended sediment and organic yield and variability from catchment (Although sampling of organic input to the estuary from the catchment not included in current estuarine monitoring requirements of method – mainly costs - this may be important and an attempt should be made to better quantify this component)	Daily for 5 years	Head of estuary 11 km from mouth
Hydrodynamic	Accurate flow gauging of river inflow to estuary.	Continuous.	At head of estuary
	Water level recordings along estuary.	Once off during a spring and neap tidal cycle.	Existing station(s) and temporary ones Already available.
	Video Camera recording of mouth with local observers input.	Daily.	At Arabella.
	Near-shore wave data records (only if available).		
Sediment dynamics	Bathymetric survey: series of cross-sections and a longitudinal profile collected at about 500m intervals, but in some locations a previous survey. More detailed at the mouth. Vertical accuracy should be better than 300 mm.	Five years.	Entire estuary. Already Available.
	Topographical surveys of Bot and Kleinmond berm at Mouth	Every 3 years	Mouth Area.
	Set of sediment grab samples at cross-sections for grading analysis.	Once off.	Entire estuary.
	Set of core samples (2.0 m) save at cross-sections for grading analysis, age and origin (Isotope analysis).	Once off.	Entire estuary say every 1.0 km.

Figure 9: Proposed locations for water column sampling stations in Bot River estuary (CSIR, 2011)

Table 9: Long-term resource monitoring programme proposed for the Bot River estuary after implementation of the Reserve (Dark grey is high priority, light grey is medium priority) (CSIR, 2011)

Ecological Component	Monitoring action	Related TPC (see Appendix 2: Table 10))	Temporal scale (frequency and when)	Spatial scale (no. Stations)
Birds	Undertake counts of all water associated birds. All birds should be identified to species level and total number of each counted.	TPCs related to Birds (1.1- 1.3)	Jun/Jul, Sep/Oct, Dec/Jan Note: mid-summer and mid-winter counts are already covered by CWAC. Need to add a spring count	Full estuary count, with estuary to be divided into at least the four zones defined in this study.
Fish	Seine & gillnet sampling	TPCs related to fish (2.1 -2.4)	Twice annually, summer & winter	6 seines from mouth to head of estuary at same sites as 1980s sampling 1-2 gillnet sites depending on weed/macroalgal distribution
	Fishery observer-programme, catch monitoring	TPCs related to fish (2.1 -2.4)	Ongoing stratified random sampling procedure (roving creel surveys)	Stratified random procedure (shore-based and slipway/boat monitoring)
Invertebrates	Collection of zooplankton samples	TPCs related to zooplankton (3.1)	When the mouth is open and again a few months later after the mouth has closed and salinity values have declined to low values (<10).	Collections to be done at five sites.
	Benthic samples from sandy and muddy substrata as well as from the submerged vegetation in the lower estuary.	TPCs related to Benthic Invertebrates (3.2)	When the mouth is open and again a few months later after the mouth has closed and salinity values have declined to low values (<10).	Collections to be done at three sites in each habitat.

	Collection of macrocrustacea from marginal vegetation sites, as well as in the submerged macrophyte beds.	TPCs related to Invertebrates (3.3)	When the mouth is open and again a few months later after the mouth has closed and salinity values have declined to low values (<10).	Collections to be done at three sites in each habitat.
Macrophytes	Use aerial photographs to quantify area covered by different macrophyte habitats and produce a vegetation map to overlay on the existing GIS map from this study. Conduct ground survey to: 1) verify areas covered by different macrophyte habitats 2) check the spread of macroalgae and reeds 3) check the extent and health of the salt marsh.	TPCs related to Macrophytes (4.1-4.4)	Annually	Entire estuary
Microalgae	Phytoplankton: Conduct water column chlorophyll a measurements and counts of dominant phytoplankton group.	TPCs related to Phytoplankton (5.1 – 5.2)	Twice a year, at least during closed and open state.	Minimum 5 stations + river site
	Benthic microalgae: Conduct benthic chlorophyll a measurements	TPCs related to Benthic microalgae (5.3)	Twice a year, at least during closed and open state.	Minimum 5 stations + river site
Water quality	In situ Salinity and temperature measurements	(1.1 – 5.3; 6.2 – 6.2)	Quarterly, with monthly surveys once salinity < 10 ppt or biotic surveys require information for interpretation	Entire system (~15 stations)
	Temperature, suspended matter/turbidity, dissolved oxygen, pH, inorganic nutrients (and organic content) in river inflow	TPCs related to river inflow (6.3; 6.5; 6.6)	At least monthly on going	G4H014Q01 at Roode Heuvel Recommend that sampling point be added to DWA WQ monitoring network closer to head of estuary 11 km from mouth
	Measurements along grid of station in (at least surface and bottom samples) for pH, dissolved oxygen, suspended solids/turbidity/Secchi departmenth and inorganic nutrients	TPCs related to conditions in estuary (6.4; 6.7; 6.8)	To be measured when biotic surveys require information for interpretation	Entire estuary (~15 stns)

	Accumulation of trace metals and pesticides/herbicides accumulation in sediments (also requires organic content and sediment grain size data from interpretation)	TPCs related to toxic substances in estuary (6.10; 6.11)	Every 3 – 6 years	Focus on sheltered, depositional areas
Hydrodynamics	Continuous water level recordings (need ten - 15 year record).	1.1 – 8.8	Continuous.	At Station G4R003 at Ysterklip near 1st bridge from mouth.
	Accurate flow gauging of river inflow to estuary.	1.1 – 8.8	Continuous.	At head of estuary
	Aerial photographs of estuary (photographed at spring low tide) at 1:2000 scale.	1.1 – 8.8	Every three years.	Entire estuary.
	Video Camera recording of mouth with local observers input.	1.1 – 8.8	Daily.	At Arabella Country Estate
	Water level recordings along estuary.	1.1 – 8.8	Once off during a spring and neap tidal cycle.	Existing station(s) and temporary ones Already available.
	Near-shore wave data records (only if available).	1.1 – 8.8		
Sediment dynamics	Bathymetric survey: series of cross-sections and a longitudinal profile collected at about 500m intervals, but in some locations a previous survey. More detailed at the mouth. Vertical accuracy should be better than 300 mm.	1.1 – 8.8	Five years.	Entire estuary. Already Available.
	Topographical surveys of Bot and Kleinmond berm at Mouth	1.1 – 8.8	Every 3 years	Mouth Area.
	Set of sediment grab samples at cross-sections for grading analysis.	1.1 – 8.8	Once off.	Entire estuary.
	Set of core samples (2.0 m) save at cross-sections for grading analysis, age and origin (Isotope analysis).	1.1 – 8.8	Once off.	Entire estuary say every 1.0 km.

APPENDIX 2: ECOLOGICAL SPECIFICATIONS

Table 10: Ecological Specifications and Thresholds of Potential Concern associated with an Ecological Category B in the Bot River estuary (CSIR, 2011)

Component	Ecological specification/resource quality objective	Threshold of Potential Concern	Potential Causes
1 Birds	Retain the species richness, abundance and diversity of the bird community.	1.1 Species richness: The number of non-passerine waterbird species recorded in counts decreases by more than 10% over a five-year period. 1.2 The overall numbers of waders, wading birds or gulls & terns, or numbers of any of the species in these groups decreases relative to the baseline average by more than 10% over a five-year period, after correcting for regional/global population changes. 1.3 The total summer numbers of waterfowl exceed 15 000 for more than 4 years.	Changes in: Salinity Invertebrate biomass/abundance Fish biomass/abundance in smaller size classes Vegetated habitat Mud flats Human disturbance
2 Fish	Optimal recruitment of estuary-dependent marine species	2.1 No juvenile estuary-dependent marine fish caught in the estuary two years in a row	>2 yr mouth closure, open duration < 2 months, opening doesn't coincide with peak recruitment (August-November) Flow reduction, spillover to an open Kleinmond Estuary. Artificial breaching at low levels.
	Stable assemblage of estuary residents	2.2 % contribution to assemblage by number <60% of residents	Predation (eggs, larvae & adults) and competition with alien species Mass mortalities due to low oxygen events
	No alien species	2.3 Alien species abundant (> 5 % of biomass) in main body of estuary	Prolonged duration of freshwater conditions
	Recruitment into marine fisheries	2.4 % contribution of adult & sub-adult estuary-dependent fish to assemblage by number <15%	Gillnet fishing and/or high linefishing effort Mass mortalities due to low oxygen or sudden hypo-, hyper salinity events
3 Invertebrates	In the zooplankton, the density of Pseudodiaptomus hessei should range between 100 and 5000 m3 in the summer in the mid-estuary region.	3.1: *Pseudodiaptomus hessei* disappears from the zooplankton for prolonged periods (months).	Salinty values persistently below 5-7 ppt
	Density of sandprawn burrow openings should exceed 75 per m^2 in the highest density areas in the lower estuary.	3.2: The abundance of *Callianassa kraussi* burrows in the lower estuary drops below 50 counts per m2 in the highest density areas.	The mouth remains closed or semi-closed for extended periods, leading to persistent low salinity values below the threshold necessary for breeding purposes(<17-20 ppt) throughout the

			estuary.Abundance levels may be influenced by excessive bait collecting activities.
	Presence of all size classes in the population.	3.3: Absence of small sandprawns in the population.	Salinity not suitable for breeding purposes.
4 Macrophytes	Maintain the present area (2011) covered by the macrophyte habitats; submerged macrophytes (476 ha); reeds and sedges (60 ha); salt marsh (69 ha) and macroalgae (238 ha).	4.1 Greater than 20% change in the area covered by each macrophyte habitat type. 4.2 Decrease in salt marsh cover by 20% below the current area occupied i.e. less than 28 ha. 4.3 Increase in area cover of *Phragmites australis* by 20% i.e. greater than 93 ha.	Infilling reduces salt marsh habitat. Low flow, extended closed mouth and high water level conditions results in die-back of salt marsh plants. Increased nutrient point source inputs, increased sedimentation and low water level increases reed growth.
	Prevent excessive filamentous macroalgal growth.	4.4 The present ratio of macroalgae to submerged macrophytes must be maintained (i.e. 50%).	Elevated nutrient concentrations, prolonged closed mouth conditions and lack of freshwater floods and flushing.
5 Microalgae	Maintain low phytoplankton biomass (< 6 ug l^{-1}).	5.1: Increase in phytoplankton biomass to 10 ug l^{-1} for greater than 6 months.	Elevated nutrient concentrations in the inflowing freshwater and point source inputs and an increase in low flow and closed mouth conditions.
	Maintain microalgal group diversity as measured for the baseline survey. An increase in Cyanophytes (blue greens) should be a cause for concern.	5.2: Deviation in phytoplankton group diversity to 20 % of that found for baseline conditions. Baseline conditions must still be established.	Reduced freshwater inflow, increased in closed mouth conditions and low salinity. Elevated nutrient concentrations in the inflowing freshwater and point source inputs.
	Maintain present benthic microalgal biomass (< 4 ug g^{-1}).	5.3: Increase in benthic microalgal biomass to 10 ug g^{-1} for greater than 6 months.	Elevated nutrient concentrations in the inflowing freshwater and an increase in low flow and closed mouth conditions.
6 Water quality	Salinity distribution not to exceed TPCs for fish, invertebrates, macrophytes and microalgae (see above).	6.1: Loss of the 0 – 10 ppt. zone in the upper reaches (Zone A) of the estuary. 6.2: Salinity values below 8 ppt in summer 6.3: Salinity values above 40 ppt in summer (1st summer after breachings).	Illegal abstractions from the river upstream, Extended mouth closure due to flow reduction, Artificial breaching at Kleinmond.
	System variables (pH, dissolved oxygen & transparency) not to exceed TPCs for biota (see above)	6.4: River inflow: 6 < pH > 8.5 DO <4 mg/l Suspended solids (to be determined) 6.5: Estuary: Transparency– to be determine (system naturally turbid)	• Organic inputs and suspended solids from river and river banks. Also if high nutrient causes algal blooms (during die off these can reduce oxygen levels).

		6 < pH > 8.5 DO <4 mg/l	
	Inorganic nutrient concentrations not to cause in exceedance of TPCs for macrophytes and microalgae (see above)	6.6: River inflow (low flows): DIN >100 µg/l; DRP > 50 µg/l 6.7: River inflow (high flows): DIN >300 µg/l; DRP >80 µg/l 6.8: Estuary (low flows): DIN >100 µg/l; DRP >50, except during upwelling when high nutrient water can enter estuary from sea (usually associated with low water temperatures ~13°C) 6.9: Estuary (high flows): DIN >300 µg/l ; DRP >80 µg/l in Zones A & B DIN >100 µg/l; DRP >50 µg/l in Zones C & D, except during upwelling when high nutrient water can enter estuary from sea (usually associated with low water temperatures ~13°C)	• Agricultural return flows currently producing high DIN concentrations (>800 µg/l) during high flow (e.g. fertilizers) • Wastewater seepage during low flow periods (e.g. sewage)
	Presence of toxic substances not to cause exceedence of TPCs for biota (see biotic components above)	6.9 River inflow: Trace metals (to be determined) Pesticides/herbicides (to be determined) 6.10Trace metals: Concentrations in estuary waters exceed target values as per *SA Water Quality Guidelines for coastal marine waters* (DWAF, 1995). Baseline studies to be undertaken before TPCs can be set for trace metals in sediments. 6.11Pesticides/herbicides: Baseline studies to be undertaken before TPCs can be set (preliminary TPC = when deteced)	• Inappropriate agricultural practices in catchment (e.g. pesticides/herbicides) • Runoff from urban development along the banks (e.g. trace metals)
7 Hydrodynamics	Maintain a flow regime to create the required habitat for birds, fish, macrophytes, microalgae and water quality.	7.1 River inflow distribution patterns differ by more than 5 % from that Present (i.e. recommended flow scenario for the Bot). 7.2 Accumulative summer (October to March) river inflow below 4.2 million m^3 7.3 Annual flows below 50 (million m^3) for three consecutive years.	Illegal abstractions from rivers upstream, operational releases not executed correctly or drought condition.

		7.3 Summer river inflow below 0.15 m^3/s persists for longer than three months in a row. 7.4 Floods decrease by 5% from that of Present. 7.5 Mouth closure occurs more than three years in a row in a year.	
8 Sediment dynamics and morphology	Flood regime to maintain the sediment distribution patterns and aquatic habitat (instream physical habitat) so as not to exceed TPCs for biota (see above).	8.1: River inflow distribution patterns (flood components) differ by more than 20 % (in terms of magnitude, timing and variability) from that of the present state (2011). 8.2: Suspended sediment concentration from river inflow deviates by more than 20 % of the sediment load-discharge relationship to be determined as part of baseline studies (present state 2011). 8.3: Findings from the bathymetric surveys undertaken as part of the Monitoring programme indicate changes in the sedimentation and erosion patterns in the estuary have occurred (± 0.5 m).	Modification to inflow at head of estuary. Changes in mouth breaching techniques.

APPENDIX 3: RECOMMENDED PERFORMANCE MONITORING PLAN

Table 11: Recommended Performance Monitoring Plan for the Bot/Kleinmond Estuarine Management Plan

MANAGEMENT OBJECTIVES	PERFORMANCE INDICATOR	FREQUENCY	LEGISLATION	RESPONSIBILITY
1. Social, Institutional & Governance				
1.1 Organisational Arrangements	Regional Estuaries Management (EM) office established Performance of EM Co-ordinator Confirmed roles & responsibilities of participating departments & agencies Number and representativeness of IAPs attending meetings of the Estuary Advisory Forum Number of EAF meetings EM financial plan in place	Twice a year	ICMA NEMP	RMA/ CapeNature, DEADP, BREF
1.2 Funding & Capacity	Funds committed by all participating agencies for EMP activities Increased labour force Increased knowledge base/competency Improved enforcement efficiency - reported contraventions and prosecutions Long term finances secured	Quarterly	ICMA, NWA, CARA, MSA	RMA/ CapeNature, Key partners
1.3 Monitoring & Evaluation Framework	EMP M&E framework EMP evaluations Integrated monitoring system Monitoring team trained and knowledgeable Employment opportunities for local communities Data collection and maintenance	Twice a year	NWA NEMP	RMA/ CapeNature, DWS
1.4 Improved compliance	Hotline established Rapid response network established with protocols/SOPs Public awareness programme implemented Reported contraventions and prosecutions.	Twice a year	MLRA, ICMA, NWA, NEMA	RMA/ CapeNature, BREF, Key partners
2. Water Quantity & Quality				
2.1 Resource Directed Measures	Ecological health Category of C is improved to B RQO indicators Number of Water User Associations	Twice a year for DWS	NWA	BGCMA, DWS

	Water licensing Water consumption Freshwater inflow from rivers into the Bot/Kleinmond system Water awareness programme			
2.2 Water Quality Programme	Water quality indicators Water quality monitoring programme in place Generation of water quality data and database maintenance Rapid response deployment strategy for pollution incidents Expenditure on sewer network / waste water treatment infrastructure upgrades. Pollution-related prosecutions Agricultural best practice adopted	Twice a year for DWS Monthly for BREF Ad hoc visual monitoring during normal daily activities	NWA, MSA, NEMA, CARA	RMA / CapeNature, BGCMA, OSM, ODM, DFFE, BREF
2.3 Riparian Buffer	Extent of sensitive / vital riparian habitats mapped Policy and guidelines developed Buy-in from OSM and riparian land owners Implementation and rehabilitation of riparian buffer Extent of alien vegetation infestation in the Bot/Kleinmond catchment and rate of removal/clearing	Once a year	NWA, CARA, NEM:BA	RMA/ CapeNature, DFFE, OSM, BREF DEA:WfW
3. Fish Resource Priority Area				
3.1 Estuarine Protected Area	Extent of formally established estuarine sanctuary areas Guidelines developed, bylaws updated Information disseminated	Twice a year, After peak holiday seasons	NEM:PAA, NEM:BA, ICMA, EIA	CapeNature, OSM, BREF
3.2 Mouth Management Plan	Application of MMP Number of natural and artificially induced mouth openings (Bot/Kleinmond). Diversity, abundance and structure of fish populations Monitoring and reporting	Twice a year	NEMA, MLRA	CapeNature, DFFE, OSM
3.3 Sustainable Resource Use	Increased labour force and number/frequency of patrols Number of permit holders Numbers and types of estuary users Reported incidents of unlicensed fishing (recreational and subsistence) and Significant oversight by DFFE	Twice a year and after peak holiday seasons	MLRA	DFFE, CapeNature

4. Land-Use & Development Planning				
4.1 Coastal Protection Environmental Overlay Zone	Implementation of Coastal Protection EMOZ by OSM (i.e. LUMS) Improved capacity for enforcement of coastal and estuarine management	Once a year	ICMA	OSM, CapeNature, DEADP
4.2 Terrestrial Conservation Area	Detailed mapping of sensitive habitats Improved integrity of undeveloped, natural habitats Municipal conservation plan developed Stewardship agreements signed Increase in land under conservation/formal protection against development Guidelines produced for land use and management in biodiversity priority areas and corridors	Once a year	NEM:PAA, ICMA, MSA	OSM, CapeNature, DEADP
4.3 Public Recreation Areas Development and Access	Designated access and amenities provided Number of allocated areas and amenities for Public Recreation around the estuary Investment in development of Bot/Kleinmond Public Recreation facilities Number of permanent and temporary jobs created, new enterprises established.	Twice a year	ICMA (Access), LUPA, NEMA, MSA	CapeNature, OSM LED
4.4 Ecotourism Development	Innovative tourism development opportunities identified and implemented Number of tourism concessions awarded. Number of tourism enterprises owned by residents of the estuarine catchment. Number of permanent and temporary jobs in estuarine-based ecotourism enterprises. New and improved amenities and access to support tourism Ongoing effectual marketing of ecotourism products Contribution of tourism to GDP	Twice a year	MSA	OSM LED, BREF,